

# HARVEY TOOL™

*Your Specials Are Our Standards™*



3

PART #	BRNO	ORDER DATE	DELIVERY DATE
00088 0001		08-23-2020	08-23-2020

4

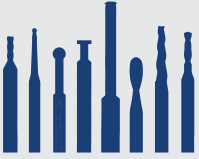
**PROJECT**

**HIGH PRIORITY**



# THINK HARVEY TOOL FIRST

FOR



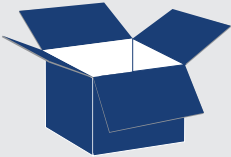
## Unique Selection

We offer a comprehensive selection of over 24,000 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

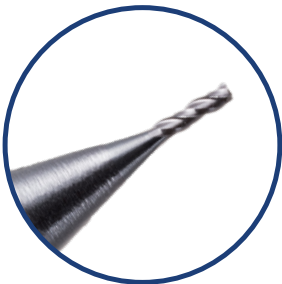
We are committed to designing unique geometries that optimize cutting performance for a variety of materials and applications. We introduce hundreds of new tools into the market every 6 months, offering our customers the solutions they need most.



## Same-Day Shipping

Our fully stocked inventory is ready to ship the same day. 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 [www.harveytool.com](http://www.harveytool.com).

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



### Think Harvey Tool First

More than 24,000 miniature and specialty end mills.  
Ship today, in your machine tomorrow.

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



### Let Helical Impress You

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

[www.helicaltool.com](http://www.helicaltool.com)















### Make More with Micro 100

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





[www.micro100.com](http://www.micro100.com)

# WHAT WE OFFER

<p><b>Miniature End Mills</b> (page 9)</p>		<p>Select from over <b>7,000</b> miniature end mills down to .001" cutter diameter, available in a variety of styles and profiles.</p>
<p><b>Material-Specific End Mills</b> (page 81)</p>		<p>Achieve the best results in exotic alloys, medium alloys, free machining steels, aluminum alloys, graphite, plastics, composites, wood, and more with over <b>5,100</b> high performance end mills.</p>
<p><b>Undercutting End Mills</b> (page 223)</p>		<p>Over <b>900</b> options, with <b>3</b> different wrap angles: 300°, 270°, and 220°.</p>
<p><b>Drill/End Mills</b> (page 238)</p>		<p>Over <b>550</b> options, with cutter diameters from 1/32" to 1".</p>
<p><b>Chamfer Cutters</b> (page 249)</p>		<p>Over <b>1,000</b> options, with diameters from 1/32" to 1" and <b>21</b> different angles per side.</p>
<p><b>Engraving Cutters</b> (page 271)</p>		<p>Over <b>900</b> options, available with <b>16</b> included angles and a variety of styles.</p>
<p><b>Double Angle Shank Cutters</b> (page 292)</p>		<p>Over <b>550</b> options in multiple styles and reach lengths and <b>14</b> included angles.</p>
<p><b>Keyseat Cutters</b> (page 301)</p>		<p>Over <b>2,000</b> options, with cutter diameters from 1/16" to 1-1/2".</p>
<p><b>Slitting Saws</b> (page 330)</p>		<p>Over <b>100</b> coated and uncoated options, with thicknesses from .0100" to .2500".</p>
<p><b>Corner Rounding End Mills</b> (page 333)</p>		<p>Over <b>850</b> options, with over <b>100</b> radii from .003" to 5/8".</p>
<p><b>Dovetail Cutters</b> (page 346)</p>		<p><b>Over 500</b> options, with <b>17</b> included angles.</p>
<p><b>Holemaking &amp; Threading</b> (page 357)</p>		<p>Solve a variety of holemaking challenges from spotting to threading with over <b>3,900</b> options that include miniature drills, reamers, countersinks, counterbores, and single-form, multi-form, and tri-form threadmills.</p>









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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.

SQUARE



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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

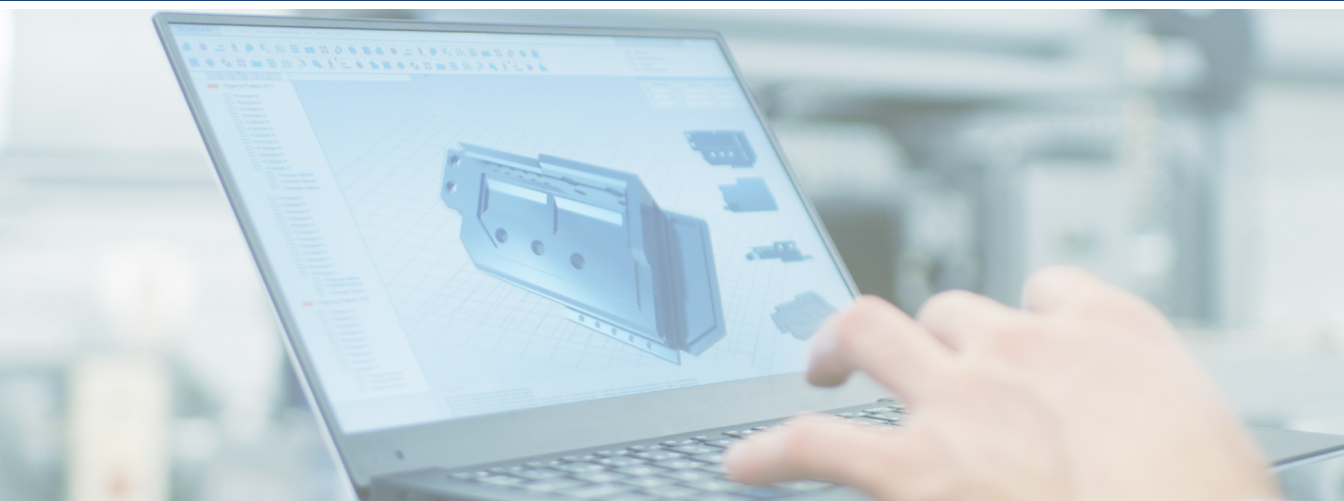
Deburring parts can be tiresome, expensive, and time-consuming, especially if done by hand. Harvey Tool's engineers have created a variety of **CNC-toleranced** deburring tools that allow you to deburr **in your CNC machine**, providing better finish, **reduced part and labor costs**, and increased capacity.



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# New CAM Tool Libraries

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



## CAM Partners

### Valuable Time Savings

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

### Confident Machining

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

### Growing Libraries & Partnerships

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



Download Tool Libraries Now



[www.harveyperformance.com/tool-libraries](http://www.harveyperformance.com/tool-libraries)



# MINIATURE END MILLS

## SQUARE

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## CORNER RADIUS

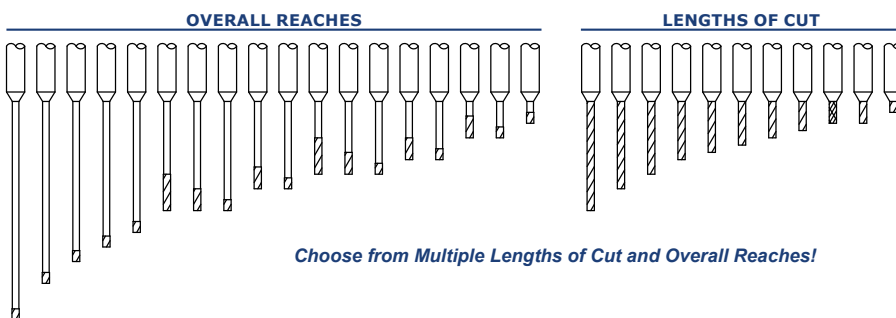
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# MINIATURE END MILLS

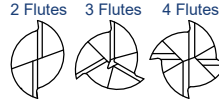
## Square – Stub & Standard



Stub Flute & Standard Length  
3x

SQUARE

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

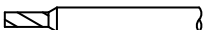


CUTTER DIA.	LOC	SHANK DIA.		UNCOATED				AITIN COATED				AMORPHOUS DIAMOND		
		D <sub>2</sub>	L <sub>1</sub>	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>											
.001	<b>.001</b> (1.5x)	1/8	1-1/2	13901			51.40							
.001	<b>.003</b> (3x)	1/8	1-1/2	72001			51.40							
.002	<b>.003</b> (1.5x)	1/8	1-1/2	13902			44.70							
.002	<b>.006</b> (3x)	1/8	1-1/2	72002			44.70							
.003	<b>.004</b> (1.5x)	1/8	1-1/2	13903			38.60							
.003	<b>.009</b> (3x)	1/8	1-1/2	72003			38.60							
.004 (.1 mm)	<b>.006</b> (1.5x)	1/8	1-1/2	13904			33.20							
.004 (.1 mm)	<b>.012</b> (3x)	1/8	1-1/2	72004			33.20							
.005	<b>.007</b> (1.5x)	1/8	1-1/2	13905	823005	14005*	30.00	13905-C3	823005-C3	14005-C3*	34.60			
.005	<b>.015</b> (3x)	1/8	1-1/2	72005	836305	73005*	30.00	72005-C3	836305-C3	73005-C3*	34.60			
.006	<b>.009</b> (1.5x)	1/8	1-1/2	13906		14006*	30.70	13906-C3		14006-C3*	35.30			
.006	<b>.018</b> (3x)	1/8	1-1/2	72006	836306	73006*	30.70	72006-C3	836306-C3	73006-C3*	35.30			
.007	<b>.010</b> (1.5x)	1/8	1-1/2	13907		14007*	30.70	13907-C3		14007-C3*	35.30			
.007	<b>.021</b> (3x)	1/8	1-1/2	72007	836307	73007*	30.70	72007-C3	836307-C3	73007-C3*	35.30			
.008 (.2 mm)	<b>.012</b> (1.5x)	1/8	1-1/2	13908		14008*	30.70	13908-C3		14008-C3*	35.30			
.008 (.2 mm)	<b>.024</b> (3x)	1/8	1-1/2	72008	836308	73008*	30.70	72008-C3	836308-C3	73008-C3*	35.30			
.009	<b>.013</b> (1.5x)	1/8	1-1/2	13909		14009*	30.70	13909-C3		14009-C3*	35.30			
.009	<b>.027</b> (3x)	1/8	1-1/2	72009	836309	73009*	30.70	72009-C3	836309-C3	73009-C3*	35.30			
.010	<b>.015</b> (1.5x)	1/8	1-1/2	13910	823010	14010	24.20	13910-C3	823010-C3	14010-C3	28.80		14010-C4	35.90
.010	<b>.030</b> (3x)	1/8	1-1/2	72010	836310	73010	24.20	72010-C3	836310-C3	73010-C3	28.80	72010-C4	73010-C4	35.90
.011	<b>.016</b> (1.5x)	1/8	1-1/2	13911		14011	24.70	13911-C3		14011-C3	29.30			
.011	<b>.033</b> (3x)	1/8	1-1/2	72011	836311	73011	24.70	72011-C3	836311-C3	73011-C3	29.30		73011-C4	36.40
.012 (.3 mm)	<b>.018</b> (1.5x)	1/8	1-1/2	13912		14012	24.70	13912-C3		14012-C3	29.30			
.012 (.3 mm)	<b>.036</b> (3x)	1/8	1-1/2	72012	836312	73012	24.70	72012-C3	836312-C3	73012-C3	29.30	72012-C4	73012-C4	36.40
.013	<b>.019</b> (1.5x)	1/8	1-1/2	13913		14013	24.70	13913-C3		14013-C3	29.30			
.013	<b>.039</b> (3x)	1/8	1-1/2	72013	836313	73013	24.70	72013-C3	836313-C3	73013-C3	29.30		73013-C4	36.40
.014	<b>.021</b> (1.5x)	1/8	1-1/2	13914		14014	24.70	13914-C3		14014-C3	29.30			
.014	<b>.042</b> (3x)	1/8	1-1/2	72014	836314	73014	24.70	72014-C3	836314-C3	73014-C3	29.30		73014-C4	36.40
.015 (1/64)	<b>.022</b> (1.5x)	1/8	1-1/2	13915	823015	14015	21.00	13915-C3	823015-C3	14015-C3	25.60	13915-C4	14015-C4	32.70
.015 (1/64)	<b>.045</b> (3x)	1/8	1-1/2	72015	836315	73015	21.00	72015-C3	836315-C3	73015-C3	25.60	72015-C4	73015-C4	32.70
.016 (.4 mm)	<b>.024</b> (1.5x)	1/8	1-1/2	13916		14016	22.20	13916-C3		14016-C3	26.80			
.016 (.4 mm)	<b>.048</b> (3x)	1/8	1-1/2	72016	836316	73016	22.20	72016-C3	836316-C3	73016-C3	26.80		73016-C4	33.90
.017	<b>.026</b> (1.5x)	1/8	1-1/2	13917		14017	22.20	13917-C3		14017-C3	26.80			
.017	<b>.051</b> (3x)	1/8	1-1/2	72017	836317	73017	22.20	72017-C3	836317-C3	73017-C3	26.80		73017-C4	33.90
.018	<b>.027</b> (1.5x)	1/8	1-1/2	13918		14018	22.20	13918-C3		14018-C3	26.80			
.018	<b>.054</b> (3x)	1/8	1-1/2	72018	836318	73018	22.20	72018-C3	836318-C3	73018-C3	26.80		73018-C4	33.90
.019	<b>.029</b> (1.5x)	1/8	1-1/2	13919		14019	22.20	13919-C3		14019-C3	26.80			
.019	<b>.057</b> (3x)	1/8	1-1/2	72019	836319	73019	22.20	72019-C3	836319-C3	73019-C3	26.80		73019-C4	33.90

Coated sizes down to .005"!

\*End cutting (not center cutting).

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MINIATURE END MILLS

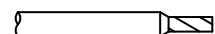
Square – Stub & Standard (cont.)

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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	4 FL	PRICE
NEW	.020 (.5 mm)	<b>.030</b> (1.5x)	1/8	1-1/2	13920	823020	14020	20.10	13920-C3	823020-C3	14020-C3	24.70	13920-C4	14020-C4	31.80
	.020 (.5 mm)	<b>.060</b> (3x)	1/8	1-1/2	72020	836320	73020	20.10	72020-C3	836320-C3	73020-C3	24.70	72020-C4	73020-C4	31.80
	.021	<b>.031</b> (1.5x)	1/8	1-1/2	13921		14021	21.20	13921-C3		14021-C3	25.80			
	.021	<b>.063</b> (3x)	1/8	1-1/2	72021	836321	73021	21.20	72021-C3	836321-C3	73021-C3	25.80		73021-C4	32.90
	.022	<b>.033</b> (1.5x)	1/8	1-1/2	13922		14022	21.20	13922-C3		14022-C3	25.80			
	.022	<b>.066</b> (3x)	1/8	1-1/2	72022	836322	73022	21.20	72022-C3	836322-C3	73022-C3	25.80		73022-C4	32.90
	.023	<b>.035</b> (1.5x)	1/8	1-1/2	13923		14023	21.20	13923-C3		14023-C3	25.80			
	.023	<b>.069</b> (3x)	1/8	1-1/2	72023	836323	73023	21.20	72023-C3	836323-C3	73023-C3	25.80		73023-C4	32.90
	.024 (.6 mm)	<b>.036</b> (1.5x)	1/8	1-1/2	13924		14024	21.20	13924-C3		14024-C3	25.80			
	.024 (.6 mm)	<b>.072</b> (3x)	1/8	1-1/2	72024	836324	73024	21.20	72024-C3	836324-C3	73024-C3	25.80		73024-C4	32.90
NEW	.025	<b>.037</b> (1.5x)	1/8	1-1/2	13925	823025	14025	18.60	13925-C3	823025-C3	14025-C3	23.20	13925-C4	14025-C4	30.30
	.025	<b>.075</b> (3x)	1/8	1-1/2	72025	836325	73025	18.60	72025-C3	836325-C3	73025-C3	23.20	72025-C4	73025-C4	30.30
	.026	<b>.039</b> (1.5x)	1/8	1-1/2	13926		14026	19.70	13926-C3		14026-C3	24.30			
	.026	<b>.078</b> (3x)	1/8	1-1/2	72026	836326	73026	19.70	72026-C3	836326-C3	73026-C3	24.30		73026-C4	31.40
	.027	<b>.041</b> (1.5x)	1/8	1-1/2	13927		14027	19.70	13927-C3		14027-C3	24.30			
	.027	<b>.081</b> (3x)	1/8	1-1/2	72027	836327	73027	19.70	72027-C3	836327-C3	73027-C3	24.30		73027-C4	31.40
	.028 (.7 mm)	<b>.042</b> (1.5x)	1/8	1-1/2	13928		14028	19.70	13928-C3		14028-C3	24.30			
	.028 (.7 mm)	<b>.084</b> (3x)	1/8	1-1/2	72028	836328	73028	19.70	72028-C3	836328-C3	73028-C3	24.30		73028-C4	31.40
	.029	<b>.043</b> (1.5x)	1/8	1-1/2	13929		14029	19.70	13929-C3		14029-C3	24.30			
	.029	<b>.087</b> (3x)	1/8	1-1/2	72029	836329	73029	19.70	72029-C3	836329-C3	73029-C3	24.30		73029-C4	31.40
	.030	<b>.045</b> (1.5x)	1/8	1-1/2	13930	823030	14030	18.60	13930-C3	823030-C3	14030-C3	23.20		14030-C4	30.30
	.030	<b>.090</b> (3x)	1/8	1-1/2	72030	836330	73030	18.60	72030-C3	836330-C3	73030-C3	23.20	72030-C4	73030-C4	30.30
	.031 (1/32)	<b>.046</b> (1.5x)	1/8	1-1/2	13931	823031	14031	18.60	13931-C3	823031-C3	14031-C3	23.20	13931-C4	14031-C4	30.30
	.031 (1/32)	<b>.093</b> (3x)	1/8	1-1/2	72031	836331	73031	18.60	72031-C3	836331-C3	73031-C3	23.20	72031-C4	73031-C4	30.30
	.032	<b>.048</b> (1.5x)	1/8	1-1/2	13932		14032	19.70	13932-C3		14032-C3	24.30			
	.032	<b>.096</b> (3x)	1/8	1-1/2	72032		73032	19.70	72032-C3		73032-C3	24.30			
	.033	<b>.049</b> (1.5x)	1/8	1-1/2	13933		14033	19.70	13933-C3		14033-C3	24.30			
	.033	<b>.099</b> (3x)	1/8	1-1/2	72033		73033	19.70	72033-C3		73033-C3	24.30			
	.034	<b>.051</b> (1.5x)	1/8	1-1/2	13934		14034	19.70	13934-C3		14034-C3	24.30			
	.034	<b>.102</b> (3x)	1/8	1-1/2	72034		73034	19.70	72034-C3		73034-C3	24.30			
	.035 (.9 mm)	<b>.052</b> (1.5x)	1/8	1-1/2	13935	823035	14035	16.20	13935-C3	823035-C3	14035-C3	20.80		14035-C4	27.90
	.035 (.9 mm)	<b>.105</b> (3x)	1/8	1-1/2	72035	836335	73035	16.20	72035-C3	836335-C3	73035-C3	20.80	72035-C4	73035-C4	27.90
	.036	<b>.054</b> (1.5x)	1/8	1-1/2	13936		14036	16.90	13936-C3		14036-C3	21.50			
	.036	<b>.108</b> (3x)	1/8	1-1/2	72036		73036	16.90	72036-C3		73036-C3	21.50			
	.037	<b>.055</b> (1.5x)	1/8	1-1/2	13937		14037	16.90	13937-C3		14037-C3	21.50			
	.037	<b>.111</b> (3x)	1/8	1-1/2	72037		73037	16.90	72037-C3		73037-C3	21.50			
	.038	<b>.057</b> (1.5x)	1/8	1-1/2	13938		14038	16.90	13938-C3		14038-C3	21.50			
	.038	<b>.114</b> (3x)	1/8	1-1/2	72038		73038	16.90	72038-C3		73038-C3	21.50			
	.039 (1 mm)	<b>.058</b> (1.5x)	1/8	1-1/2	13939	823039	14039	16.70	13939-C3	823039-C3	14039-C3	21.30			
	.039 (1 mm)	<b>.117</b> (3x)	1/8	1-1/2	72039	836339	73039	16.70	72039-C3	836339-C3	73039-C3	21.30		73039-C4	28.40
	.040	<b>.060</b> (1.5x)	1/8	1-1/2	13940	823040	14040	16.20	13940-C3	823040-C3	14040-C3	20.80		14040-C4	27.90
	.040	<b>.120</b> (3x)	1/8	1-1/2	72040	836340	73040	16.20	72040-C3	836340-C3	73040-C3	20.80	72040-C4	73040-C4	27.90
	.041	<b>.062</b> (1.5x)	1/8	1-1/2	13941		14041	16.90	13941-C3		14041-C3	21.50			
	.041	<b>.123</b> (3x)	1/8	1-1/2	72041		73041	16.90	72041-C3		73041-C3	21.50			

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# MINIATURE END MILLS

## Square – Stub & Standard (cont.)

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SQUARE

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		
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>													
.042	<b>.063</b> (1.5x)	1/8	1-1/2	13942		14042	16.90	13942-C3		14042-C3	21.50					
.042	<b>.126</b> (3x)	1/8	1-1/2	72042		73042	16.90	72042-C3		73042-C3	21.50					
.043 (1.1 mm)	<b>.065</b> (1.5x)	1/8	1-1/2	13943		14043	16.90	13943-C3		14043-C3	21.50					
.043 (1.1 mm)	<b>.129</b> (3x)	1/8	1-1/2	72043		73043	16.90	72043-C3		73043-C3	21.50					
.044	<b>.066</b> (1.5x)	1/8	1-1/2	13944		14044	16.90	13944-C3		14044-C3	21.50					
.044	<b>.132</b> (3x)	1/8	1-1/2	72044		73044	16.90	72044-C3		73044-C3	21.50					
.045	<b>.067</b> (1.5x)	1/8	1-1/2	13945	823045	14045	16.20	13945-C3	823045-C3	14045-C3	20.80			14045-C4	27.90	
.045	<b>.135</b> (3x)	1/8	1-1/2	72045	836345	73045	16.20	72045-C3	836345-C3	73045-C3	20.80	72045-C4	73045-C4	27.90		
.046	<b>.069</b> (1.5x)	1/8	1-1/2			14046	16.90			14046-C3	21.50					
.046	<b>.138</b> (3x)	1/8	1-1/2	72046	836346	73046	16.90	72046-C3	836346-C3	73046-C3	21.50					
.047 (3/64)	<b>.070</b> (1.5x)	1/8	1-1/2	13947	823047	14047	16.20	13947-C3	823047-C3	14047-C3	20.80			14047-C4	27.90	
.047 (3/64)	<b>.141</b> (3x)	1/8	1-1/2	72047	836347	73047	16.20	72047-C3	836347-C3	73047-C3	20.80	72047-C4	73047-C4	27.90		
.048	<b>.144</b> (3x)	1/8	1-1/2	72048		73048	16.90	72048-C3		73048-C3	21.50					
.049	<b>.147</b> (3x)	1/8	1-1/2	72049		73049	16.90	72049-C3		73049-C3	21.50					
.050	<b>.075</b> (1.5x)	1/8	1-1/2	13950	823050	14050	16.20	13950-C3	823050-C3	14050-C3	20.80			14050-C4	27.90	
.050	<b>.150</b> (3x)	1/8	1-1/2	72050	836350	73050	16.20	72050-C3	836350-C3	73050-C3	20.80	72050-C4	73050-C4	27.90		
.051 (1.3 mm)	<b>.153</b> (3x)	1/8	1-1/2	72051		73051	16.90	72051-C3		73051-C3	21.50					
.052	<b>.078</b> (1.5x)	1/8	1-1/2	13952		14052	16.90	13952-C3		14052-C3	21.50					
.052	<b>.156</b> (3x)	1/8	1-1/2	72052		73052	16.90	72052-C3		73052-C3	21.50					
.053	<b>.159</b> (3x)	1/8	1-1/2	72053		73053	16.90	72053-C3		73053-C3	21.50					
.054	<b>.162</b> (3x)	1/8	1-1/2	72054		73054	16.90	72054-C3		73054-C3	21.50					
.055 (1.4 mm)	<b>.082</b> (1.5x)	1/8	1-1/2	13955	823055	14055	16.20	13955-C3	823055-C3	14055-C3	20.80			14055-C4	27.90	
.055 (1.4 mm)	<b>.165</b> (3x)	1/8	1-1/2	72055	836355	73055	16.20	72055-C3	836355-C3	73055-C3	20.80	72055-C4	73055-C4	27.90		
.056	<b>.168</b> (3x)	1/8	1-1/2	72056		73056	16.90	72056-C3		73056-C3	21.50					
.057	<b>.171</b> (3x)	1/8	1-1/2	72057		73057	16.90	72057-C3		73057-C3	21.50					
.058	<b>.174</b> (3x)	1/8	1-1/2	72058		73058	16.90	72058-C3		73058-C3	21.50					
.059 (1.5 mm)	<b>.089</b> (1.5x)	1/8	1-1/2	13959	823059	14059	16.90	13959-C3	823059-C3	14059-C3	21.50					
.059 (1.5 mm)	<b>.177</b> (3x)	1/8	1-1/2	72059	836359	73059	16.90	72059-C3	836359-C3	73059-C3	21.50					
.060	<b>.090</b> (1.5x)	1/8	1-1/2	13960	823060	14060	16.20	13960-C3	823060-C3	14060-C3	20.80			14060-C4	27.90	
.060	<b>.180</b> (3x)	1/8	1-1/2	72060	836360	73060	16.20	72060-C3	836360-C3	73060-C3	20.80	72060-C4	73060-C4	27.90		
.061	<b>.183</b> (3x)	1/8	1-1/2			73061	17.00			73061-C3	21.60					
.062 (1/16)	<b>.093</b> (1.5x)	1/8	1-1/2	13962	823062	14062	14.60	13962-C3	823062-C3	14062-C3	19.20	13962-C4	14062-C4	26.30		
.062 (1/16)	<b>.186</b> (3x)	1/8	1-1/2	72062	836362	73062	14.60	72062-C3	836362-C3	73062-C3	19.20	72062-C4	73062-C4	26.30		
.063 (1.6 mm)	<b>.189</b> (3x)	1/8	1-1/2			73063	17.00			73063-C3	21.60					
.064	<b>.192</b> (3x)	1/8	1-1/2			73064	17.00			73064-C3	21.60					
.065	<b>.097</b> (1.5x)	1/8	1-1/2	13965	823065	14065	14.60	13965-C3	823065-C3	14065-C3	19.20					
.065	<b>.195</b> (3x)	1/8	1-1/2	72065	836365	73065	14.60	72065-C3	836365-C3	73065-C3	19.20	72065-C4	73065-C4	26.30		
.066	<b>.198</b> (3x)	1/8	1-1/2			73066	17.00			73066-C3	21.60					
.067 (1.7 mm)	<b>.201</b> (3x)	1/8	1-1/2			73067	17.00			73067-C3	21.60					
.068	<b>.204</b> (3x)	1/8	1-1/2			73068	17.00			73068-C3	21.60					
.069	<b>.207</b> (3x)	1/8	1-1/2			73069	17.00			73069-C3	21.60					
.070	<b>.105</b> (1.5x)	1/8	1-1/2	13970	823070	14070	14.60	13970-C3	823070-C3	14070-C3	19.20					
.070	<b>.210</b> (3x)	1/8	1-1/2	72070	836370	73070	14.60	72070-C3	836370-C3	73070-C3	19.20	72070-C4	73070-C4	26.30		
.071 (1.8 mm)	<b>.213</b> (3x)	1/8	1-1/2			73071	17.00			73071-C3	21.60					
.072	<b>.216</b> (3x)	1/8	1-1/2			73072	17.00			73072-C3	21.60					

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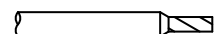
# MINIATURE END MILLS

Square – Stub & Standard (cont.)

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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
.073	<b>.219</b> (3x)	1/8	1-1/2			73073	17.00			73073-C3	21.60			
.074	<b>.222</b> (3x)	1/8	1-1/2			73074	17.00			73074-C3	21.60			
.075 (1.9 mm)	<b>.112</b> (1.5x)	1/8	1-1/2	13975	823075	14075	14.60	13975-C3	823075-C3	14075-C3	19.20			
.075 (1.9 mm)	<b>.225</b> (3x)	1/8	1-1/2	72075	836375	73075	14.60	72075-C3	836375-C3	73075-C3	19.20		73075-C4	26.30
.076	<b>.228</b> (3x)	1/8	1-1/2			73076	17.00			73076-C3	21.60			
.077	<b>.231</b> (3x)	1/8	1-1/2			73077	17.00			73077-C3	21.60			
.078 (5/64)	<b>.117</b> (1.5x)	1/8	1-1/2	13978	823078	14078	14.60	13978-C3	823078-C3	14078-C3	19.20		14078-C4	26.30
.078 (5/64)	<b>.234</b> (3x)	1/8	1-1/2	72078	836378	73078	14.60	72078-C3	836378-C3	73078-C3	19.20	72078-C4	73078-C4	26.30
.079	<b>.237</b> (3x)	1/8	1-1/2			73079	17.00			73079-C3	21.60			
.080	<b>.120</b> (1.5x)	1/8	1-1/2	13980	823080	14080	14.60	13980-C3	823080-C3	14080-C3	19.20			
.080	<b>.240</b> (3x)	1/8	1-1/2	72080	836380	73080	14.60	72080-C3	836380-C3	73080-C3	19.20	72080-C4	73080-C4	26.30
.081	<b>.243</b> (3x)	1/8	1-1/2			73081	17.00			73081-C3	21.60			
.082	<b>.246</b> (3x)	1/8	1-1/2			73082	17.00			73082-C3	21.60			
.083 (2.1 mm)	<b>.249</b> (3x)	1/8	1-1/2			73083	17.00			73083-C3	21.60			
.084	<b>.252</b> (3x)	1/8	1-1/2			73084	17.00			73084-C3	21.60			
.085	<b>.127</b> (1.5x)	1/8	1-1/2	13985	823085	14085	14.60	13985-C3	823085-C3	14085-C3	19.20			
.085	<b>.255</b> (3x)	1/8	1-1/2	72085	836385	73085	14.60	72085-C3	836385-C3	73085-C3	19.20		73085-C4	26.30
.086	<b>.258</b> (3x)	1/8	1-1/2			73086	17.00			73086-C3	21.60			
.087 (2.2 mm)	<b>.261</b> (3x)	1/8	1-1/2			73087	17.00			73087-C3	21.60			
.088	<b>.264</b> (3x)	1/8	1-1/2			73088	17.00			73088-C3	21.60			
.089	<b>.267</b> (3x)	1/8	1-1/2			73089	17.00			73089-C3	21.60			
.090	<b>.135</b> (1.5x)	1/8	1-1/2	13990	823090	14090	14.60	13990-C3	823090-C3	14090-C3	19.20			
.090	<b>.270</b> (3x)	1/8	1-1/2	72090	836390	73090	14.60	72090-C3	836390-C3	73090-C3	19.20	72090-C4	73090-C4	26.30
.091 (2.3 mm)	<b>.273</b> (3x)	1/8	1-1/2			73091	17.00			73091-C3	21.60			
.092	<b>.276</b> (3x)	1/8	1-1/2			73092	17.00			73092-C3	21.60			
.093 (3/32)	<b>.139</b> (1.5x)	1/8	1-1/2	13993	823093	14093	14.60	13993-C3	823093-C3	14093-C3	19.20	13993-C4	14093-C4	26.30
.093 (3/32)	<b>.279</b> (3x)	1/8	1-1/2	72093	836393	73093	14.60	72093-C3	836393-C3	73093-C3	19.20	72093-C4	73093-C4	26.30
.094 (2.4 mm)	<b>.282</b> (3x)	1/8	1-1/2			73094	17.00			73094-C3	21.60			
.095	<b>.142</b> (1.5x)	1/8	1-1/2	13995	823095	14095	14.60	13995-C3	823095-C3	14095-C3	19.20			
.095	<b>.285</b> (3x)	1/8	1-1/2	72095	836395	73095	14.60	72095-C3	836395-C3	73095-C3	19.20		73095-C4	26.30
.096	<b>.288</b> (3x)	1/8	1-1/2			73096	17.00			73096-C3	21.60			
.097	<b>.291</b> (3x)	1/8	1-1/2			73097	17.00			73097-C3	21.60			
.098 (2.5 mm)	<b>.294</b> (3x)	1/8	1-1/2			73098	17.00			73098-C3	21.60			
.099	<b>.297</b> (3x)	1/8	1-1/2			73099	17.00			73099-C3	21.60			
.100	<b>.150</b> (1.5x)	1/8	1-1/2	13999	823100	14099	14.60	13999-C3	823100-C3	14099-C3	19.20			
.100	<b>.300</b> (3x)	1/8	1-1/2	72100	836400	73100	14.60	72100-C3	836400-C3	73100-C3	19.20	72100-C4	73100-C4	26.30
.101	<b>.303</b> (3x)	1/8	1-1/2			73101	17.00			73101-C3	21.60			
.102 (2.6 mm)	<b>.306</b> (3x)	1/8	1-1/2			73102	17.00			73102-C3	21.60			
.103	<b>.309</b> (3x)	1/8	1-1/2			73103	17.00			73103-C3	21.60			
.104	<b>.312</b> (3x)	1/8	1-1/2			73104	17.00			73104-C3	21.60			
.105	<b>.158</b> (1.5x)	1/8	1-1/2	50200		50300	14.60	50200-C3		50300-C3	19.20			
.105	<b>.315</b> (3x)	1/8	1-1/2	72105		73105	14.60	72105-C3		73105-C3	19.20		73105-C4	26.30
.106 (2.7 mm)	<b>.318</b> (3x)	1/8	1-1/2			73106	17.00			73106-C3	21.60			
.107	<b>.321</b> (3x)	1/8	1-1/2			73107	17.00			73107-C3	21.60			
.108	<b>.324</b> (3x)	1/8	1-1/2			73108	17.00			73108-C3	21.60			

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# MINIATURE END MILLS

## Square – Stub & Standard (cont.)

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SQUARE

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
D <sub>1</sub> $\begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	D <sub>2</sub>	L <sub>1</sub>											
.109 (7/64)	<b>.164</b> (1.5x)	1/8	1-1/2	50201	823102	50301	14.60	50201-C3	823102-C3	50301-C3	19.20			
.109 (7/64)	<b>.327</b> (3x)	1/8	1-1/2	72109	836402	73109	14.60	72109-C3	836402-C3	73109-C3	19.20			
.110	<b>.165</b> (1.5x)	1/8	1-1/2	50202		50302	14.60	50202-C3		50302-C3	19.20			
.110	<b>.330</b> (3x)	1/8	1-1/2	72110		73110	14.60	72110-C3		73110-C3	19.20		73110-C4	26.30
.111 (2.8 mm)	<b>.333</b> (3x)	1/8	1-1/2			73111	17.00			73111-C3	21.60			
.112	<b>.336</b> (3x)	1/8	1-1/2			73112	17.00			73112-C3	21.60			
.113	<b>.339</b> (3x)	1/8	1-1/2			73113	17.00			73113-C3	21.60			
.114 (2.9 mm)	<b>.341</b> (3x)	1/8	1-1/2			73114	17.00			73114-C3	21.60			
.115	<b>.173</b> (1.5x)	1/8	1-1/2	50203		50303	14.60	50203-C3		50303-C3	19.20			
.115	<b>.345</b> (3x)	1/8	1-1/2	72115		73115	14.60	72115-C3		73115-C3	19.20		73115-C4	26.30
.116	<b>.348</b> (3x)	1/8	1-1/2			73116	17.00			73116-C3	21.60			
.117	<b>.351</b> (3x)	1/8	1-1/2			73117	17.00			73117-C3	21.60			
.118 (3 mm)	<b>.177</b> (1.5x)	1/8	1-1/2	50204	823105	50304	14.90	50204-C3	823105-C3	50304-C3	19.50			
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	72118	836405	73118	14.90	72118-C3	836405-C3	73118-C3	19.50		73118-C4	26.60
.119	<b>.357</b> (3x)	1/8	1-1/2			73119	17.00			73119-C3	21.60			
.120	<b>.180</b> (1.5x)	1/8	1-1/2	50205		50305	14.60	50205-C3		50305-C3	19.20			
.120	<b>.360</b> (3x)	1/8	1-1/2	72120		73120	14.60	72120-C3		73120-C3	19.20		73120-C4	26.30

D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	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	PRICE
.125 (1/8)	<b>.187</b> (1.5x)	1/8	1-1/2	50208	823108	50308	14.20	50208-C3	823108-C3	50308-C3	18.80	50208-C4	50308-C4	25.90
.125 (1/8)	<b>.375</b> (3x)	1/8	1-1/2	72125	836408	73125	14.20	72125-C3	836408-C3	73125-C3	18.80	72125-C4	73125-C4	25.90
.140 (9/64)	<b>.220</b> (1.5x)	3/16	2	50209	823109	50309	15.40	50209-C3	823109-C3	50309-C3	20.40			
.140 (9/64)	<b>.562</b> (4x)	3/16	2	72140	836409	73140	15.40	72140-C3	836409-C3	73140-C3	20.40		73140-C4	31.50
.156 (5/32)	<b>.281</b> (1.5x)	3/16	2	50210	823110	50310	15.40	50210-C3	823110-C3	50310-C3	20.40		50310-C4	31.50
.156 (5/32)	<b>.562</b> (3x)	3/16	2	72156	836410	73156	15.40	72156-C3	836410-C3	73156-C3	20.40	72156-C4	73156-C4	31.50
.172 (11/64)	<b>.625</b> (3x)	3/16	2	72172		73172	15.40	72172-C3		73172-C3	20.40			
.187 (3/16)	<b>.312</b> (1.5x)	3/16	2	50212	823112	50312	15.40	50212-C3	823112-C3	50312-C3	20.40		50312-C4	31.50
.187 (3/16)	<b>.625</b> (3x)	3/16	2	72187	836412	73187	15.40	72187-C3	836412-C3	73187-C3	20.40	72187-C4	73187-C4	31.50
.203 (13/64)	<b>.625</b> (3x)	1/4	2-1/2	72190		73190	16.80	72190-C3		73190-C3	23.60			
.218 (7/32)	<b>.330</b> (1.5x)	1/4	2-1/2	50214	823114	50314	16.80	50214-C3	823114-C3	50314-C3	23.60			
.218 (7/32)	<b>.625</b> (3x)	1/4	2-1/2	72193	836414	73193	16.80	72193-C3	836414-C3	73193-C3	23.60			
.234 (15/64)	<b>.750</b> (3x)	1/4	2-1/2	72195		73195	16.80	72195-C3		73195-C3	23.60			
.250 (1/4)	<b>.375</b> (1.5x)	1/4	2-1/2	50216	823116	50316	16.80	50216-C3	823116-C3	50316-C3	23.60		50316-C4	35.10
.250 (1/4)	<b>.750</b> (3x)	1/4	2-1/2	72199	836416	73199	16.80	72199-C3	836416-C3	73199-C3	23.60	72199-C4	73199-C4	35.10
.312 (5/16)	<b>.470</b> (1.5x)	5/16	2-1/2	50220		50320	22.90	50220-C3		50320-C3	30.80			
.312 (5/16)	<b>.812</b> (3x)	5/16	2-1/2	15120		15220	22.90	15120-C3		15220-C3	30.80		15220-C4	45.00
.375 (3/8)	<b>.570</b> (1.5x)	3/8	2-1/2	50224		50324	30.60	50224-C3		50324-C3	39.60			
.375 (3/8)	<b>1.000</b> (3x)	3/8	2-1/2	15124		15224	30.60	15124-C3		15224-C3	39.60		15224-C4	52.70
.437 (7/16)	<b>1.312</b> (3x)	7/16	3				48.60				59.80			
.500 (1/2)	<b>1.000</b> (2x)	1/2	3	15132		15232	52.60	15132-C3		15232-C3	66.00		15232-C4	79.20

NEW

NEW



# 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 🇺🇸

NEW

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>						
.004	<b>.020</b> (5x)	3	1/8	2-1/2	<b>31804</b>	43.60				
.005	<b>.025</b> (5x)	3	1/8	2-1/2	31805	43.60				
.005	<b>.040</b> (8x)	3	1/8	2-1/2	33605	46.30				
.008	<b>.040</b> (5x)	3	1/8	2-1/2	31808	43.60				
.008	<b>.064</b> (8x)	3	1/8	2-1/2	33608	46.30				
.010	<b>.040</b> (4x)	3	1/8	2-1/2	888410	36.90	888410-C3	41.50		
.010	<b>.050</b> (5x)	3	1/8	2-1/2	12710	37.10	12710-C3	41.70	12710-C4	48.80
.010	<b>.060</b> (6x)	3	1/8	2-1/2	894210	44.50	894210-C3	49.10		
.010	<b>.070</b> (7x)	3	1/8	2-1/2	897910	51.90	897910-C3	56.50		
.010	<b>.080</b> (8x)	3	1/8	2-1/2	33610	64.50	33610-C3	69.10		
.010	<b>.100</b> (10x)	3	1/8	2-1/2	951310	69.80	951310-C3	74.40		
.015 (1/64)	<b>.062</b> (4x)	3	1/8	2-1/2	888415	34.00	888415-C3	38.60		
.015 (1/64)	<b>.078</b> (5x)	3	1/8	2-1/2	31815	34.00	31815-C3	38.60	31815-C4	45.70
.015 (1/64)	<b>.078</b> (5x)	4	1/8	2-1/2	834115	35.60	834115-C3	40.20		
.015 (1/64)	<b>.093</b> (6x)	3	1/8	2-1/2	894215	40.60	894215-C3	45.20		
.015 (1/64)	<b>.109</b> (7x)	3	1/8	2-1/2	897915	47.40	897915-C3	52.00		
.015 (1/64)	<b>.125</b> (8x)	3	1/8	2-1/2	33615	59.60	33615-C3	64.20	33615-C4	71.30
.015 (1/64)	<b>.125</b> (8x)	4	1/8	2-1/2	826815	60.90	826815-C3	65.50		
.015 (1/64)	<b>.156</b> (10x)	3	1/8	2-1/2	951315	66.60	951315-C3	71.20		
.015 (1/64)	<b>.187</b> (12x)	3	1/8	2-1/2	34915	73.40	34915-C3	78.00		
.020 (.5 mm)	<b>.080</b> (4x)	3	1/8	2-1/2	888420	29.10	888420-C3	33.70		
.020 (.5 mm)	<b>.100</b> (5x)	3	1/8	2-1/2	12720	29.10	12720-C3	33.70	12720-C4	40.80
.020 (.5 mm)	<b>.100</b> (5x)	4	1/8	2-1/2	834120	31.00	834120-C3	35.60		
.020 (.5 mm)	<b>.120</b> (6x)	3	1/8	2-1/2	894220	35.00	894220-C3	39.60		
.020 (.5 mm)	<b>.140</b> (7x)	3	1/8	2-1/2	897920	40.60	897920-C3	45.20		
.020 (.5 mm)	<b>.160</b> (8x)	3	1/8	2-1/2	33620	57.00	33620-C3	61.60	33620-C4	68.70
.020 (.5 mm)	<b>.200</b> (10x)	3	1/8	2-1/2	951320	63.90	951320-C3	68.50		
.020 (.5 mm)	<b>.250</b> (12x)	3	1/8	2-1/2	34920	70.60	34920-C3	75.20		
.025	<b>.100</b> (4x)	3	1/8	2-1/2	888425	27.80	888425-C3	32.40		
.025	<b>.125</b> (5x)	3	1/8	2-1/2	12725	27.80	12725-C3	32.40	12725-C4	39.50
.025	<b>.125</b> (5x)	4	1/8	2-1/2	834125	29.40	834125-C3	34.00		
.025	<b>.150</b> (6x)	3	1/8	2-1/2	894225	33.40	894225-C3	38.00		
.025	<b>.175</b> (7x)	3	1/8	2-1/2	897925	38.90	897925-C3	43.50		
.025	<b>.203</b> (8x)	3	1/8	2-1/2	33625	55.50	33625-C3	60.10	33625-C4	67.20
.025	<b>.250</b> (10x)	3	1/8	2-1/2	951325	59.00	951325-C3	63.60		
.025	<b>.312</b> (12x)	3	1/8	2-1/2	34925	62.60	34925-C3	67.20		
.030	<b>.125</b> (4x)	3	1/8	2-1/2	888430	26.80	888430-C3	31.40		
.030	<b>.150</b> (5x)	3	1/8	2-1/2	12730	26.80	12730-C3	31.40	12730-C4	38.50
.030	<b>.156</b> (5x)	4	1/8	2-1/2	834130	28.40	834130-C3	33.00		
.030	<b>.187</b> (6x)	3	1/8	2-1/2	894230	32.00	894230-C3	36.60		
.030	<b>.218</b> (7x)	3	1/8	2-1/2	897930	37.40	897930-C3	42.00		
.030	<b>.250</b> (8x)	3	1/8	2-1/2	33630	52.60	33630-C3	57.20	33630-C4	64.30
.030	<b>.312</b> (10x)	3	1/8	2-1/2	951330	56.40	951330-C3	61.00		
.030	<b>.375</b> (12x)	3	1/8	2-1/2	34930	59.30	34930-C3	63.90		

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# MINIATURE END MILLS

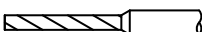
## Square – Long Flute (cont.)

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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>-0.005"</sub>	L <sub>2</sub> <sup>+0.10"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.031 (1/32)	<b>.125</b> (4x)	3	1/8	2-1/2	888431	26.80	888431-C3	31.40		
.031 (1/32)	<b>.156</b> (5x)	3	1/8	2-1/2	31831	26.80	31831-C3	31.40	31831-C4	38.50
.031 (1/32)	<b>.156</b> (5x)	4	1/8	2-1/2	834131	28.10	834131-C3	32.70		
.031 (1/32)	<b>.187</b> (6x)	3	1/8	2-1/2	894231	32.00	894231-C3	36.60		
.031 (1/32)	<b>.218</b> (7x)	3	1/8	2-1/2	897931	37.40	897931-C3	42.00		
.031 (1/32)	<b>.250</b> (8x)	3	1/8	2-1/2	33631	52.60	33631-C3	57.20	33631-C4	64.30
.031 (1/32)	<b>.250</b> (8x)	4	1/8	2-1/2	826831	54.20	826831-C3	58.80		
.031 (1/32)	<b>.281</b> (9x)	3	1/8	2-1/2	837831	55.20	837831-C3	59.80		
.031 (1/32)	<b>.312</b> (10x)	3	1/8	2-1/2	951331	55.90	951331-C3	60.50		
.031 (1/32)	<b>.375</b> (12x)	3	1/8	2-1/2	34931	59.30	34931-C3	63.90	34931-C4	71.00
.031 (1/32)	<b>.470</b> (15x)	3	1/8	2-1/2	35831	79.00	35831-C3	83.60		
.035 (.9 mm)	<b>.140</b> (4x)	3	1/8	2-1/2	888435	26.80	888435-C3	31.40		
.035 (.9 mm)	<b>.175</b> (5x)	3	1/8	2-1/2	12735	26.80	12735-C3	31.40	12735-C4	38.50
.035 (.9 mm)	<b>.187</b> (5x)	4	1/8	2-1/2	<b>834135</b>	28.70	<b>834135-C3</b>	33.30		NEW
.035 (.9 mm)	<b>.218</b> (6x)	3	1/8	2-1/2	894235	32.00	894235-C3	36.60		
.035 (.9 mm)	<b>.250</b> (7x)	3	1/8	2-1/2	897935	37.40	897935-C3	42.00		
.035 (.9 mm)	<b>.280</b> (8x)	3	1/8	2-1/2	33635	52.60	33635-C3	57.20	33635-C4	64.30
.035 (.9 mm)	<b>.350</b> (10x)	3	1/8	2-1/2	951335	55.90	951335-C3	60.50		
.035 (.9 mm)	<b>.425</b> (12x)	3	1/8	2-1/2	34935	60.10	34935-C3	64.70		
.039 (1 mm)	<b>.156</b> (4x)	3	1/8	2-1/2	888439	27.20	888439-C3	31.80		
.039 (1 mm)	<b>.203</b> (5x)	3	1/8	2-1/2	31839	27.20	31839-C3	31.80	31839-C4	38.90
.039 (1 mm)	<b>.203</b> (5x)	4	1/8	2-1/2	<b>834139</b>	29.10	<b>834139-C3</b>	33.70		NEW
.039 (1 mm)	<b>.240</b> (6x)	3	1/8	2-1/2	894239	42.80	894239-C3	47.40		
.039 (1 mm)	<b>.281</b> (7x)	3	1/8	2-1/2	897939	48.20	897939-C3	52.80		
.039 (1 mm)	<b>.325</b> (8x)	3	1/8	2-1/2	33639	53.10	33639-C3	57.70		
.039 (1 mm)	<b>.400</b> (10x)	3	1/8	2-1/2	951339	56.40	951339-C3	61.00		
.039 (1 mm)	<b>.480</b> (12x)	3	1/8	2-1/2	34939	60.40	34939-C3	65.00		
.040	<b>.160</b> (4x)	3	1/8	2-1/2	888440	26.80	888440-C3	31.40		
.040	<b>.200</b> (5x)	3	1/8	2-1/2	12740	26.80	12740-C3	31.40	12740-C4	38.50
.040	<b>.203</b> (5x)	4	1/8	2-1/2	834140	28.40	834140-C3	33.00		
.040	<b>.240</b> (6x)	3	1/8	2-1/2	894240	32.00	894240-C3	36.60		
.040	<b>.281</b> (7x)	3	1/8	2-1/2	897940	37.40	897940-C3	42.00		
.040	<b>.325</b> (8x)	3	1/8	2-1/2	33640	52.60	33640-C3	57.20	33640-C4	64.30
.040	<b>.400</b> (10x)	3	1/8	2-1/2	951340	55.90	951340-C3	60.50		
.040	<b>.480</b> (12x)	3	1/8	2-1/2	34940	60.10	34940-C3	64.70		
.045	<b>.225</b> (5x)	3	1/8	2-1/2	12745	26.80	12745-C3	31.40	12745-C4	38.50
.045	<b>.375</b> (8x)	3	1/8	2-1/2	33645	52.60	33645-C3	57.20		
.045	<b>.450</b> (10x)	3	1/8	2-1/2	951345	55.90	951345-C3	60.50		
.045	<b>.550</b> (12x)	3	1/8	2-1/2	34945	60.10	34945-C3	64.70		
.047 (3/64)	<b>.187</b> (4x)	3	1/8	2-1/2	888447	26.80	888447-C3	31.40		
.047 (3/64)	<b>.250</b> (5x)	3	1/8	2-1/2	31847	26.80	31847-C3	31.40	31847-C4	38.50
.047 (3/64)	<b>.250</b> (5x)	4	1/8	2-1/2	834147	28.10	834147-C3	32.70		
.047 (3/64)	<b>.281</b> (6x)	3	1/8	2-1/2	894247	32.00	894247-C3	36.60		
.047 (3/64)	<b>.328</b> (7x)	3	1/8	2-1/2	897947	37.40	897947-C3	42.00		
.047 (3/64)	<b>.375</b> (8x)	3	1/8	2-1/2	33647	51.70	33647-C3	56.30	33647-C4	63.40
.047 (3/64)	<b>.375</b> (8x)	4	1/8	2-1/2	826847	53.10	826847-C3	57.70		
.047 (3/64)	<b>.480</b> (10x)	3	1/8	2-1/2	951347	55.90	951347-C3	60.50		
.047 (3/64)	<b>.570</b> (12x)	3	1/8	2-1/2	34947	59.30	34947-C3	63.90	34947-C4	71.00
.047 (3/64)	<b>.710</b> (15x)	3	1/8	2-1/2	35847	74.30	35847-C3	78.90		

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**MINIATURE END MILLS**

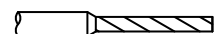
Square – Long Flute (cont.)

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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>+ .0005"</sup> <sub>- .0005"</sub>	L <sub>2</sub> <sup>+ .010"</sup> <sub>- .000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
	.050	<b>.203</b> (4x)	3	1/8	2-1/2	888450	26.80	888450-C3	31.40		
	.050	<b>.250</b> (5x)	3	1/8	2-1/2	31850	26.80	31850-C3	31.40		
	.050	<b>.250</b> (5x)	4	1/8	2-1/2	834150	28.40	834150-C3	33.00		
	.050	<b>.300</b> (6x)	3	1/8	2-1/2	12750	26.80	12750-C3	31.40	12750-C4	38.50
	.050	<b>.350</b> (7x)	3	1/8	2-1/2	897950	37.40	897950-C3	42.00		
	.050	<b>.400</b> (8x)	3	1/8	2-1/2	33650	52.60	33650-C3	57.20	33650-C4	64.30
	.050	<b>.500</b> (10x)	3	1/8	2-1/2	951350	56.40	951350-C3	61.00		
	.050	<b>.600</b> (12x)	3	1/8	2-1/2	34950	59.30	34950-C3	63.90		
NEW	.055 (1.4 mm)	<b>.275</b> (5x)	3	1/8	2-1/2	31855	23.90	31855-C3	28.50		
	.055 (1.4 mm)	<b>.275</b> (5x)	4	1/8	2-1/2	<b>834155</b>	25.80	<b>834155-C3</b>	30.40		
	.055 (1.4 mm)	<b>.385</b> (7x)	3	1/8	2-1/2	12755	26.80	12755-C3	31.40	12755-C4	38.50
	.055 (1.4 mm)	<b>.560</b> (10x)	3	1/8	2-1/2	951355	41.70	951355-C3	46.30		
	.055 (1.4 mm)	<b>.660</b> (12x)	3	1/8	2-1/2	34955	60.10	34955-C3	64.70		
	.059 (1.5 mm)	<b>.295</b> (5x)	3	1/8	2-1/2	31859	25.00	31859-C3	29.60		
	.059 (1.5 mm)	<b>.472</b> (8x)	3	1/8	2-1/2	12759	25.00	12759-C3	29.60		
	.060	<b>.250</b> (4x)	3	1/8	2-1/2	888460	23.90	888460-C3	28.50		
	.060	<b>.312</b> (5x)	3	1/8	2-1/2	31860	23.90	31860-C3	28.50		
	.060	<b>.312</b> (5x)	4	1/8	2-1/2	834160	25.30	834160-C3	29.90		
	.060	<b>.375</b> (6x)	3	1/8	2-1/2	894260	24.90	894260-C3	29.50		
	.060	<b>.437</b> (7x)	3	1/8	2-1/2	897960	26.00	897960-C3	30.60		
NEW	.060	<b>.500</b> (8x)	3	1/8	2-1/2	12760	27.20	12760-C3	31.80	12760-C4	38.90
	.060	<b>.500</b> (8x)	4	1/8	2-1/2	<b>826860</b>	29.10	<b>826860-C3</b>	33.70		
	.060	<b>.625</b> (10x)	3	1/8	2-1/2	951360	47.20	951360-C3	51.80		
NEW	.060	<b>.720</b> (12x)	3	1/8	2-1/2	34960	60.10	34960-C3	64.70		
	.062 (1/16)	<b>.250</b> (4x)	3	1/8	2-1/2	888462	23.90	888462-C3	28.50	<b>888462-C4</b>	35.60
NEW	.062 (1/16)	<b>.250</b> (4x)	4	1/8	2-1/2	<b>836962</b>	25.80	<b>836962-C3</b>	30.40		
	.062 (1/16)	<b>.312</b> (5x)	3	1/8	2-1/2	31862	23.90	31862-C3	28.50	31862-C4	35.60
	.062 (1/16)	<b>.312</b> (5x)	4	1/8	2-1/2	834162	25.80	834162-C3	30.40		
	.062 (1/16)	<b>.375</b> (6x)	3	1/8	2-1/2	894262	24.90	894262-C3	29.50		
	.062 (1/16)	<b>.437</b> (7x)	3	1/8	2-1/2	897962	26.00	897962-C3	30.60		
	.062 (1/16)	<b>.500</b> (8x)	3	1/8	2-1/2	33662	27.20	33662-C3	31.80	33662-C4	38.90
	.062 (1/16)	<b>.500</b> (8x)	4	1/8	2-1/2	826862	28.60	826862-C3	33.20		
	.062 (1/16)	<b>.562</b> (9x)	3	1/8	2-1/2	837862	31.50	837862-C3	36.10		
	.062 (1/16)	<b>.625</b> (10x)	3	1/8	2-1/2	951362	34.20	951362-C3	38.80		
	.062 (1/16)	<b>.750</b> (12x)	3	1/8	2-1/2	34962	46.40	34962-C3	51.00	34962-C4	58.10
	.062 (1/16)	<b>.750</b> (12x)	4	1/8	2-1/2	818062	48.30	818062-C3	52.90		
NEW	.062 (1/16)	<b>.950</b> (15x)	3	1/8	2-1/2	35862	65.60	35862-C3	70.20	35862-C4	77.30
	.065	<b>.325</b> (5x)	3	1/8	2-1/2	<b>31865</b>	23.90	<b>31865-C3</b>	28.50		
	.065	<b>.500</b> (8x)	3	1/8	2-1/2	12765	26.80	12765-C3	31.40	12765-C4	38.50
	.065	<b>.650</b> (10x)	3	1/8	2-1/2	951365	41.70	951365-C3	46.30		
	.070	<b>.375</b> (5x)	3	1/8	2-1/2	31870	23.90	31870-C3	28.50		
	.070	<b>.500</b> (7x)	3	1/8	2-1/2	12770	26.80	12770-C3	31.40	12770-C4	38.50
	.070	<b>.700</b> (10x)	3	1/8	2-1/2	951370	41.70	951370-C3	46.30		
	.070	<b>.850</b> (12x)	3	1/8	2-1/2	34970	47.00	34970-C3	51.60		
	.075	<b>.375</b> (5x)	3	1/8	2-1/2	31875	23.90	31875-C3	28.50		
	.075	<b>.500</b> (7x)	3	1/8	2-1/2	12775	26.80	12775-C3	31.40	12775-C4	38.50
	.075	<b>.750</b> (10x)	3	1/8	2-1/2	951375	41.70	951375-C3	46.30		
	.075	<b>.900</b> (12x)	3	1/8	2-1/2	34975	47.00	34975-C3	51.60		

SQUARE

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# MINIATURE END MILLS

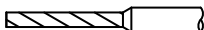
## Square – Long Flute (cont.)

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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>+0.10"</sup> <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.078 (5/64)	.312 (4x)	3	1/8	2-1/2	888478	23.90	888478-C3	28.50		
.078 (5/64)	.312 (4x)	4	1/8	2-1/2	836978	25.80	836978-C3	30.40		NEW
.078 (5/64)	.406 (5x)	3	1/8	2-1/2	31878	23.90	31878-C3	28.50	31878-C4	35.60
.078 (5/64)	.406 (5x)	4	1/8	2-1/2	834178	25.80	834178-C3	30.40		
.078 (5/64)	.475 (6x)	3	1/8	2-1/2	894278	24.90	894278-C3	29.50		
.078 (5/64)	.550 (7x)	3	1/8	2-1/2	897978	26.00	897978-C3	30.60		
.078 (5/64)	.625 (8x)	3	1/8	2-1/2	33678	27.20	33678-C3	31.80	33678-C4	38.90
.078 (5/64)	.625 (8x)	4	1/8	2-1/2	826878	29.70	826878-C3	34.30		
.078 (5/64)	.800 (10x)	3	1/8	2-1/2	951378	33.60	951378-C3	38.20		
.078 (5/64)	.940 (12x)	3	1/8	2-1/2	34978	46.40	34978-C3	51.00	34978-C4	58.10
.078 (5/64)	1.187 (15x)	3	1/8	2-1/2	35878	65.60	35878-C3	70.20	35878-C4	77.30
.080	.406 (5x)	3	1/8	2-1/2	31880	23.90	31880-C3	28.50		
.080	.750 (9x)	3	1/8	2-1/2	12780	27.30	12780-C3	31.90	12780-C4	39.00
.080	.960 (12x)	3	1/8	2-1/2	34980	47.00	34980-C3	51.60		
.085	.425 (5x)	3	1/8	2-1/2	31885	23.90	31885-C3	28.50		
.085	.750 (9x)	3	1/8	2-1/2	12785	27.30	12785-C3	31.90	12785-C4	39.00
.090	.450 (5x)	3	1/8	2-1/2	31890	23.90	31890-C3	28.50		
.090	.750 (8x)	3	1/8	2-1/2	12790	27.20	12790-C3	31.80	12790-C4	38.90
.090	.900 (10x)	3	1/8	2-1/2	951390	41.70	951390-C3	46.30		
.090	1.080 (12x)	3	1/8	2-1/2	34990	47.00	34990-C3	51.60		
.093 (3/32)	.375 (4x)	3	1/8	2-1/2	888493	23.90	888493-C3	28.50	888493-C4	35.60
.093 (3/32)	.375 (4x)	4	1/8	2-1/2	836993	25.80	836993-C3	30.40		NEW
.093 (3/32)	.500 (5x)	3	1/8	2-1/2	31893	23.90	31893-C3	28.50	31893-C4	35.60
.093 (3/32)	.500 (5x)	4	1/8	2-1/2	834193	25.80	834193-C3	30.40		NEW
.093 (3/32)	.585 (6x)	3	1/8	2-1/2	894293	24.90	894293-C3	29.50		
.093 (3/32)	.670 (7x)	3	1/8	2-1/2	897993	26.00	897993-C3	30.60		
.093 (3/32)	.750 (8x)	3	1/8	2-1/2	33693	27.20	33693-C3	31.80	33693-C4	38.90
.093 (3/32)	.750 (8x)	4	1/8	2-1/2	826893	29.70	826893-C3	34.30		
.093 (3/32)	.850 (9x)	3	1/8	2-1/2	837893	31.80	837893-C3	36.40		
.093 (3/32)	.950 (10x)	3	1/8	2-1/2	951393	33.60	951393-C3	38.20		
.093 (3/32)	1.125 (12x)	3	1/8	2-1/2	34993	46.40	34993-C3	51.00	34993-C4	58.10
.093 (3/32)	1.400 (15x)	3	1/8	3	35893	68.10	35893-C3	72.70	35893-C4	79.80
.095	.500 (5x)	3	1/8	2-1/2	31895	23.90	31895-C3	28.50		
.095	.750 (8x)	3	1/8	2-1/2	12795	26.80	12795-C3	31.40	12795-C4	38.50
.095	.950 (10x)	3	1/8	2-1/2	951395	41.70	951395-C3	46.30		
.100	.500 (5x)	3	1/8	2-1/2	31899	23.90	31899-C3	28.50		
.100	.500 (5x)	4	1/8	2-1/2	834200	25.80	834200-C3	30.40		NEW
.100	.600 (6x)	3	1/8	2-1/2	894300	24.90	894300-C3	29.50		NEW
.100	.750 (7.5x)	3	1/8	2-1/2	12799	26.80	12799-C3	31.40	12799-C4	38.50
.100	1.000 (10x)	3	1/8	2-1/2	951600	41.70	951600-C3	46.30		
.100	1.200 (12x)	3	1/8	2-1/2	34999	47.00	34999-C3	51.60		
.105	.530 (5x)	3	1/8	2-1/2	31901	24.70	31901-C3	29.30		
.109 (7/64)	.570 (5x)	3	1/8	2-1/2	31902	23.90	31902-C3	28.50	31902-C4	35.60
.109 (7/64)	.900 (8x)	3	1/8	2-1/2	33702	27.10	33702-C3	31.70		
.109 (7/64)	1.125 (10x)	3	1/8	2-1/2	951602	47.20	951602-C3	51.80		
.110	.570 (5x)	3	1/8	2-1/2	31903	24.70	31903-C3	29.30		
.115	.600 (5x)	3	1/8	2-1/2	31904	24.70	31904-C3	29.30		
.118 (3 mm)	.625 (5x)	3	1/8	2-1/2	31905	24.20	31905-C3	28.80	31905-C4	35.90
.118 (3 mm)	.950 (8x)	3	1/8	2-1/2	33705	27.40	33705-C3	32.00		
.118 (3 mm)	1.187 (10x)	3	1/8	2-1/2	951605	47.50	951605-C3	52.10		
.120	.625 (5x)	3	1/8	2-1/2	31906	25.00	31906-C3	29.60		

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# MINIATURE END MILLS

## Square – Long Flute (cont.)

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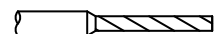
	CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
	D <sub>1</sub> $\begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.030" \\ -.000" \end{smallmatrix}$		D <sub>2</sub>	L <sub>1</sub>						
NEW	.125 (1/8)	<b>.500</b> (4x)	3	1/8	2-1/2	888508	23.50	888508-C3	28.10		
	.125 (1/8)	<b>.500</b> (4x)	4	1/8	2-1/2	<b>837008</b>	25.90	<b>837008-C3</b>	30.50		
	.125 (1/8)	<b>.625</b> (5x)	3	1/8	2-1/2	31908	23.50	31908-C3	28.10	31908-C4	35.20
	.125 (1/8)	<b>.625</b> (5x)	4	1/8	2-1/2	834208	25.90	834208-C3	30.50		
	.125 (1/8)	<b>.750</b> (6x)	3	1/8	2-1/2	894308	24.30	894308-C3	28.90		
	.125 (1/8)	<b>.875</b> (7x)	3	1/8	2-1/2	898008	24.80	898008-C3	29.40		
	.125 (1/8)	<b>1.000</b> (8x)	3	1/8	2-1/2	33708	25.30	33708-C3	29.90	33708-C4	37.00
	.125 (1/8)	<b>1.000</b> (8x)	4	1/8	2-1/2	826908	27.90	826908-C3	32.50		
	.125 (1/8)	<b>1.125</b> (9x)	3	1/8	2-1/2	837908	35.60	837908-C3	40.20		
	.125 (1/8)	<b>1.250</b> (10x)	3	1/8	2-1/2	951608	43.10	951608-C3	47.70		
NEW	.125 (1/8)	<b>1.500</b> (12x)	3	1/8	3	35008	49.40	35008-C3	54.00	35008-C4	61.10
	.125 (1/8)	<b>1.500</b> (12x)	4	1/8	3	<b>818108</b>	51.30	<b>818108-C3</b>	55.90		
	.125 (1/8)	<b>1.875</b> (15x)	3	1/8	3	35908	68.10	35908-C3	72.70	35908-C4	79.80
	.140 (9/64)	<b>.750</b> (5x)	4	3/16	3	31909	25.90	31909-C3	30.90		
	.140 (9/64)	<b>1.125</b> (8x)	4	3/16	3	33709	45.70	33709-C3	50.70		
NEW	.140 (9/64)	<b>1.450</b> (10x)	4	3/16	3	951609	54.00	951609-C3	59.00		
	.156 (5/32)	<b>.625</b> (4x)	4	3/16	3	888510	24.00	888510-C3	29.00		
	.156 (5/32)	<b>.750</b> (5x)	4	3/16	3	834210	24.00	834210-C3	29.00		
	.156 (5/32)	<b>1.000</b> (6x)	3	3/16	3	<b>894310</b>	24.20	<b>894310-C3</b>	29.20		
	.156 (5/32)	<b>1.000</b> (6x)	4	3/16	3	12510	26.10	12510-C3	31.10	12510-C4	42.20
	.156 (5/32)	<b>1.093</b> (7x)	4	3/16	3	898010	30.90	898010-C3	35.90		
	.156 (5/32)	<b>1.250</b> (8x)	4	3/16	3	33710	45.70	33710-C3	50.70		
	.156 (5/32)	<b>1.570</b> (10x)	4	3/16	3	951610	54.00	951610-C3	59.00		
	.156 (5/32)	<b>1.875</b> (12x)	4	3/16	4	35010	62.90	35010-C3	69.70	35010-C4	80.10
	NEW	.187 (3/16)	<b>.750</b> (4x)	4	3/16	3	888512	24.00	888512-C3	29.00	
.187 (3/16)		<b>1.000</b> (5x)	4	3/16	3	834212	24.00	834212-C3	29.00		
.187 (3/16)		<b>1.125</b> (6x)	3	3/16	3	<b>894312</b>	24.20	<b>894312-C3</b>	29.20		
.187 (3/16)		<b>1.125</b> (6x)	4	3/16	3	12512	26.10	12512-C3	31.10	77012	42.20
.187 (3/16)		<b>1.312</b> (7x)	4	3/16	3	898012	30.90	898012-C3	35.90		
.187 (3/16)		<b>1.500</b> (8x)	4	3/16	3	33712	45.70	33712-C3	50.70	33712-C4	61.80
.187 (3/16)		<b>1.875</b> (10x)	4	3/16	4	951612	54.20	951612-C3	61.00		
NEW	.250 (1/4)	<b>2.250</b> (12x)	4	3/16	4	35012	62.90	35012-C3	69.70		
	.250 (1/4)	<b>1.000</b> (4x)	4	1/4	4	888516	27.50	888516-C3	35.40		
	.250 (1/4)	<b>1.250</b> (5x)	4	1/4	4	834216	27.50	834216-C3	35.40		
	.250 (1/4)	<b>1.500</b> (6x)	3	1/4	4	<b>894316</b>	27.70	<b>894316-C3</b>	35.60		
	.250 (1/4)	<b>1.500</b> (6x)	4	1/4	4	12516	29.60	12516-C3	37.50	77016	47.90
	.250 (1/4)	<b>1.750</b> (7x)	4	1/4	4	898016	34.50	898016-C3	42.40		
	.250 (1/4)	<b>2.000</b> (8x)	4	1/4	4	33716	48.90	33716-C3	56.80	33716-C4	67.20
	.250 (1/4)	<b>2.500</b> (10x)	4	1/4	4	951616	58.70	951616-C3	66.60		
	.250 (1/4)	<b>3.000</b> (12x)	4	1/4	6	35016	69.00	35016-C3	78.00		
.312 (5/16)	<b>1.625</b> (5x)	4	5/16	4	12520	42.50	12520-C3	52.00			
.375 (3/8)	<b>1.750</b> (5x)	4	3/8	4	12524	45.20	12524-C3	57.50			
.500 (1/2)	<b>2.000</b> (4x)	4	1/2	4	12532	63.60	12532-C3	77.00			

SQUARE



View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

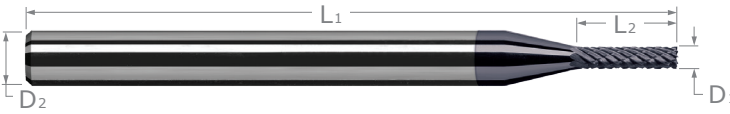
Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)



# MINIATURE END MILLS

## Square – Deburring End Mill

SQUARE



**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

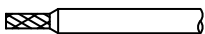
CUTTER DIAMETER	LENGTH OF CUT	RIGHT HAND TEETH	LEFT HAND TEETH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AlTiN COATED	
						TOOL #	PRICE	TOOL #	PRICE
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$				
.015 (1/64)	<b>.045</b> (3x)	6	3	1/8	2-1/2	60715	32.60	60715-C3	37.20
.031 (1/32)	<b>.093</b> (3x)	6	3	1/8	2-1/2	60731	25.00	60731-C3	29.60
.047 (3/64)	<b>.141</b> (3x)	8	4	1/8	2-1/2	60747	24.10	60747-C3	28.70
.062 (1/16)	<b>.186</b> (3x)	8	4	1/8	2-1/2	60762	24.10	60762-C3	28.70
.078 (5/64)	<b>.234</b> (3x)	10	5	1/8	2-1/2	60778	24.10	60778-C3	28.70
.093 (3/32)	<b>.279</b> (3x)	12	6	1/8	2-1/2	60793	24.10	60793-C3	28.70
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$				
.125 (1/8)	<b>.375</b> (3x)	14	7	1/8	2-1/2	60808	22.80	60808-C3	27.40
.187 (3/16)	<b>.562</b> (3x)	16	8	3/16	2-1/2	60812	40.70	60812-C3	45.70
.250 (1/4)	<b>.750</b> (3x)	18	9	1/4	2-1/2	60816	48.30	60816-C3	55.10



### Tips for Maintaining Tight Tolerances

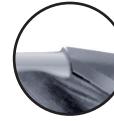
Tolerances are very important for machining operations, but do you know what they mean? Do you know how to maintain tight tolerances even in difficult operations, such as machining thin walls? Our "In the Loupe" blog post **Tips for Maintaining Tight Tolerances** is a must-read before beginning any job.

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



# MINIATURE END MILLS

## Square – Long Reach, Standard Flute



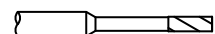
Reduced Neck Diameter to Avoid Heeling

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

SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED			A1TiN COATED		
					2 FL	4FL	PRICE	2FL	4FL	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>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>						
.010	.030	<b>.050</b> (5x)	1/8	1-1/2	944510	956810	45.70	944510-C3	956810-C3	50.30
.010	.030	<b>.080</b> (8x)	1/8	1-1/2	76210	76410	45.70	76210-C3	76410-C3	50.30
.010	.030	<b>.125</b> (12x)	1/8	1-1/2	952010	992510	48.30	952010-C3	992510-C3	52.90
.015 (1/64)	.045	<b>.078</b> (5x)	1/8	1-1/2	944515	956815	36.90	944515-C3	956815-C3	41.50
.015 (1/64)	.045	<b>.128</b> (8x)	1/8	1-1/2	76215	76415	36.90	76215-C3	76415-C3	41.50
.015 (1/64)	.045	<b>.156</b> (10x)	1/8	1-1/2	849615	846115	38.40		846115-C3	43.00
.015 (1/64)	.045	<b>.187</b> (12x)	1/8	1-1/2	952015	992515	38.40	952015-C3	992515-C3	43.00
.020 (.5 mm)	.060	<b>.100</b> (5x)	1/8	1-1/2	944520	956820	35.30	944520-C3	956820-C3	39.90
.020 (.5 mm)	.060	<b>.170</b> (8x)	1/8	1-1/2	76220	76420	35.30	76220-C3	76420-C3	39.90
.020 (.5 mm)	.060	<b>.200</b> (10x)	1/8	1-1/2	849620	846120	37.10		846120-C3	41.70
.020 (.5 mm)	.060	<b>.250</b> (12x)	1/8	1-1/2	952020	992520	37.10	952020-C3	992520-C3	41.70
.025	.075	<b>.125</b> (5x)	1/8	1-1/2	944525	956825	34.00	944525-C3	956825-C3	38.60
.025	.075	<b>.213</b> (8x)	1/8	1-1/2	76225	76425	34.00	76225-C3	76425-C3	38.60
.025	.075	<b>.312</b> (12x)	1/8	1-1/2	952025	992525	35.20	952025-C3	992525-C3	39.80
.030	.090	<b>.156</b> (5x)	1/8	1-1/2	944530	956830	34.00	944530-C3	956830-C3	38.60
.030	.090	<b>.270</b> (9x)	1/8	1-1/2	76230	76430	34.00	76230-C3	76430-C3	38.60
.030	.090	<b>.375</b> (12x)	1/8	1-1/2	952030	992530	35.20	952030-C3	992530-C3	39.80
.031 (1/32)	.093	<b>.156</b> (5x)	1/8	1-1/2	944531	956831	34.00	944531-C3	956831-C3	38.60
.031 (1/32)	.093	<b>.279</b> (9x)	1/8	1-1/2	76231	76431	34.00	76231-C3	76431-C3	38.60
.031 (1/32)	.093	<b>.375</b> (12x)	1/8	1-1/2	952031	992531	35.20	952031-C3	992531-C3	39.80
.031 (1/32)	.093	<b>.470</b> (15x)	1/8	1-1/2	829131	838631	37.20	829131-C3	838631-C3	41.80
.035 (.9 mm)	.105	<b>.187</b> (5x)	1/8	1-1/2	944535	956835	34.00	944535-C3	956835-C3	38.60
.035 (.9 mm)	.105	<b>.315</b> (9x)	1/8	1-1/2	76235	76435	34.00	76235-C3	76435-C3	38.60
.035 (.9 mm)	.105	<b>.425</b> (12x)	1/8	1-1/2	952035	992535	35.20	952035-C3	992535-C3	39.80
.039 (1 mm)	.117	<b>.203</b> (5x)	1/8	1-1/2	944539	956839	34.00	944539-C3	956839-C3	38.60
.039 (1 mm)	.117	<b>.325</b> (8x)	1/8	1-1/2	960839	972239	34.00	960839-C3	972239-C3	38.60
.040	.120	<b>.203</b> (5x)	1/8	1-1/2	944540	956840	34.00	944540-C3	956840-C3	38.60
.040	.120	<b>.360</b> (9x)	1/8	1-1/2	76240	76440	34.00	76240-C3	76440-C3	38.60
.040	.120	<b>.480</b> (12x)	1/8	1-1/2	952040	992540	35.20	952040-C3	992540-C3	39.80
.045	.135	<b>.225</b> (5x)	1/8	1-1/2	944545	956845	33.40	944545-C3	956845-C3	38.00
.045	.135	<b>.405</b> (9x)	1/8	1-1/2	76245	76445	33.40	76245-C3	76445-C3	38.00
.047 (3/64)	.141	<b>.423</b> (9x)	1/8	1-1/2	76247	76447	33.40	76247-C3	76447-C3	38.00
.047 (3/64)	.141	<b>.570</b> (12x)	1/8	1-1/2	952047	992547	34.40	952047-C3	992547-C3	39.00
.047 (3/64)	.141	<b>.250</b> (5x)	1/8	1-1/2	944547	956847	33.40	944547-C3	956847-C3	38.00
.047 (3/64)	.141	<b>.328</b> (7x)	1/8	1-1/2	898747	896847	33.40		896847-C3	38.00

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# MINIATURE END MILLS

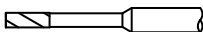
## Square – Long Reach, Standard Flute (cont.)

continued from previous page

SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED			AITiN COATED		
					2 FL	4FL	PRICE	2FL	4FL	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>						
.050	.150	<b>.250</b> (5x)	1/8	1-1/2	944550	956850	33.40	944550-C3	956850-C3	38.00
.050	.150	<b>.400</b> (8x)	1/8	1-1/2	960850	972250	33.40	960850-C3	972250-C3	38.00
.050	.150	<b>.500</b> (10x)	1/8	1-1/2	76250	76450	34.40	76250-C3	76450-C3	39.00
.050	.150	<b>.600</b> (12x)	1/8	2	952050	992550	36.60	952050-C3	992550-C3	41.20
.055 (1.4 mm)	.165	<b>.275</b> (5x)	1/8	1-1/2	944555	956855	34.20	944555-C3	956855-C3	38.80
.055 (1.4 mm)	.165	<b>.500</b> (9x)	1/8	1-1/2	76255	76455	34.20	76255-C3	76455-C3	38.80
.055 (1.4 mm)	.165	<b>.660</b> (12x)	1/8	2	952055	992555	36.40		992555-C3	41.00
.060	.180	.312 (5x)	1/8	1-1/2	944560	956860	33.40	944560-C3	956860-C3	38.00
.060	.180	<b>.500</b> (8x)	1/8	1-1/2	76260	76460	33.40	76260-C3	76460-C3	38.00
.060	.180	<b>.720</b> (12x)	1/8	2	952060	992560	34.40	952060-C3	992560-C3	39.00
.062 (1/16)	.186	<b>.312</b> (5x)	1/8	1-1/2	944562	956862	33.40	944562-C3	956862-C3	38.00
.062 (1/16)	.186	<b>.500</b> (8x)	1/8	1-1/2	76262	76462	33.40	76262-C3	76462-C3	38.00
.062 (1/16)	.186	<b>.625</b> (10x)	1/8	2	849662	846162	34.40	849662-C3	846162-C3	39.00
.062 (1/16)	.186	<b>.750</b> (12x)	1/8	2	952062	992562	34.40	952062-C3	992562-C3	39.00
.062 (1/16)	.186	<b>.950</b> (15x)	1/8	2	829162	838662	36.60	829162-C3	838662-C3	41.20
.065	.195	<b>.500</b> (8x)	1/8	1-1/2	76265	76465	33.40	76265-C3	76465-C3	38.00
.070	.210	<b>.500</b> (7x)	1/8	1-1/2	76270	76470	33.40	76270-C3	76470-C3	38.00
.070	.210	<b>.850</b> (12x)	1/8	2	952070	992570	34.40	952070-C3	992570-C3	39.00
.075	.225	<b>.500</b> (7x)	1/8	1-1/2	76275	76475	33.40	76275-C3	76475-C3	38.00
.078 (5/64)	.234	<b>.500</b> (6x)	1/8	1-1/2	76278	76478	33.40	76278-C3	76478-C3	38.00
.078 (5/64)	.234	<b>.625</b> (8x)	1/8	2	960878	972278	33.50		972278-C3	38.10
.078 (5/64)	.234	<b>.940</b> (12x)	1/8	2	952078	992578	34.40	952078-C3	992578-C3	39.00
.080	.240	<b>.500</b> (6x)	1/8	1-1/2	76280	76480	33.40	76280-C3	76480-C3	38.00
.080	.240	<b>.960</b> (12x)	1/8	2	952080	992580	34.40	952080-C3	992580-C3	39.00
.085	.255	<b>.500</b> (6x)	1/8	1-1/2	76285	76485	33.40	76285-C3	76485-C3	38.00
.090	.270	<b>.625</b> (7x)	1/8	1-1/2	76290	76490	33.40	76290-C3	76490-C3	38.00
.090	.270	<b>1.080</b> (12x)	1/8	2	952090	992590	34.40	952090-C3	992590-C3	39.00
.093 (3/32)	.279	<b>.500</b> (5x)	1/8	1-1/2	944593	956893	33.40	944593-C3	956893-C3	38.00
.093 (3/32)	.279	<b>.625</b> (7x)	1/8	1-1/2	76293	76493	33.40	76293-C3	76493-C3	38.00
.093 (3/32)	.279	<b>.950</b> (10x)	1/8	2	849693	846193	34.40	849693-C3	846193-C3	39.00
.093 (3/32)	.279	<b>1.125</b> (12x)	1/8	2	952093	992593	34.40	952093-C3	992593-C3	39.00
.093 (3/32)	.279	<b>1.400</b> (15x)	1/8	2-1/2	829193	838693	36.60	829193-C3	838693-C3	41.20
.095	.285	<b>.625</b> (6x)	1/8	1-1/2	76295	76495	33.40	76295-C3	76495-C3	38.00
.100	.300	<b>.625</b> (6x)	1/8	1-1/2	76300	76500	33.40	76300-C3	76500-C3	38.00
.100	.300	<b>1.200</b> (12x)	1/8	2-1/2	952100	992600	34.40	952100-C3	992600-C3	39.00
.109 (7/64)	.327	<b>.570</b> (5x)	1/8	1-1/2	944602	956902	33.40		956902-C3	38.00
.109 (7/64)	.327	<b>.900</b> (8x)	1/8	2	960902	972302	33.40		972302-C3	38.00
.118 (3 mm)	.354	<b>.625</b> (5x)	1/8	1-1/2	944605	956905	33.40	944605-C3	956905-C3	38.00
.118 (3 mm)	.354	<b>.950</b> (8x)	1/8	2	960905	972305	33.40	960905-C3	972305-C3	38.00

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## MINIATURE END MILLS

Square – Long Reach, Standard Flute (cont.)

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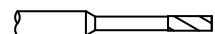
CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED			A1TiN COATED		
					2 FL	4FL	PRICE	2FL	4FL	PRICE
D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	L <sub>3</sub> $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	D <sub>2</sub>	L <sub>1</sub>						
.125 (1/8)	.375	<b>.625</b> (5x)	1/8	1-1/2	944608	956908	33.40	944608-C3	956908-C3	38.00
.125 (1/8)	.375	<b>1.000</b> (8x)	1/8	2	960908	972308	33.40	960908-C3	972308-C3	38.00
.125 (1/8)	.375	<b>1.250</b> (10x)	1/8	2-1/2	849708	846208	36.20	849708-C3	846208-C3	40.80
.125 (1/8)	.375	<b>1.500</b> (12x)	1/8	2-1/2	952108	992608	36.20	952108-C3	992608-C3	40.80
.125 (1/8)	.375	<b>1.875</b> (15x)	1/8	3	829208	838708	38.60	829208-C3	838708-C3	43.20
.140 (9/64)	.422	<b>.750</b> (5x)	3/16	2	944609	956909	39.50		956909-C3	44.50
.140 (9/64)	.422	<b>1.125</b> (8x)	3/16	2-1/2	960909	972309	39.50		972309-C3	44.50
.156 (5/32)	.469	<b>.750</b> (5x)	3/16	2	944610	956910	39.50		956910-C3	44.50
.156 (5/32)	.469	<b>1.250</b> (8x)	3/16	2-1/2	960910	972310	39.50		972310-C3	44.50
.187 (3/16)	.562	<b>1.000</b> (5x)	3/16	2	944612	956912	39.50	944612-C3	956912-C3	44.50
.187 (3/16)	.562	<b>1.500</b> (8x)	3/16	2-1/2	960912	972312	39.50	960912-C3	972312-C3	44.50
.187 (3/16)	.562	<b>1.875</b> (10x)	3/16	3	849712	846212	41.30	849712-C3	846212-C3	46.30
.250 (1/4)	.750	<b>1.250</b> (5x)	1/4	2-1/2	944616	956916	44.10	944616-C3	956916-C3	50.90
.250 (1/4)	.750	<b>2.000</b> (8x)	1/4	4	960916	972316	44.10	960916-C3	972316-C3	52.00
.250 (1/4)	.750	<b>3.000</b> (12x)	1/4	6	952116	992616	50.10		992616-C3	59.10

SQUARE



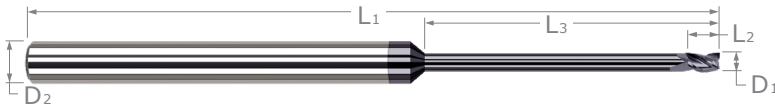
View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](https://www.harveytool.com).

Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](https://www.harveytool.com)



# MINIATURE END MILLS

## Square – Long Reach, Stub Flute



SQUARE

➤ Long length design for deep cavities, up to 10" overall length

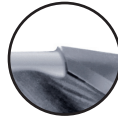
➤ Stub flutes for maximum rigidity

➤ Length of cut = 1½x diameter

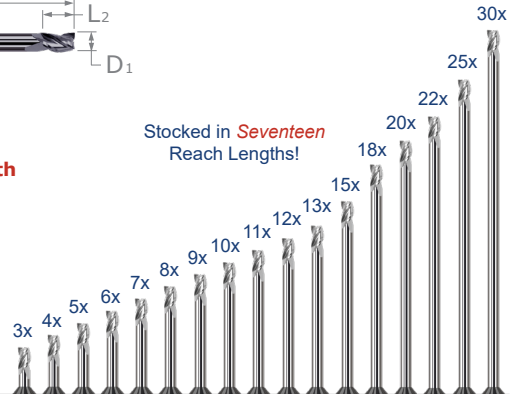
➤ Center cutting

➤ Solid carbide

➤ CNC ground in the USA



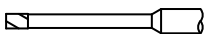
Reduced Neck Diameter to Avoid Heeling



Stocked in *Seventeen* Reach Lengths!

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>						
.005	.007	<b>.025</b> (5x)	3	1/8	2-1/2	33205	46.50				
.005	.007	<b>.040</b> (8x)	3	1/8	2-1/2	34605	46.50				
.008	.012	<b>.040</b> (5x)	3	1/8	2-1/2	33208	46.50				
.008	.012	<b>.065</b> (8x)	3	1/8	2-1/2	34608	46.50				
.010	.015	<b>.030</b> (3x)	3	1/8	2-1/2	47810	44.70	47810-C3	49.30		
.010	.015	<b>.050</b> (5x)	3	1/8	2-1/2	33210	44.70	33210-C3	49.30	33210-C4	56.40
.010	.015	<b>.080</b> (8x)	3	1/8	2-1/2	34610	46.50	34610-C3	51.10	34610-C4	58.20
.010	.015	<b>.100</b> (10x)	3	1/8	2-1/2	982110	48.90	982110-C3	53.50		
.010	.015	<b>.125</b> (12x)	3	1/8	2-1/2	35410	48.90	35410-C3	53.50	35410-C4	60.60
.010	.015	<b>.150</b> (15x)	3	1/8	2-1/2	48910	56.80	48910-C3	61.40		
.010	.015	<b>.180</b> (18x)	3	1/8	2-1/2	977310	63.20	977310-C3	67.80		
.011	.016	<b>.055</b> (5x)	3	1/8	2-1/2	33211	44.70	33211-C3	49.30		
.011	.016	<b>.088</b> (8x)	3	1/8	2-1/2	34611	46.50	34611-C3	51.10		
.012 (.3 mm)	.018	<b>.060</b> (5x)	3	1/8	2-1/2	33212	44.70	33212-C3	49.30		
.012 (.3 mm)	.018	<b>.096</b> (8x)	3	1/8	2-1/2	34612	46.50	34612-C3	51.10		
.013	.019	<b>.065</b> (5x)	3	1/8	2-1/2	33213	44.70	33213-C3	49.30		
.013	.019	<b>.104</b> (8x)	3	1/8	2-1/2	34613	46.50	34613-C3	51.10		
.014	.021	<b>.070</b> (5x)	3	1/8	2-1/2	33214	44.70	33214-C3	49.30		
.014	.021	<b>.112</b> (8x)	3	1/8	2-1/2	34614	46.50	34614-C3	51.10		
.015 (1/64)	.022	<b>.045</b> (3x)	3	1/8	2-1/2	47815	36.90	47815-C3	41.50	47815-C4	48.60
.015 (1/64)	.022	<b>.062</b> (4x)	3	1/8	2-1/2	945515	36.90	945515-C3	41.50		
.015 (1/64)	.022	<b>.078</b> (5x)	3	1/8	2-1/2	33215	36.90	33215-C3	41.50	33215-C4	48.60
.015 (1/64)	.022	<b>.093</b> (6x)	3	1/8	2-1/2	937015	37.10	937015-C3	41.70		
.015 (1/64)	.022	<b>.109</b> (7x)	3	1/8	2-1/2	934815	37.10	934815-C3	41.70		
.015 (1/64)	.022	<b>.125</b> (8x)	3	1/8	2-1/2	34615	37.10	34615-C3	41.70	34615-C4	48.80
.015 (1/64)	.022	<b>.156</b> (10x)	3	1/8	2-1/2	982115	38.40	982115-C3	43.00	982115-C4	50.10
.015 (1/64)	.022	<b>.187</b> (12x)	3	1/8	2-1/2	35415	38.40	35415-C3	43.00	35415-C4	50.10
.015 (1/64)	.022	<b>.225</b> (15x)	3	1/8	2-1/2	48915	43.50	48915-C3	48.10	48915-C4	55.20
.015 (1/64)	.022	<b>.270</b> (18x)	3	1/8	2-1/2	977315	51.10	977315-C3	55.70		
.015 (1/64)	.022	<b>.300</b> (20x)	3	1/8	2-1/2	58315	54.20	58315-C3	58.80		
.015 (1/64)	.022	<b>.375</b> (25x)	3	1/8	2-1/2	38015	69.30	38015-C3	73.90	<b>25x Diameter!</b>	
.016 (.4 mm)	.024	<b>.080</b> (5x)	3	1/8	2-1/2	33216	38.00	33216-C3	42.60		
.016 (.4 mm)	.024	<b>.128</b> (8x)	3	1/8	2-1/2	34616	38.20	34616-C3	42.80		
.017	.026	<b>.085</b> (5x)	3	1/8	2-1/2	33217	38.00	33217-C3	42.60		
.017	.026	<b>.136</b> (8x)	3	1/8	2-1/2	34617	38.20	34617-C3	42.80		

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**MINIATURE END MILLS**

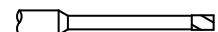
**Square – Long Reach, Stub Flute (cont.)**

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CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI 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>-.0000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.0000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.018	.027	<b>.090</b> (5x)	3	1/8	2-1/2	33218	38.00	33218-C3	42.60		
.018	.027	<b>.144</b> (8x)	3	1/8	2-1/2	34618	38.20	34618-C3	42.80		
.019	.029	<b>.095</b> (5x)	3	1/8	2-1/2	33219	38.00	33219-C3	42.60		
.019	.029	<b>.152</b> (8x)	3	1/8	2-1/2	34619	38.20	34619-C3	42.80		
.020 (.5 mm)	.030	<b>.060</b> (3x)	3	1/8	2-1/2	47820	35.30	47820-C3	39.90		
.020 (.5 mm)	.030	<b>.080</b> (4x)	3	1/8	2-1/2	945520	35.30	945520-C3	39.90		
.020 (.5 mm)	.030	<b>.100</b> (5x)	3	1/8	2-1/2	33220	35.30	33220-C3	39.90	33220-C4	47.00
<b>NEW</b> .020 (.5 mm)	.030	<b>.100</b> (5x)	4	1/8	2-1/2	<b>861620</b>	37.20	<b>861620-C3</b>	41.80		
.020 (.5 mm)	.030	<b>.120</b> (6x)	3	1/8	2-1/2	937020	35.30	937020-C3	39.90		
.020 (.5 mm)	.030	<b>.140</b> (7x)	3	1/8	2-1/2	934820	35.50	934820-C3	40.10		
.020 (.5 mm)	.030	<b>.160</b> (8x)	3	1/8	2-1/2	34620	35.50	34620-C3	40.10	34620-C4	47.20
.020 (.5 mm)	.030	<b>.180</b> (9x)	3	1/8	2-1/2	846820	37.10	846820-C3	41.70		
.020 (.5 mm)	.030	<b>.200</b> (10x)	3	1/8	2-1/2	982120	37.10	982120-C3	41.70	982120-C4	48.80
.020 (.5 mm)	.030	<b>.250</b> (12x)	3	1/8	2-1/2	35420	37.10	35420-C3	41.70	35420-C4	48.80
.020 (.5 mm)	.030	<b>.300</b> (15x)	3	1/8	2-1/2	48920	41.90	48920-C3	46.50	48920-C4	53.60
.020 (.5 mm)	.030	<b>.360</b> (18x)	3	1/8	2-1/2	977320	47.70	977320-C3	52.30		
.020 (.5 mm)	.030	<b>.400</b> (20x)	3	1/8	2-1/2	58320	51.80	58320-C3	56.40		
.020 (.5 mm)	.030	<b>.500</b> (25x)	3	1/8	2-1/2	38020	66.80	38020-C3	71.40		<b>25x Diameter!</b>
.020 (.5 mm)	.030	<b>.600</b> (30x)	3	1/8	2-1/2	972020	69.70	972020-C3	74.30		<b>30x Diameter!</b>
.021	.031	<b>.105</b> (5x)	3	1/8	2-1/2	33221	36.90	33221-C3	41.50		
.021	.031	<b>.168</b> (8x)	3	1/8	2-1/2	34621	37.10	34621-C3	41.70		
.022	.033	<b>.110</b> (5x)	3	1/8	2-1/2	33222	36.90	33222-C3	41.50		
.022	.033	<b>.176</b> (8x)	3	1/8	2-1/2	34622	37.10	34622-C3	41.70		
.023	.035	<b>.115</b> (5x)	3	1/8	2-1/2	33223	36.90	33223-C3	41.50		
.023	.035	<b>.187</b> (8x)	3	1/8	2-1/2	34623	37.10	34623-C3	41.70		
.024 (.6 mm)	.036	<b>.120</b> (5x)	3	1/8	2-1/2	33224	36.90	33224-C3	41.50		
.024 (.6 mm)	.036	<b>.192</b> (8x)	3	1/8	2-1/2	34624	37.10	34624-C3	41.70		
.025	.037	<b>.075</b> (3x)	3	1/8	2-1/2	47825	34.00	47825-C3	38.60		
.025	.037	<b>.100</b> (4x)	3	1/8	2-1/2	945525	34.00	945525-C3	38.60		
.025	.037	<b>.125</b> (5x)	3	1/8	2-1/2	33225	34.00	33225-C3	38.60	33225-C4	45.70
.025	.037	<b>.150</b> (6x)	3	1/8	2-1/2	937025	34.00	937025-C3	38.60		
.025	.037	<b>.175</b> (7x)	3	1/8	2-1/2	934825	34.00	934825-C3	38.60		
.025	.037	<b>.203</b> (8x)	3	1/8	2-1/2	34625	34.20	34625-C3	38.80	34625-C4	45.90
.025	.037	<b>.250</b> (10x)	3	1/8	2-1/2	982125	35.20	982125-C3	39.80		
.025	.037	<b>.312</b> (12x)	3	1/8	2-1/2	35425	35.20	35425-C3	39.80	35425-C4	46.90
.025	.037	<b>.375</b> (15x)	3	1/8	2-1/2	48925	41.10	48925-C3	45.70	48925-C4	52.80
.025	.037	<b>.450</b> (18x)	3	1/8	2-1/2	977325	47.10	977325-C3	51.70		
.025	.037	<b>.500</b> (20x)	3	1/8	2-1/2	58325	51.10	58325-C3	55.70		
.025	.037	<b>.625</b> (25x)	3	1/8	2-1/2	38025	66.20	38025-C3	70.80		<b>25x Diameter!</b>
.026	.039	<b>.130</b> (5x)	3	1/8	2-1/2	33226	34.80	33226-C3	39.40		
.026	.039	<b>.208</b> (8x)	3	1/8	2-1/2	34626	35.00	34626-C3	39.60		
.027	.041	<b>.135</b> (5x)	3	1/8	2-1/2	33227	34.80	33227-C3	39.40		
.027	.041	<b>.216</b> (8x)	3	1/8	2-1/2	34627	35.00	34627-C3	39.60		
.028 (.7 mm)	.042	<b>.140</b> (5x)	3	1/8	2-1/2	33228	34.80	33228-C3	39.40		
.028 (.7 mm)	.042	<b>.224</b> (8x)	3	1/8	2-1/2	34628	35.00	34628-C3	39.60		
.029	.043	<b>.145</b> (5x)	3	1/8	2-1/2	33229	34.80	33229-C3	39.40		
.029	.043	<b>.232</b> (8x)	3	1/8	2-1/2	34629	35.00	34629-C3	39.60		

SQUARE

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# MINIATURE END MILLS

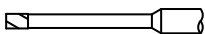
## Square – Long Reach, Stub Flute (cont.)

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SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI 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>						
.030	.045	<b>.090</b> (3x)	3	1/8	2-1/2	47830	34.00	47830-C3	38.60		
.030	.045	<b>.125</b> (4x)	3	1/8	2-1/2	945530	34.00	945530-C3	38.60		
.030	.045	<b>.156</b> (5x)	3	1/8	2-1/2	33230	34.00	33230-C3	38.60	33230-C4	45.70
.030	.045	<b>.187</b> (6x)	3	1/8	2-1/2	937030	34.20	937030-C3	38.80		
.030	.045	<b>.218</b> (7x)	3	1/8	2-1/2	934830	34.20	934830-C3	38.80		
.030	.045	<b>.250</b> (8x)	3	1/8	2-1/2	34630	34.20	34630-C3	38.80	34630-C4	45.90
.030	.045	<b>.270</b> (9x)	3	1/8	2-1/2	846830	35.20	846830-C3	39.80		
.030	.045	<b>.312</b> (10x)	3	1/8	2-1/2	982130	35.20	982130-C3	39.80		
.030	.045	<b>.375</b> (12x)	3	1/8	2-1/2	35430	35.20	35430-C3	39.80	35430-C4	46.90
.030	.045	<b>.450</b> (15x)	3	1/8	2-1/2	48930	41.10	48930-C3	45.70		
.030	.045	<b>.540</b> (18x)	3	1/8	2-1/2	977330	47.10	977330-C3	51.70		
.030	.045	<b>.600</b> (20x)	3	1/8	2-1/2	58330	51.10	58330-C3	55.70		
.031 (1/32)	.046	<b>.093</b> (3x)	3	1/8	2-1/2	47831	34.00	47831-C3	38.60	47831-C4	45.70
.031 (1/32)	.046	<b>.125</b> (4x)	3	1/8	2-1/2	945531	34.00	945531-C3	38.60		
.031 (1/32)	.046	<b>.156</b> (5x)	3	1/8	2-1/2	33231	34.00	33231-C3	38.60	33231-C4	45.70
.031 (1/32)	.046	<b>.156</b> (5x)	4	1/8	2-1/2	861631	36.00	861631-C3	40.60		
.031 (1/32)	.046	<b>.187</b> (6x)	3	1/8	2-1/2	937031	34.00	937031-C3	38.60		
.031 (1/32)	.046	<b>.218</b> (7x)	3	1/8	2-1/2	934831	34.20	934831-C3	38.80		
.031 (1/32)	.046	<b>.250</b> (8x)	3	1/8	2-1/2	34631	34.20	34631-C3	38.80	34631-C4	45.90
.031 (1/32)	.046	<b>.250</b> (8x)	4	1/8	2-1/2	874131	36.10	874131-C3	40.70		
.031 (1/32)	.046	<b>.281</b> (9x)	3	1/8	2-1/2	846831	35.20	846831-C3	39.80		
.031 (1/32)	.046	<b>.312</b> (10x)	3	1/8	2-1/2	982131	35.20	982131-C3	39.80	982131-C4	46.90
.031 (1/32)	.046	<b>.375</b> (12x)	3	1/8	2-1/2	35431	35.20	35431-C3	39.80	35431-C4	46.90
.031 (1/32)	.046	<b>.470</b> (15x)	3	1/8	2-1/2	48931	41.10	48931-C3	45.70	48931-C4	52.80
.031 (1/32)	.046	<b>.565</b> (18x)	3	1/8	2-1/2	977331	51.10	977331-C3	55.70		
.031 (1/32)	.046	<b>.625</b> (20x)	3	1/8	2-1/2	58331	51.10	58331-C3	55.70		
.031 (1/32)	.046	<b>.687</b> (22x)	3	1/8	2-1/2	969631	56.40	969631-C3	61.00		
.031 (1/32)	.046	<b>.775</b> (25x)	3	1/8	2-1/2	38031	66.20	38031-C3	70.80		<b>25x Diameter!</b>
.031 (1/32)	.046	<b>.937</b> (30x)	3	1/8	2-1/2	972031	76.90	972031-C3	81.50		<b>30x Diameter!</b>
.035 (.9 mm)	.052	<b>.105</b> (3x)	3	1/8	2-1/2	47835	34.00	47835-C3	38.60		
.035 (.9 mm)	.052	<b>.187</b> (5x)	3	1/8	2-1/2	33235	34.00	33235-C3	38.60	33235-C4	45.70
.035 (.9 mm)	.052	<b>.281</b> (8x)	3	1/8	2-1/2	34635	34.20	34635-C3	38.80	34635-C4	45.90
.035 (.9 mm)	.052	<b>.350</b> (10x)	3	1/8	2-1/2	982135	35.20	982135-C3	39.80		
.035 (.9 mm)	.052	<b>.425</b> (12x)	3	1/8	2-1/2	35435	35.20	35435-C3	39.80	35435-C4	46.90
.035 (.9 mm)	.052	<b>.525</b> (15x)	3	1/8	2-1/2	48935	41.10	48935-C3	45.70		
.035 (.9 mm)	.052	<b>.700</b> (20x)	3	1/8	2-1/2	58335	51.10	58335-C3	55.70		
.039 (1 mm)	.059	<b>.117</b> (3x)	3	1/8	2-1/2	47839	34.00	47839-C3	38.60		
.039 (1 mm)	.059	<b>.203</b> (5x)	3	1/8	2-1/2	33239	34.00	33239-C3	38.60	33239-C4	45.70
.039 (1 mm)	.059	<b>.325</b> (8x)	3	1/8	2-1/2	34639	34.20	34639-C3	38.80	34639-C4	45.90
.039 (1 mm)	.059	<b>.400</b> (10x)	3	1/8	2-1/2	982139	35.20	982139-C3	39.80		
.039 (1 mm)	.059	<b>.480</b> (12x)	3	1/8	2-1/2	35439	35.20	35439-C3	39.80		
.039 (1 mm)	.059	<b>.600</b> (15x)	3	1/8	2-1/2	48939	41.10	48939-C3	45.70		
.039 (1 mm)	.059	<b>.700</b> (18x)	3	1/8	2-1/2	977339	44.00	977339-C3	48.10		
.040	.060	<b>.120</b> (3x)	3	1/8	2-1/2	47840	34.00	47840-C3	38.60		
.040	.060	<b>.160</b> (4x)	3	1/8	2-1/2	945540	34.00	945540-C3	38.60		
.040	.060	<b>.203</b> (5x)	3	1/8	2-1/2	33240	34.00	33240-C3	38.60	33240-C4	45.70
.040	.060	<b>.240</b> (6x)	3	1/8	2-1/2	937040	34.20	937040-C3	38.80		
.040	.060	<b>.281</b> (7x)	3	1/8	2-1/2	934840	34.20	934840-C3	38.80		
.040	.060	<b>.325</b> (8x)	3	1/8	2-1/2	34640	34.20	34640-C3	38.80	34640-C4	45.90

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**MINIATURE END MILLS**

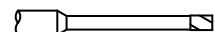
**Square – Long Reach, Stub Flute (cont.)**

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CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						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>						
.040	.060	<b>.400</b> (10x)	3	1/8	2-1/2	982140	35.20	982140-C3	39.80		
.040	.060	<b>.480</b> (12x)	3	1/8	2-1/2	35440	35.20	35440-C3	39.80	35440-C4	46.90
.040	.060	<b>.600</b> (15x)	3	1/8	2-1/2	48940	41.10	48940-C3	45.70		
.040	.060	<b>.720</b> (18x)	3	1/8	2-1/2	977340	51.10	977340-C3	55.70		
.040	.060	<b>.800</b> (20x)	3	1/8	2-1/2	58340	51.10	58340-C3	55.70		
.040	.060	<b>1.000</b> (25x)	3	1/8	2-1/2	38040	66.20	38040-C3	70.80		<b>25x Diameter!</b>
.045	.067	<b>.135</b> (3x)	3	1/8	2-1/2	47845	33.40	47845-C3	38.00		
.045	.067	<b>.225</b> (5x)	3	1/8	2-1/2	33245	33.40	33245-C3	38.00	33245-C4	45.10
.045	.067	<b>.375</b> (8x)	3	1/8	2-1/2	34645	33.50	34645-C3	38.10	34645-C4	45.20
.045	.067	<b>.450</b> (10x)	3	1/8	2-1/2	982145	34.70	982145-C3	39.30		
.045	.067	<b>.550</b> (12x)	3	1/8	2-1/2	35445	34.70	35445-C3	39.30	35445-C4	46.40
.045	.067	<b>.680</b> (15x)	3	1/8	2-1/2	48945	39.10	48945-C3	43.70		
.045	.067	<b>.900</b> (20x)	3	1/8	2-1/2	58345	48.10	58345-C3	52.70		
.047 (3/64)	.070	<b>.141</b> (3x)	3	1/8	2-1/2	47847	33.40	47847-C3	38.00		
.047 (3/64)	.070	<b>.187</b> (4x)	3	1/8	2-1/2	945547	33.40	945547-C3	38.00		
.047 (3/64)	.070	<b>.250</b> (5x)	3	1/8	2-1/2	33247	33.40	33247-C3	38.00	33247-C4	45.10
.047 (3/64)	.070	<b>.250</b> (5x)	4	1/8	2-1/2	861647	35.50	861647-C3	40.10		
.047 (3/64)	.070	<b>.281</b> (6x)	3	1/8	2-1/2	937047	33.40	937047-C3	38.00		
.047 (3/64)	.070	<b>.328</b> (7x)	3	1/8	2-1/2	934847	33.50	934847-C3	38.10		
.047 (3/64)	.070	<b>.375</b> (8x)	3	1/8	2-1/2	34647	33.50	34647-C3	38.10	34647-C4	45.20
.047 (3/64)	.070	<b>.375</b> (8x)	4	1/8	2-1/2	874147	35.60	874147-C3	40.20		
.047 (3/64)	.070	<b>.425</b> (9x)	3	1/8	2-1/2	846847	34.70	846847-C3	39.30		
.047 (3/64)	.070	<b>.480</b> (10x)	3	1/8	2-1/2	982147	34.70	982147-C3	39.30		
.047 (3/64)	.070	<b>.570</b> (12x)	3	1/8	2-1/2	35447	34.70	35447-C3	39.30	35447-C4	46.40
.047 (3/64)	.070	<b>.710</b> (15x)	3	1/8	2-1/2	48947	39.10	48947-C3	43.70		
.047 (3/64)	.070	<b>.850</b> (18x)	3	1/8	2-1/2	977347	48.10	977347-C3	52.70		
.047 (3/64)	.070	<b>.950</b> (20x)	3	1/8	2-1/2	58347	48.10	58347-C3	52.70		
.047 (3/64)	.070	<b>1.187</b> (25x)	3	1/8	2-1/2	38047	58.40	38047-C3	63.00		<b>25x Diameter!</b>
.047 (3/64)	.070	<b>1.406</b> (30x)	3	1/8	2-1/2	972047	75.40	972047-C3	80.00		<b>30x Diameter!</b>
.050	.075	<b>.150</b> (3x)	3	1/8	2-1/2	47850	33.40	47850-C3	38.00		
.050	.075	<b>.203</b> (4x)	3	1/8	2-1/2	945550	33.40	945550-C3	38.00		
.050	.075	<b>.250</b> (5x)	3	1/8	2-1/2	33250	33.40	33250-C3	38.00	33250-C4	45.10
.050	.075	<b>.300</b> (6x)	3	1/8	2-1/2	937050	33.50	937050-C3	38.10		
.050	.075	<b>.350</b> (7x)	3	1/8	2-1/2	934850	33.50	934850-C3	38.10		
.050	.075	<b>.400</b> (8x)	3	1/8	2-1/2	34650	33.50	34650-C3	38.10	34650-C4	45.20
.050	.075	<b>.500</b> (10x)	3	1/8	2-1/2	982150	34.70	982150-C3	39.30		
.050	.075	<b>.600</b> (12x)	3	1/8	2-1/2	35450	34.70	35450-C3	39.30	35450-C4	46.40
.050	.075	<b>.750</b> (15x)	3	1/8	2-1/2	48950	39.10	48950-C3	43.70		
.050	.075	<b>.900</b> (18x)	3	1/8	2-1/2	977350	48.10	977350-C3	52.70		
.055 (1.4 mm)	.082	<b>.165</b> (3x)	3	1/8	2-1/2	47855	33.40	47855-C3	38.00		
.055 (1.4 mm)	.082	<b>.275</b> (5x)	3	1/8	2-1/2	33255	33.40	33255-C3	38.00	33255-C4	45.10
<b>NEW</b> <b>NEW</b> .055 (1.4 mm)	.082	<b>.330</b> (6x)	3	1/8	2-1/2	<b>937055</b>	33.50	<b>937055-C3</b>	38.10		
.055 (1.4 mm)	.082	<b>.385</b> (7x)	3	1/8	2-1/2	<b>934855</b>	33.50	<b>934855-C3</b>	38.10		
.055 (1.4 mm)	.082	<b>.450</b> (8x)	3	1/8	2-1/2	34655	33.50	34655-C3	38.10	34655-C4	45.20
.055 (1.4 mm)	.082	<b>.560</b> (10x)	3	1/8	2-1/2	982155	34.70	982155-C3	39.30		
.055 (1.4 mm)	.082	<b>.660</b> (12x)	3	1/8	2-1/2	35455	34.70	35455-C3	39.30	35455-C4	46.40
.055 (1.4 mm)	.082	<b>.825</b> (15x)	3	1/8	2-1/2	48955	39.10	48955-C3	43.70		
.055 (1.4 mm)	.082	<b>1.000</b> (18x)	3	1/8	2-1/2	977355	48.10	977355-C3	52.70		

SQUARE

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# MINIATURE END MILLS

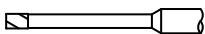
## Square – Long Reach, Stub Flute (cont.)

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SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		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>						
.060	.090	<b>.180</b> (3x)	3	1/8	2-1/2	47860	33.40	47860-C3	38.00		
.060	.090	<b>.250</b> (4x)	3	1/8	2-1/2	945560	33.40	945560-C3	38.00		
.060	.090	<b>.312</b> (5x)	3	1/8	2-1/2	33260	33.40	33260-C3	38.00	33260-C4	45.10
.060	.090	<b>.375</b> (6x)	3	1/8	2-1/2	937060	33.50	937060-C3	38.10		
.060	.090	<b>.437</b> (7x)	3	1/8	2-1/2	934860	33.50	934860-C3	38.10		
.060	.090	<b>.500</b> (8x)	3	1/8	2-1/2	34660	33.50	34660-C3	38.10	34660-C4	45.20
.060	.090	<b>.562</b> (9x)	3	1/8	2-1/2	846860	34.70	846860-C3	39.30		
.060	.090	<b>.625</b> (10x)	3	1/8	2-1/2	982160	34.70	982160-C3	39.30		
.060	.090	<b>.720</b> (12x)	3	1/8	2-1/2	35460	34.70	35460-C3	39.30	35460-C4	46.40
.060	.090	<b>.900</b> (15x)	3	1/8	2-1/2	48960	39.10	48960-C3	43.70		
.060	.090	<b>1.062</b> (18x)	3	1/8	2-1/2	977360	48.10	977360-C3	52.70		
.060	.090	<b>1.200</b> (20x)	3	1/8	2-1/2	58360	48.10	58360-C3	52.70		
.062 (1/16)	.093	<b>.186</b> (3x)	3	1/8	2-1/2	47862	33.40	47862-C3	38.00	47862-C4	45.10
.062 (1/16)	.093	<b>.250</b> (4x)	3	1/8	2-1/2	945562	33.40	945562-C3	38.00	945562-C4	45.10
.062 (1/16)	.093	<b>.312</b> (5x)	3	1/8	2-1/2	33262	33.40	33262-C3	38.00	33262-C4	45.10
.062 (1/16)	.093	<b>.312</b> (5x)	4	1/8	2-1/2	861662	35.50	861662-C3	40.10		
.062 (1/16)	.093	<b>.375</b> (6x)	3	1/8	2-1/2	937062	33.40	937062-C3	38.00	937062-C4	45.10
.062 (1/16)	.093	<b>.437</b> (7x)	3	1/8	2-1/2	934862	33.50	934862-C3	38.10	934862-C4	45.20
.062 (1/16)	.093	<b>.500</b> (8x)	3	1/8	2-1/2	34662	33.50	34662-C3	38.10	34662-C4	45.20
.062 (1/16)	.093	<b>.500</b> (8x)	4	1/8	2-1/2	874162	35.60	874162-C3	40.20		
.062 (1/16)	.093	<b>.562</b> (9x)	3	1/8	2-1/2	846862	34.70	846862-C3	39.30		
.062 (1/16)	.093	<b>.625</b> (10x)	3	1/8	2-1/2	982162	34.70	982162-C3	39.30	982162-C4	46.40
.062 (1/16)	.093	<b>.687</b> (11x)	3	1/8	2-1/2	850262	34.70	850262-C3	39.30		
.062 (1/16)	.093	<b>.750</b> (12x)	3	1/8	2-1/2	35462	34.70	35462-C3	39.30	35462-C4	46.40
.062 (1/16)	.093	<b>.800</b> (13x)	3	1/8	2-1/2	839362	36.90	839362-C3	41.50		
.062 (1/16)	.093	<b>.950</b> (15x)	3	1/8	2-1/2	48962	39.10	48962-C3	43.70	48962-C4	50.80
.062 (1/16)	.093	<b>1.125</b> (18x)	3	1/8	2-1/2	977362	48.10	977362-C3	52.70		
.062 (1/16)	.093	<b>1.250</b> (20x)	3	1/8	2-1/2	58362	48.10	58362-C3	52.70		
.062 (1/16)	.093	<b>1.375</b> (22x)	3	1/8	3	969662	54.20	969662-C3	58.80		
.062 (1/16)	.093	<b>1.550</b> (25x)	3	1/8	3	38062	58.40	38062-C3	63.00	<b>25x Diameter!</b>	
.062 (1/16)	.093	<b>1.875</b> (30x)	3	1/8	3	972062	75.40	972062-C3	80.00	<b>30x Diameter!</b>	
.065	.097	<b>.195</b> (3x)	3	1/8	2-1/2	47865	33.40	47865-C3	38.00		
.065	.097	<b>.325</b> (5x)	3	1/8	2-1/2	33265	33.40	33265-C3	38.00		
.065	.097	<b>.530</b> (8x)	3	1/8	2-1/2	34665	33.50	34665-C3	38.10	34665-C4	45.20
.065	.097	<b>.650</b> (10x)	3	1/8	2-1/2	982165	34.70	982165-C3	39.30		
.065	.097	<b>.800</b> (12x)	3	1/8	2-1/2	35465	34.70	35465-C3	39.30		
.070	.105	<b>.210</b> (3x)	3	1/8	2-1/2	47870	33.40	47870-C3	38.00		
.070	.105	<b>.375</b> (5x)	3	1/8	2-1/2	33270	33.40	33270-C3	38.00		
.070	.105	<b>.570</b> (8x)	3	1/8	2-1/2	34670	33.50	34670-C3	38.10	34670-C4	45.20
.070	.105	<b>.700</b> (10x)	3	1/8	2-1/2	982170	34.70	982170-C3	39.30		
.070	.105	<b>.850</b> (12x)	3	1/8	2-1/2	35470	34.70	35470-C3	39.30		
.070	.105	<b>1.062</b> (15x)	3	1/8	2-1/2	48970	39.10	48970-C3	43.70		
.075	.112	<b>.225</b> (3x)	3	1/8	2-1/2	47875	33.40	47875-C3	38.00		
.075	.112	<b>.375</b> (5x)	3	1/8	2-1/2	33275	33.40	33275-C3	38.00		
.075	.112	<b>.625</b> (8x)	3	1/8	2-1/2	34675	33.50	34675-C3	38.10	34675-C4	45.20
.075	.112	<b>.750</b> (10x)	3	1/8	2-1/2	982175	34.70	982175-C3	39.30		
.075	.112	<b>.900</b> (12x)	3	1/8	2-1/2	35475	34.70	35475-C3	39.30		

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**MINIATURE END MILLS**

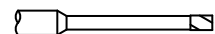
**Square – Long Reach, Stub Flute (cont.)**

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CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIRTIN 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>						
.078 (5/64)	.117	<b>.234</b> (3x)	3	1/8	2-1/2	47878	33.40	47878-C3	38.00		
.078 (5/64)	.117	<b>.312</b> (4x)	3	1/8	2-1/2	945578	33.40	945578-C3	38.00		
.078 (5/64)	.117	<b>.406</b> (5x)	3	1/8	2-1/2	33278	33.40	33278-C3	38.00	33278-C4	45.10
.078 (5/64)	.117	<b>.406</b> (5x)	4	1/8	2-1/2	861678	35.50	861678-C3	40.10		
.078 (5/64)	.117	<b>.475</b> (6x)	3	1/8	2-1/2	937078	33.40	937078-C3	38.00		
.078 (5/64)	.117	<b>.550</b> (7x)	3	1/8	2-1/2	934878	33.50	934878-C3	38.10		
.078 (5/64)	.117	<b>.625</b> (8x)	3	1/8	2-1/2	34678	33.50	34678-C3	38.10	34678-C4	45.20
.078 (5/64)	.117	<b>.625</b> (8x)	4	1/8	2-1/2	874178	35.60	874178-C3	40.20		
.078 (5/64)	.117	<b>.700</b> (9x)	3	1/8	2-1/2	846878	34.70	846878-C3	39.30		
.078 (5/64)	.117	<b>.800</b> (10x)	3	1/8	2-1/2	982178	34.70	982178-C3	39.30		
.078 (5/64)	.117	<b>.940</b> (12x)	3	1/8	2-1/2	35478	34.70	35478-C3	39.30	35478-C4	46.40
.078 (5/64)	.117	<b>1.187</b> (15x)	3	1/8	2-1/2	48978	39.10	48978-C3	43.70		
.078 (5/64)	.117	<b>1.400</b> (18x)	3	1/8	3	977378	48.10	977378-C3	52.70		
.078 (5/64)	.117	<b>1.562</b> (20x)	3	1/8	3	58378	48.10	58378-C3	52.70		
.078 (5/64)	.117	<b>1.950</b> (25x)	3	1/8	3	38078	58.40	38078-C3	63.00		<b>25x Diameter!</b>
.078 (5/64)	.117	<b>2.343</b> (30x)	3	1/8	4	972078	75.40	972078-C3	80.40		<b>30x Diameter!</b>
.080	.120	<b>.240</b> (3x)	3	1/8	2-1/2	47880	33.40	47880-C3	38.00		
.080	.120	<b>.406</b> (5x)	3	1/8	2-1/2	33280	33.40	33280-C3	38.00		
.080	.120	<b>.650</b> (8x)	3	1/8	2-1/2	34680	33.50	34680-C3	38.10	34680-C4	45.20
.080	.120	<b>.960</b> (12x)	3	1/8	2-1/2	35480	34.70	35480-C3	39.30		
.085	.127	<b>.425</b> (5x)	3	1/8	2-1/2	33285	33.40	33285-C3	38.00		
.085	.127	<b>.700</b> (8x)	3	1/8	2-1/2	34685	33.50	34685-C3	38.10	34685-C4	45.20
.085	.127	<b>1.020</b> (12x)	3	1/8	2-1/2	35485	34.70	35485-C3	39.30		
.090	.135	<b>.270</b> (3x)	3	1/8	2-1/2	47890	33.40	47890-C3	38.00		
.090	.135	<b>.450</b> (5x)	3	1/8	2-1/2	33290	33.40	33290-C3	38.00		
.090	.135	<b>.750</b> (8x)	3	1/8	2-1/2	34690	33.50	34690-C3	38.10	34690-C4	45.20
.090	.135	<b>1.080</b> (12x)	3	1/8	2-1/2	35490	34.70	35490-C3	39.30		
.093 (3/32)	.139	<b>.279</b> (3x)	3	1/8	2-1/2	47893	33.40	47893-C3	38.00	47893-C4	45.10
.093 (3/32)	.139	<b>.375</b> (4x)	3	1/8	2-1/2	945593	33.40	945593-C3	38.00	945593-C4	45.10
.093 (3/32)	.139	<b>.500</b> (5x)	3	1/8	2-1/2	33293	33.40	33293-C3	38.00	33293-C4	45.10
.093 (3/32)	.139	<b>.500</b> (5x)	4	1/8	2-1/2	861693	35.50	861693-C3	40.10		
.093 (3/32)	.139	<b>.585</b> (6x)	3	1/8	2-1/2	937093	33.40	937093-C3	38.00	937093-C4	45.10
.093 (3/32)	.139	<b>.670</b> (7x)	3	1/8	2-1/2	934893	33.50	934893-C3	38.10	934893-C4	45.20
.093 (3/32)	.139	<b>.750</b> (8x)	3	1/8	2-1/2	34693	33.50	34693-C3	38.10	34693-C4	45.20
.093 (3/32)	.139	<b>.750</b> (8x)	4	1/8	2-1/2	874193	35.60	874193-C3	40.20		
.093 (3/32)	.139	<b>.850</b> (9x)	3	1/8	2-1/2	846893	34.70	846893-C3	39.30		
.093 (3/32)	.139	<b>.950</b> (10x)	3	1/8	2-1/2	982193	34.70	982193-C3	39.30		
.093 (3/32)	.139	<b>1.030</b> (11x)	3	1/8	2-1/2	850293	34.70	850293-C3	39.30		
.093 (3/32)	.139	<b>1.125</b> (12x)	3	1/8	2-1/2	35493	34.70	35493-C3	39.30	35493-C4	46.40
.093 (3/32)	.139	<b>1.250</b> (13x)	3	1/8	2-1/2	839393	37.30	839393-C3	41.90		
.093 (3/32)	.139	<b>1.400</b> (15x)	3	1/8	3	48993	40.60	48993-C3	44.80	48993-C4	51.90
.093 (3/32)	.139	<b>1.675</b> (18x)	3	1/8	3	977393	48.70	977393-C3	52.80		
.093 (3/32)	.139	<b>1.875</b> (20x)	3	1/8	4	58393	53.10	58393-C3	58.10		
.093 (3/32)	.139	<b>2.062</b> (22x)	3	1/8	4	969693	55.80	969693-C3	60.80		
.093 (3/32)	.139	<b>2.312</b> (25x)	3	1/8	4	38093	60.80	38093-C3	65.80		<b>25x Diameter!</b>
.093 (3/32)	.139	<b>2.812</b> (30x)	3	1/8	4	972093	83.50	972093-C3	88.50		<b>30x Diameter!</b>

SQUARE

continued on next page



# MINIATURE END MILLS

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

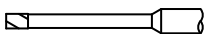
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SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIRTIN 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>						
.095	.142	<b>.500</b> (5x)	3	1/8	2-1/2	33295	33.40	33295-C3	38.00		
.095	.142	<b>.750</b> (8x)	3	1/8	2-1/2	34695	33.50	34695-C3	38.10	34695-C4	45.20
.095	.142	<b>1.150</b> (12x)	3	1/8	2-1/2	35495	34.70	35495-C3	39.30		
.100	.150	<b>.300</b> (3x)	3	1/8	2-1/2	978400	33.40	978400-C3	38.00		
.100	.150	<b>.400</b> (4x)	3	1/8	2-1/2	945600	33.40	945600-C3	38.00		
.100	.150	<b>.500</b> (5x)	3	1/8	2-1/2	33300	33.40	33300-C3	38.00		
.100	.150	<b>.600</b> (6x)	3	1/8	2-1/2	937100	33.40	937100-C3	38.00		
.100	.150	<b>.700</b> (7x)	3	1/8	2-1/2	934900	33.40	934900-C3	38.00		
.100	.150	<b>.800</b> (8x)	3	1/8	2-1/2	34700	33.50	34700-C3	38.10	34700-C4	45.20
.100	.150	<b>1.000</b> (10x)	3	1/8	2-1/2	982200	34.70	982200-C3	39.30		
.100	.150	<b>1.200</b> (12x)	3	1/8	2-1/2	35499	34.70	35499-C3	39.30		
.100	.150	<b>1.500</b> (15x)	3	1/8	3	49000	41.40	49000-C3	46.00		
.100	.150	<b>1.812</b> (18x)	3	1/8	4	977400	51.10	977400-C3	56.10		
.105	.158	<b>.530</b> (5x)	3	1/8	2-1/2	33301	33.40	33301-C3	38.00		
.105	.158	<b>.850</b> (8x)	3	1/8	2-1/2	34701	33.50	34701-C3	38.10		
.109 (7/64)	.163	<b>.570</b> (5x)	3	1/8	2-1/2	33302	33.40	33302-C3	38.00		
.109 (7/64)	.163	<b>.900</b> (8x)	3	1/8	2-1/2	34702	33.50	34702-C3	38.10		
.109 (7/64)	.163	<b>1.125</b> (10x)	3	1/8	2-1/2	982202	34.70	982202-C3	39.30		
.109 (7/64)	.163	<b>1.312</b> (12x)	3	1/8	3	35502	35.20	35502-C3	39.80		
.110	.165	<b>.570</b> (5x)	3	1/8	2-1/2	33303	33.40	33303-C3	38.00		
.110	.165	<b>.900</b> (8x)	3	1/8	2-1/2	34703	33.50	34703-C3	38.10		
.115	.173	<b>.600</b> (5x)	3	1/8	2-1/2	33304	33.40	33304-C3	38.00		
.115	.173	<b>.950</b> (8x)	3	1/8	2-1/2	34704	33.50	34704-C3	38.10		
.118 (3 mm)	.177	<b>.625</b> (5x)	3	1/8	2-1/2	33305	33.40	33305-C3	38.00		
.118 (3 mm)	.177	<b>.950</b> (8x)	3	1/8	2-1/2	34705	33.50	34705-C3	38.10		
.118 (3 mm)	.177	<b>1.187</b> (10x)	3	1/8	2-1/2	982205	34.70	982205-C3	39.30		
.118 (3 mm)	.177	<b>1.420</b> (12x)	3	1/8	3	35505	35.20	35505-C3	40.20		
.118 (3 mm)	.177	<b>1.770</b> (15x)	3	1/8	3	49005	42.20	49005-C3	46.80		
.118 (3 mm)	.177	<b>2.125</b> (18x)	3	1/8	4	977405	51.70	977405-C3	56.70		
.120	.180	<b>.625</b> (5x)	3	1/8	2-1/2	33306	33.40	33306-C3	38.00		
.120	.180	<b>1.000</b> (8x)	3	1/8	2-1/2	34706	33.50	34706-C3	38.10		

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>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.125 (1/8)	.187	<b>.375</b> (3x)	3	1/8	2-1/2	978408	33.40	978408-C3	38.00		
.125 (1/8)	.187	<b>.500</b> (4x)	3	1/8	2-1/2	945608	33.40	945608-C3	38.00	945608-C4	45.10
.125 (1/8)	.187	<b>.625</b> (5x)	3	1/8	2-1/2	33308	33.40	33308-C3	38.00	33308-C4	45.10
.125 (1/8)	.187	<b>.625</b> (5x)	4	1/8	2-1/2	861708	35.50	861708-C3	40.10		
.125 (1/8)	.187	<b>.750</b> (6x)	3	1/8	2-1/2	937108	33.40	937108-C3	38.00	937108-C4	45.10
.125 (1/8)	.187	<b>.875</b> (7x)	3	1/8	2-1/2	934908	33.40	934908-C3	38.00	934908-C4	45.10
.125 (1/8)	.187	<b>1.000</b> (8x)	3	1/8	2-1/2	34708	33.40	34708-C3	38.00	34708-C4	45.10
.125 (1/8)	.187	<b>1.000</b> (8x)	4	1/8	2-1/2	874208	35.50	874208-C3	40.10		
.125 (1/8)	.187	<b>1.125</b> (9x)	3	1/8	2-1/2	846908	36.10	846908-C3	40.70		
.125 (1/8)	.187	<b>1.250</b> (10x)	3	1/8	2-1/2	982208	36.10	982208-C3	40.70	982208-C4	47.80
.125 (1/8)	.187	<b>1.375</b> (11x)	3	1/8	2-1/2	850308	36.20	850308-C3	40.80		
.125 (1/8)	.187	<b>1.500</b> (12x)	3	1/8	3	35508	36.20	35508-C3	40.80	35508-C4	47.90
.125 (1/8)	.187	<b>1.625</b> (13x)	3	1/8	3	839408	38.80	839408-C3	43.40		

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**MINIATURE END MILLS**

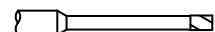
**Square – Long Reach, Stub Flute (cont.)**

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CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						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>						
.125 (1/8)	.187	<b>1.875</b> (15x)	3	1/8	3	49008	41.40	49008-C3	46.00		
.125 (1/8)	.187	<b>2.250</b> (18x)	3	1/8	4	977408	49.70	977408-C3	54.70		
.125 (1/8)	.187	<b>2.500</b> (20x)	3	1/8	4	58408	50.60	58408-C3	55.60		
.125 (1/8)	.187	<b>2.750</b> (22x)	3	1/8	4	969708	54.20	969708-C3	59.20		
.125 (1/8)	.187	<b>3.125</b> (25x)	3	1/8	4	38108	59.60	38108-C3	64.60		<b>25x Diameter!</b>
.125 (1/8)	.187	<b>3.750</b> (30x)	3	1/8	6	973608	70.40	973608-C3	76.50		<b>30x Diameter!</b>
.140 (9/64)	.220	<b>.425</b> (3x)	3	3/16	3	978409	39.50	978409-C3	44.50		
.140 (9/64)	.220	<b>.750</b> (5x)	3	3/16	3	33309	39.50	33309-C3	44.50		
.140 (9/64)	.220	<b>1.125</b> (8x)	3	3/16	3	34709	39.50	34709-C3	44.50		
.140 (9/64)	.220	<b>1.450</b> (10x)	3	3/16	3	982209	42.30	982209-C3	47.30		
.140 (9/64)	.220	<b>1.680</b> (12x)	3	3/16	4	35509	45.40	35509-C3	52.20		
.156 (5/32)	.234	<b>.470</b> (3x)	3	3/16	3	978410	39.50	978410-C3	44.50		
.156 (5/32)	.234	<b>.625</b> (4x)	3	3/16	3	945610	39.50	945610-C3	44.50		
.156 (5/32)	.234	<b>.750</b> (5x)	3	3/16	3	33310	39.50	33310-C3	44.50		
.156 (5/32)	.234	<b>.937</b> (6x)	3	3/16	3	937110	39.50	937110-C3	44.50		
.156 (5/32)	.234	<b>1.093</b> (7x)	3	3/16	3	934910	39.50	934910-C3	44.50		
.156 (5/32)	.234	<b>1.250</b> (8x)	3	3/16	3	34710	39.50	34710-C3	44.50	34710-C4	55.60
.156 (5/32)	.234	<b>1.570</b> (10x)	3	3/16	3	982210	42.30	982210-C3	47.30		
.156 (5/32)	.234	<b>1.875</b> (12x)	3	3/16	4	35510	42.50	35510-C3	49.30		
.156 (5/32)	.234	<b>2.375</b> (15x)	3	3/16	4	49010	45.40	49010-C3	52.20		
.156 (5/32)	.234	<b>2.812</b> (18x)	3	3/16	6	977410	62.60	977410-C3	71.60		
.187 (3/16)	.281	<b>.570</b> (3x)	3	3/16	3	978412	39.50	978412-C3	44.50		
.187 (3/16)	.281	<b>.750</b> (4x)	3	3/16	3	945612	39.50	945612-C3	44.50		
.187 (3/16)	.281	<b>1.000</b> (5x)	3	3/16	3	33312	39.50	33312-C3	44.50	33312-C4	55.60
.187 (3/16)	.281	<b>1.156</b> (6x)	3	3/16	3	937112	39.50	937112-C3	44.50		
.187 (3/16)	.281	<b>1.312</b> (7x)	3	3/16	3	934912	39.50	934912-C3	44.50		
.187 (3/16)	.281	<b>1.500</b> (8x)	3	3/16	3	34712	39.50	34712-C3	44.50	34712-C4	55.60
<b>NEW</b> .187 (3/16)	.281	<b>1.500</b> (8x)	4	3/16	3	<b>874212</b>	41.30	<b>874212-C3</b>	46.30		
.187 (3/16)	.281	<b>1.680</b> (9x)	3	3/16	3	846912	42.30	846912-C3	47.30		
.187 (3/16)	.281	<b>1.875</b> (10x)	3	3/16	4	982212	42.30	982212-C3	49.10		
.187 (3/16)	.281	<b>2.250</b> (12x)	3	3/16	4	35512	42.50	35512-C3	49.30	35512-C4	59.70
.187 (3/16)	.281	<b>2.812</b> (15x)	3	3/16	4	49012	45.40	49012-C3	52.20		
.187 (3/16)	.281	<b>3.375</b> (18x)	3	3/16	6	977412	63.70	977412-C3	72.70		
.187 (3/16)	.281	<b>3.750</b> (20x)	3	3/16	6	58412	63.70	58412-C3	72.70		
.187 (3/16)	.281	<b>4.125</b> (22x)	3	3/16	6	969712	63.90	969712-C3	72.90		
.203 (13/64)	.312	<b>1.015</b> (5x)	3	1/4	4	33313	49.70	33313-C3	57.60		
.203 (13/64)	.312	<b>1.625</b> (8x)	3	1/4	4	34713	49.70	34713-C3	57.60		
.218 (7/32)	.330	<b>1.125</b> (5x)	3	1/4	4	33314	49.40	33314-C3	57.30		
.218 (7/32)	.330	<b>1.750</b> (8x)	3	1/4	4	34714	49.40	34714-C3	57.30		
.218 (7/32)	.330	<b>2.187</b> (10x)	3	1/4	4	982214	50.80	982214-C3	58.70		

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SQUARE



# MINIATURE END MILLS

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

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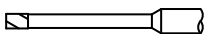
SQUARE

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN 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>						
.250 (1/4)	.375	<b>.750</b> (3x)	3	1/4	4	978416	44.10	978416-C3	52.00		
.250 (1/4)	.375	<b>1.000</b> (4x)	3	1/4	4	945616	44.10	945616-C3	52.00		
.250 (1/4)	.375	<b>1.250</b> (5x)	3	1/4	4	33316	44.10	33316-C3	52.00	33316-C4	62.40
.250 (1/4)	.375	<b>1.500</b> (6x)	3	1/4	4	937116	44.10	937116-C3	52.00		
.250 (1/4)	.375	<b>1.750</b> (7x)	3	1/4	4	934916	44.10	934916-C3	52.00		
.250 (1/4)	.375	<b>2.000</b> (8x)	3	1/4	4	34716	44.10	34716-C3	52.00	34716-C4	62.40
.250 (1/4)	.375	<b>2.000</b> (8x)	4	1/4	4	<b>874216</b>	46.00	<b>874216-C3</b>	53.90		NEW
.250 (1/4)	.375	<b>2.250</b> (9x)	3	1/4	4	846916	49.90	846916-C3	57.80		
.250 (1/4)	.375	<b>2.500</b> (10x)	3	1/4	4	982216	49.90	982216-C3	57.80		
.250 (1/4)	.375	<b>3.000</b> (12x)	3	1/4	6	35516	53.60	35516-C3	62.60	35516-C4	80.10
.250 (1/4)	.375	<b>3.750</b> (15x)	3	1/4	6	49016	55.60	49016-C3	64.60		
.250 (1/4)	.375	<b>4.375</b> (17.5x)	4	1/4	6	991916	83.00	991916-C3	92.00		
.250 (1/4)	.375	<b>4.375</b> (17.5x)	4	1/4	8	960516	112.90	960516-C3	126.30		
.250 (1/4)	.375	<b>5.000</b> (20x)	3	1/4	8	58416	112.90	58416-C3	126.30		
.312 (5/16)	.470	<b>1.625</b> (5x)	3	5/16	4	33320	73.40	33320-C3	82.90		
.312 (5/16)	.470	<b>2.500</b> (8x)	3	5/16	4	34720	73.40	34720-C3	82.90		
.312 (5/16)	.470	<b>4.343</b> (14x)	4	5/16	6	991920	99.00	991920-C3	112.40		
.375 (3/8)	.570	<b>2.000</b> (5x)	3	3/8	4	33324	73.40	33324-C3	85.70		
.375 (3/8)	.570	<b>3.000</b> (8x)	3	3/8	6	34724	100.90	34724-C3	114.30		
.375 (3/8)	.562	<b>4.312</b> (11.5x)	4	3/8	6	991924	111.70	991924-C3	125.60		
.375 (3/8)	.562	<b>4.312</b> (11.5x)	4	3/8	8	960524	135.30	960524-C3	154.10		
.437 (7/16)	.656	<b>5.875</b> (13.5x)	4	7/16	8	991928	194.40	991928-C3	222.00		
.500 (1/2)	.750	<b>5.750</b> (11.5x)	4	1/2	8	991932	199.40	991932-C3	227.00		
.500 (1/2)	.750	<b>5.750</b> (11.5x)	4	1/2	10	960532	292.50	960532-C3	320.10		
.625 (5/8)	.937	<b>5.687</b> (9x)	4	5/8	8	991940	338.60	991940-C3	362.90		
.750 (3/4)	1.125	<b>5.625</b> (7.5x)	4	3/4	8	991948	416.60	991948-C3	444.90		



View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

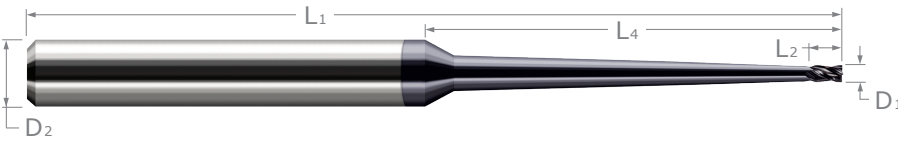
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# MINIATURE END MILLS

## Square – Tapered Reach (Clearance Cutters)



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

**Maximum  
Reach &  
Maximum  
Rigidity!**

SQUARE

CUTTER DIA.	LOC	EFF. WALL REACH	WALL ANGLE	SHANK DIA.	SHANK OAL	INTERFERENCE DEPTH AT WALL ANGLE*						UNCOATED			AITIN NANO COATED		
						0°	.5°	1°	2°	3°	4°	2 FL	4 FL	PRICE	2 FL	4 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>												
.015	.023	<b>1/2</b>	6.4°	1/8	2-1/2	.060	.080	.125	.375	.395	.420		990215	69.90		990215-C6	76.70
.031	.047	<b>1/2</b>	5.4°	1/8	2-1/2	.115	.155	.235	.385	.410	.440		990231	53.90		990231-C6	60.70
.031	.047	<b>1</b>	6.3°	1/4	4	.115	.155	.235	.755	.800	.850	26631	30831	64.80	26631-C6	30831-C6	74.80
.031	.047	<b>1-1/2</b>	4.2°	1/4	4	.115	.155	.235	1.260	1.355	1.470	28331	31231	70.00	28331-C6	31231-C6	80.00
.031	.047	<b>2</b>	3.1°	1/4	4	.115	.155	.235	1.765	1.965	-	17431	913131	75.10	17431-C6	913131-C6	85.10
.047	.071	<b>1/2</b>	4.5°	1/8	2-1/2	.180	.245	.370	.395	.430	.470		990247	53.90		990247-C6	60.70
.047	.071	<b>1</b>	5.9°	1/4	4	.180	.245	.370	.765	.815	.870	26647	30847	64.80	26647-C6	30847-C6	74.80
.047	.071	<b>1-1/2</b>	3.9°	1/4	4	.180	.245	.370	1.275	1.380	-	28347	31247	70.00	28347-C6	31247-C6	80.00
.062	.093	<b>1/2</b>	3.7°	1/8	2-1/2	.220	.295	.375	.410	.460	-		990262	52.30		990262-C6	59.10
.062	.093	<b>1</b>	5.4°	1/4	4	.220	.295	.445	.775	.825	.890	26662	30862	63.00	26662-C6	30862-C6	73.00
.062	.093	<b>1-1/2</b>	3.7°	1/4	4	.220	.295	.445	1.285	1.410	-	28362	31262	68.10	28362-C6	31262-C6	78.10
.062	.093	<b>2</b>	2.6°	1/4	4	.220	.295	.445	1.805	-	-	17462	913162	73.30	17462-C6	913162-C6	83.30
.078	.118	<b>1</b>	5.0°	1/4	4	.305	.405	.610	.785	.845	.915	26678	30878	63.00	26678-C6	30878-C6	73.00
.078	.118	<b>1-1/2</b>	3.4°	1/4	4	.305	.405	.610	1.305	1.445	-	28378	31278	68.10	28378-C6	31278-C6	78.10
.093	.140	<b>1</b>	4.6°	1/4	4	.340	.455	.685	.795	.865	.945	26693	30893	63.80	26693-C6	30893-C6	73.80
.093	.140	<b>1-1/2</b>	3.1°	1/4	4	.340	.455	.685	1.320	-	-	28393	31293	67.60	28393-C6	31293-C6	77.60
.093	.140	<b>2</b>	2.2°	1/4	4	.340	.455	.685	1.890	-	-	17493	913193	71.40	17493-C6	913193-C6	81.40
.125	.188	<b>1</b>	3.7°	1/4	4	.450	.600	.760	.835	.930	-	26708	30908	63.80	26708-C6	30908-C6	73.80
.125	.188	<b>1-1/2</b>	2.5°	1/4	4	.450	.600	.905	1.395	-	-	28408	31308	67.60	28408-C6	31308-C6	77.60
.125	.188	<b>2</b>	1.7°	1/4	4	.450	.600	.905	-	-	-	17508	913208	71.40	17508-C6	913208-C6	81.40
.156	.234	<b>1</b>	2.8°	1/4	4	.525	.705	.780	.895	-	-	26710	30910	63.80	26710-C6	30910-C6	73.80
.156	.234	<b>1-1/2</b>	1.9°	1/4	4	.525	.705	1.060	-	-	-	28410	31310	67.60	28410-C6	31310-C6	77.60
.187	.281	<b>1-1/2</b>	1.3°	1/4	4	.605	.805	1.215	-	-	-	28412	31312	67.60	28412-C6	31312-C6	77.60
.250	.375	<b>1-1/2</b>	2.5°	3/8	4	.760	1.015	1.275	1.425	-	-	28416	31316	87.20	28416-C6	31316-C6	98.40

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

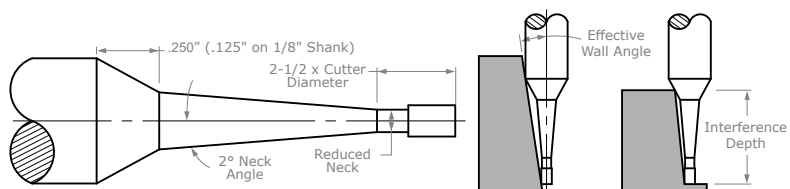
**For detailed interference charts with more angles, search for keyword [InterferenceChart](http://www.harveytool.com) on [www.harveytool.com](http://www.harveytool.com).**

**Effective Wall Angle:**

Minimum wall angle (measured from centerline of tool) that can be machined at overall reach.

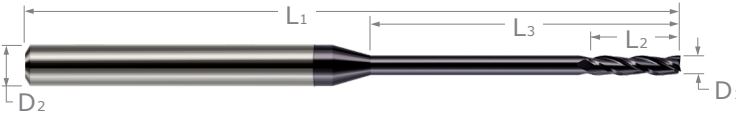
**Interference Depth:**

At a given angle, the depth at which the cutter interferes with the workpiece.



# MINIATURE END MILLS

## Square – Long Reach, Long Flute



SQUARE

➤ **Long length design for deep cavities**

➤ Long flutes for deep pocket milling

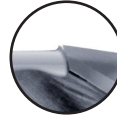
➤ Length of cut is  $\geq 5x$  diameter

➤ 3 flutes

➤ Center cutting

➤ Solid carbide

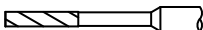
➤ CNC ground in the USA



Reduced Neck Diameter to Avoid Heeling

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
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$						
.010	.050	<b>.100</b> (10x)	1/8	2-1/2	13610	47.90	13610-C3	52.50	10010	59.60
.010	.050	<b>.150</b> (15x)	1/8	2-1/2	948210	59.90	948210-C3	64.50		
.015 (1/64)	.075	<b>.150</b> (10x)	1/8	2-1/2	13615	38.60	13615-C3	43.20	10015	50.30
.015 (1/64)	.075	<b>.225</b> (15x)	1/8	2-1/2	948215	51.40	948215-C3	56.00		
.020 (.5 mm)	.100	<b>.200</b> (10x)	1/8	2-1/2	13620	37.10	13620-C3	41.70	10020	48.80
.020 (.5 mm)	.100	<b>.300</b> (15x)	1/8	2-1/2	948220	49.70	948220-C3	54.30		
.025	.125	<b>.250</b> (10x)	1/8	2-1/2	13625	35.70	13625-C3	40.30	10025	47.40
.030	.150	<b>.300</b> (10x)	1/8	2-1/2	13630	35.70	13630-C3	40.30	10030	47.40
.030	.150	<b>.450</b> (15x)	1/8	2-1/2	948230	48.10	948230-C3	52.70		
.031 (1/32)	.155	<b>.250</b> (8x)	1/8	2-1/2	876631	34.60	876631-C3	39.20		
.031 (1/32)	.155	<b>.310</b> (10x)	1/8	2-1/2	13631	35.70	13631-C3	40.30	10031	47.40
.031 (1/32)	.155	<b>.375</b> (12x)	1/8	2-1/2	867031	45.60	867031-C3	50.20		
.031 (1/32)	.155	<b>.470</b> (15x)	1/8	2-1/2	948231	48.10	948231-C3	52.70		
.035 (.9 mm)	.175	<b>.350</b> (10x)	1/8	2-1/2	13635	35.70	13635-C3	40.30	10035	47.40
.040	.200	<b>.400</b> (10x)	1/8	2-1/2	13640	35.70	13640-C3	40.30	10040	47.40
.040	.200	<b>.600</b> (15x)	1/8	2-1/2	948240	48.10	948240-C3	52.70		
.045	.225	<b>.450</b> (10x)	1/8	2-1/2	13645	35.00	13645-C3	39.60	10045	46.70
.047 (3/64)	.250	<b>.500</b> (10x)	1/8	2-1/2	13647	35.00	13647-C3	39.60	10047	46.70
.047 (3/64)	.250	<b>.570</b> (12x)	1/8	2-1/2	867047	43.10	867047-C3	47.70		
.047 (3/64)	.250	<b>.710</b> (15x)	1/8	2-1/2	948247	45.60	948247-C3	50.20		
.050	.300	<b>.500</b> (10x)	1/8	2-1/2	956350	35.00	956350-C3	39.60		
.050	.300	<b>.600</b> (12x)	1/8	2-1/2	13650	35.00	13650-C3	39.60	10050	46.70
.050	.300	<b>.750</b> (15x)	1/8	2-1/2	948250	45.60	948250-C3	50.20		
.055 (1.4 mm)	.385	<b>.770</b> (14x)	1/8	2-1/2	13655	36.00	13655-C3	40.60	10055	47.70
.060	.312	<b>.625</b> (10x)	1/8	2-1/2	956360	35.00	956360-C3	39.60		
.060	.500	<b>1.000</b> (16x)	1/8	2-1/2	13660	36.20	13660-C3	40.80	10060	47.90
.062 (1/16)	.312	<b>.500</b> (8x)	1/8	2-1/2	876662	33.80	876662-C3	38.40		
.062 (1/16)	.312	<b>.625</b> (10x)	1/8	2-1/2	956362	35.00	956362-C3	39.60		
.062 (1/16)	.312	<b>.750</b> (12x)	1/8	2-1/2	867062	33.90	867062-C3	38.50		
.062 (1/16)	.500	<b>1.000</b> (16x)	1/8	2-1/2	13662	36.20	13662-C3	40.80	10062	47.90
.065	.500	<b>1.000</b> (15x)	1/8	2-1/2	13665	36.00	13665-C3	40.60	10065	47.70
.070	.500	<b>1.000</b> (14x)	1/8	2-1/2	13670	36.00	13670-C3	40.60	10070	47.70

continued on next page



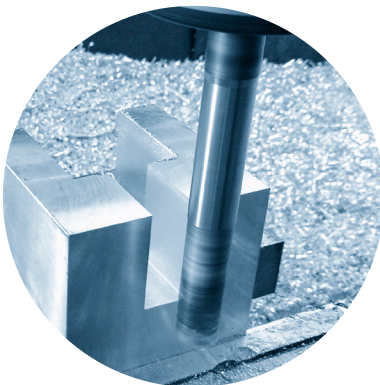
## MINIATURE END MILLS

Square – Long Reach, Long Flute (cont.)

continued from previous page

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 <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>	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.075	.500	<b>1.000</b> (13x)	1/8	2-1/2	13675	35.00	13675-C3	39.60	10075	46.70
.078 (5/64)	.406	<b>.800</b> (10x)	1/8	2-1/2	956378	35.00	956378-C3	39.60		
.078 (5/64)	.500	<b>1.000</b> (12x)	1/8	2-1/2	13678	35.00	13678-C3	39.60	10078	46.70
.078 (5/64)	.406	<b>1.187</b> (15x)	1/8	2-1/2	948278	45.60	948278-C3	50.20		
.080	.750	<b>1.250</b> (15x)	1/8	2-1/2	13680	36.20	13680-C3	40.80	10080	47.90
.085	.750	<b>1.250</b> (14x)	1/8	2-1/2	13685	36.20	13685-C3	40.80	10085	47.90
.090	.750	<b>1.250</b> (13x)	1/8	2-1/2	13690	35.20	13690-C3	39.80	10090	46.90
.093 (3/32)	.500	<b>.750</b> (8x)	1/8	2-1/2	876693	33.80	876693-C3	38.40		
.093 (3/32)	.500	<b>.950</b> (10x)	1/8	2-1/2	956393	35.00	956393-C3	39.60		
.093 (3/32)	.750	<b>1.250</b> (13x)	1/8	2-1/2	13693	35.20	13693-C3	39.80	10093	46.90
.093 (3/32)	.500	<b>1.400</b> (15x)	1/8	3	948293	45.60	948293-C3	50.20		
.095	.750	<b>1.250</b> (13x)	1/8	2-1/2	13695	35.00	13695-C3	39.60	10095	46.70
.100	.750	<b>1.250</b> (12x)	1/8	2-1/2	13700	35.00	13700-C3	39.60	10100	46.70
D <sub>1</sub> $\begin{matrix} +.000'' \\ -.002'' \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.020'' \\ -.000'' \end{matrix}$	L <sub>3</sub> $\begin{matrix} +.020'' \\ -.000'' \end{matrix}$	D <sub>2</sub>	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.125 (1/8)	.625	<b>1.000</b> (8x)	1/8	2-1/2	876708	33.80	876708-C3	38.40		
.125 (1/8)	.625	<b>1.250</b> (10x)	1/8	2-1/2	956408	35.00	956408-C3	39.60		
.125 (1/8)	1.000	<b>1.500</b> (12x)	1/8	2-1/2	13708	35.20	13708-C3	39.80	10108	46.90
.125 (1/8)	.625	<b>1.875</b> (15x)	1/8	3	948308	48.40	948308-C3	53.00		
.187 (3/16)	1.125	<b>1.625</b> (8x)	3/16	3	13712	41.40	13712-C3	46.00	10112	57.50
.250 (1/4)	1.500	<b>2.000</b> (8x)	1/4	4	13716	46.10	13716-C3	51.10	10116	64.40

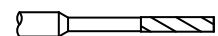
SQUARE



### 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.

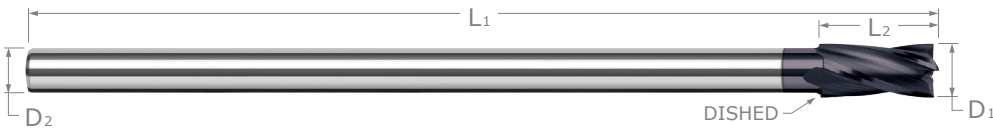
Read more on [harveperformance.com/in-the-loupe/](http://harveperformance.com/in-the-loupe/)



# END MILLS

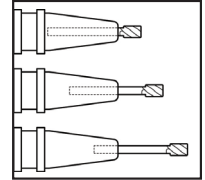
## Square – Reduced Shank

SQUARE



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

**Chuck at Any Depth!**



CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
					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	2	<b>3 mm</b>	<b>2-1/2</b>	907808	82.30	907808-C3	86.90
<b>1/8</b>	3/16	4	<b>3 mm</b>	<b>2-1/2</b>	943208	84.70	943208-C3	89.30
<b>5/32</b>	15/64	2	<b>1/8</b>	<b>2-1/2</b>	907810	82.30	907810-C3	87.30
<b>5/32</b>	15/64	4	<b>1/8</b>	<b>2-1/2</b>	943210	84.70	943210-C3	89.70
<b>5/32</b>	15/64	4	<b>1/8</b>	<b>4</b>	920610	91.40	920610-C3	98.20
<b>3/16</b>	9/32	2	<b>1/8</b>	<b>2-1/2</b>	907812	82.30	907812-C3	87.30
<b>3/16</b>	9/32	4	<b>1/8</b>	<b>2-1/2</b>	943212	84.70	943212-C3	89.70
<b>3/16</b>	9/32	4	<b>5/32</b>	<b>4</b>	920613	91.40	920613-C3	98.20
<b>1/4</b>	3/8	2	<b>3/16</b>	<b>3</b>	907816	89.30	907816-C3	96.10
<b>1/4</b>	3/8	4	<b>3/16</b>	<b>3</b>	943216	91.80	943216-C3	98.60
<b>1/4</b>	3/8	4	<b>3/16</b>	<b>4</b>	920616	122.70	920616-C3	130.60
<b>5/16</b>	15/32	4	<b>1/4</b>	<b>4</b>	943220	112.60	943220-C3	122.10
<b>5/16</b>	15/32	4	<b>1/4</b>	<b>6</b>	920620	146.70	920620-C3	160.60
<b>3/8</b>	9/16	4	<b>5/16</b>	<b>4</b>	943224	133.00	943224-C3	145.30
<b>3/8</b>	9/16	4	<b>5/16</b>	<b>6</b>	920624	159.90	920624-C3	173.80
<b>7/16</b>	21/32	4	<b>3/8</b>	<b>6</b>	943228	179.80	943228-C3	194.80
<b>1/2</b>	3/4	4	<b>7/16</b>	<b>6</b>	943232	204.40	943232-C3	217.80
<b>5/8</b>	15/16	4	<b>1/2</b>	<b>6</b>	943240	265.50	943240-C3	285.50
<b>3/4</b>	1-1/8	4	<b>5/8</b>	<b>6</b>	943248	327.70	943248-C3	348.70

**For Ball Reduced Shank, please see page 55.**

**For Corner Radius Reduced Shank, please see page 73**

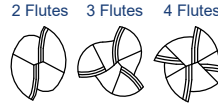
# MINIATURE END MILLS

Ball – Stub & Standard (cont.)



Stub Flute & Standard Length

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

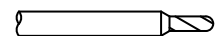


BALL

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	4 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>	L <sub>1</sub>											
.002	<b>.003</b> (1.5x)	1/8	1-1/2	24502			63.00							
.002	<b>.006</b> (3x)	1/8	1-1/2	74002			63.00							
.003	<b>.004</b> (1.5x)	1/8	1-1/2	24503			55.80							
.003	<b>.009</b> (3x)	1/8	1-1/2	74003			55.80							
.004 (.1 mm)	<b>.006</b> (1.5x)	1/8	1-1/2	24504			50.10							
.004 (.1 mm)	<b>.012</b> (3x)	1/8	1-1/2	74004			50.10							
.005	<b>.007</b> (1.5x)	1/8	1-1/2	24505		24605	45.30	24505-C3		24605-C3	49.90			
.005	<b>.015</b> (3x)	1/8	1-1/2	74005		74305	45.30	74005-C3		74305-C3	49.90			
.006	<b>.009</b> (1.5x)	1/8	1-1/2	24506		24606	46.50			24606-C3	51.10			
.006	<b>.018</b> (3x)	1/8	1-1/2	74006		74306	46.50			74306-C3	51.10			
.007	<b>.010</b> (1.5x)	1/8	1-1/2	24507		24607	46.50			24607-C3	51.10			
.007	<b>.021</b> (3x)	1/8	1-1/2	74007		74307	46.50			74307-C3	51.10			
.008 (.2 mm)	<b>.012</b> (1.5x)	1/8	1-1/2	24508		24608	46.50	24508-C3		24608-C3	51.10			
<b>NEW</b> .008 (.2 mm)	<b>.024</b> (3x)	1/8	1-1/2	74008		74308	46.50	74008-C3		74308-C3	51.10	<b>74008-C4</b>		58.20
.009	<b>.013</b> (1.5x)	1/8	1-1/2	24509		24609	46.50			24609-C3	51.10			
.009	<b>.027</b> (3x)	1/8	1-1/2	74009		74309	46.50			74309-C3	51.10			
.010	<b>.015</b> (1.5x)	1/8	1-1/2	24510	823410	24610	36.60	24510-C3	823410-C3	24610-C3	41.20		24610-C4	48.30
.010	<b>.030</b> (3x)	1/8	1-1/2	74010	835910	74310	36.60	74010-C3	835910-C3	74310-C3	41.20	74010-C4	74310-C4	48.30
.011	<b>.016</b> (1.5x)	1/8	1-1/2	24511		24611	37.80			24611-C3	42.40			
.011	<b>.033</b> (3x)	1/8	1-1/2	74011		74311	37.80			74311-C3	42.40			
.012 (.3 mm)	<b>.018</b> (1.5x)	1/8	1-1/2	24512		24612	37.80	24512-C3		24612-C3	42.40			
.012 (.3 mm)	<b>.036</b> (3x)	1/8	1-1/2	74012		74312	37.80			74312-C3	42.40			
.013	<b>.019</b> (1.5x)	1/8	1-1/2	24513		24613	37.80			24613-C3	42.40			
.013	<b>.039</b> (3x)	1/8	1-1/2	74013		74313	37.80			74313-C3	42.40			
.014	<b>.021</b> (1.5x)	1/8	1-1/2	24514		24614	37.80			24614-C3	42.40			
.014	<b>.042</b> (3x)	1/8	1-1/2	74014		74314	37.80			74314-C3	42.40			
.015 (1/64)	<b>.022</b> (1.5x)	1/8	1-1/2	24515	823415	24615	28.40	24515-C3	823415-C3	24615-C3	33.00		24615-C4	40.10
.015 (1/64)	<b>.045</b> (3x)	1/8	1-1/2	74015	835915	74315	28.40	74015-C3	835915-C3	74315-C3	33.00	74015-C4	74315-C4	40.10
.016 (.4 mm)	<b>.024</b> (1.5x)	1/8	1-1/2	24516		24616	29.80			24616-C3	34.40			
.016 (.4 mm)	<b>.048</b> (3x)	1/8	1-1/2	74016		74316	29.80			74316-C3	34.40			
.017	<b>.026</b> (1.5x)	1/8	1-1/2	24517		24617	29.80			24617-C3	34.40			
.017	<b>.051</b> (3x)	1/8	1-1/2	74017		74317	29.80			74317-C3	34.40			
.018	<b>.027</b> (1.5x)	1/8	1-1/2	24518		24618	29.80			24618-C3	34.40			
.018	<b>.054</b> (3x)	1/8	1-1/2	74018		74318	29.80	74018-C3		74318-C3	34.40			
.019	<b>.029</b> (1.5x)	1/8	1-1/2	24519		24619	29.80			24619-C3	34.40			
.019	<b>.057</b> (3x)	1/8	1-1/2	74019		74319	29.80			74319-C3	34.40	74019-C4		41.50
.020 (.5 mm)	<b>.030</b> (1.5x)	1/8	1-1/2	24520	823420	24620	27.40	24520-C3	823420-C3	24620-C3	32.00		24620-C4	39.10
.020 (.5 mm)	<b>.060</b> (3x)	1/8	1-1/2	74020	835920	74320	27.40	74020-C3	835920-C3	74320-C3	32.00	74020-C4	74320-C4	39.10



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# MINIATURE END MILLS

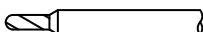
## Ball – Stub & Standard (cont.)

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BALL

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		
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>													
.021	.031 (1.5x)	1/8	1-1/2	24521		24621	28.60				24621-C3	33.20				
.021	.063 (3x)	1/8	1-1/2	74021		74321	28.60	74021-C3			74321-C3	33.20				
.022	.033 (1.5x)	1/8	1-1/2	24522		24622	28.60				24622-C3	33.20				
.022	.066 (3x)	1/8	1-1/2	74022		74322	28.60				74322-C3	33.20				
.023	.035 (1.5x)	1/8	1-1/2	24523		24623	28.60				24623-C3	33.20				
.023	.069 (3x)	1/8	1-1/2	74023		74323	28.60	74023-C3			74323-C3	33.20				
.024 (.6 mm)	.036 (1.5x)	1/8	1-1/2	24524		24624	28.60				24624-C3	33.20				
.024 (.6 mm)	.072 (3x)	1/8	1-1/2	74024		74324	28.60				74324-C3	33.20				
.025	.037 (1.5x)	1/8	1-1/2	24525	823425	24625	24.70	24525-C3	823425-C3	24625-C3	29.30			24625-C4	36.40	
.025	.075 (3x)	1/8	1-1/2	74025	835925	74325	24.70	74025-C3	835925-C3	74325-C3	29.30	74025-C4	74325-C4	36.40		
.026	.039 (1.5x)	1/8	1-1/2	24526		24626	25.80				24626-C3	30.40				
.026	.078 (3x)	1/8	1-1/2	74026		74326	25.80				74326-C3	30.40				
.027	.041 (1.5x)	1/8	1-1/2	24527		24627	25.80				24627-C3	30.40				
.027	.081 (3x)	1/8	1-1/2	74027		74327	25.80				74327-C3	30.40				
.028 (.7 mm)	.042 (1.5x)	1/8	1-1/2	24528		24628	25.80				24628-C3	30.40				
.028 (.7 mm)	.084 (3x)	1/8	1-1/2	74028		74328	25.80				74328-C3	30.40				
.029	.043 (1.5x)	1/8	1-1/2	24529		24629	25.80				24629-C3	30.40				
.029	.087 (3x)	1/8	1-1/2	74029		74329	25.80				74329-C3	30.40				
.030	.045 (1.5x)	1/8	1-1/2	24530	823430	24630	22.50	24530-C3	823430-C3	24630-C3	27.10			24630-C4	34.20	
.030	.090 (3x)	1/8	1-1/2	74030	835930	74330	22.50	74030-C3	835930-C3	74330-C3	27.10	74030-C4	74330-C4	34.20		
.031 (1/32)	.046 (1.5x)	1/8	1-1/2	24531	823431	24631	22.50	24531-C3	823431-C3	24631-C3	27.10	24531-C4	24631-C4	34.20		
.031 (1/32)	.093 (3x)	1/8	1-1/2	74031	835931	74331	22.50	74031-C3	835931-C3	74331-C3	27.10	74031-C4	74331-C4	34.20		
.032	.048 (1.5x)	1/8	1-1/2	24532		24632	23.70				24632-C3	28.30				
.032	.096 (3x)	1/8	1-1/2	74032		74332	23.70	74032-C3		74332-C3	28.30					
.033	.049 (1.5x)	1/8	1-1/2	24533		24633	23.70				24633-C3	28.30				
.033	.099 (3x)	1/8	1-1/2	74033		74333	23.70	74033-C3		74333-C3	28.30					
.034	.051 (1.5x)	1/8	1-1/2	24534		24634	23.70				24634-C3	28.30				
.034	.102 (3x)	1/8	1-1/2	74034		74334	23.70				74334-C3	28.30				
.035 (.9 mm)	.052 (1.5x)	1/8	1-1/2	24535	823435	24635	21.40	24535-C3	823435-C3	24635-C3	26.00			24635-C4	33.10	
.035 (.9 mm)	.105 (3x)	1/8	1-1/2	74035	835935	74335	21.40	74035-C3	835935-C3	74335-C3	26.00	74035-C4	74335-C4	33.10		
.036	.054 (1.5x)	1/8	1-1/2	24536		24636	22.30				24636-C3	26.90				
.036	.108 (3x)	1/8	1-1/2	74036		74336	22.30				74336-C3	26.90				
.037	.055 (1.5x)	1/8	1-1/2	24537		24637	22.30				24637-C3	26.90				
.037	.111 (3x)	1/8	1-1/2	74037		74337	22.30				74337-C3	26.90				
.038	.057 (1.5x)	1/8	1-1/2	24538		24638	22.30				24638-C3	26.90				
.038	.114 (3x)	1/8	1-1/2	74038		74338	22.30				74338-C3	26.90				
.039 (1 mm)	.058 (1.5x)	1/8	1-1/2	24539	823439	24639	21.90	24539-C3	823439-C3	24639-C3	26.50					
.039 (1 mm)	.117 (3x)	1/8	1-1/2	74039	835939	74339	21.90	74039-C3	835939-C3	74339-C3	26.50	74039-C4		33.60		
.040	.060 (1.5x)	1/8	1-1/2	24540	823440	24640	21.40	24540-C3	823440-C3	24640-C3	26.00	24540-C4	24640-C4	33.10		NEW
.040	.120 (3x)	1/8	1-1/2	74040	835940	74340	21.40	74040-C3	835940-C3	74340-C3	26.00	74040-C4	74340-C4	33.10		
.041	.123 (3x)	1/8	1-1/2	74041		74341	22.30				74341-C3	26.90				
.042	.126 (3x)	1/8	1-1/2	74042		74342	22.30				74342-C3	26.90				
.043 (1.1 mm)	.129 (3x)	1/8	1-1/2	74043		74343	22.30				74343-C3	26.90				
.044	.132 (3x)	1/8	1-1/2	74044		74344	22.30				74344-C3	26.90				
.045	.067 (1.5x)	1/8	1-1/2	24545	823445	24645	21.40			823445-C3	24645-C3	26.00			24645-C4	33.10
.045	.135 (3x)	1/8	1-1/2	74045	835945	74345	21.40	74045-C3	835945-C3	74345-C3	26.00	74045-C4	74345-C4	33.10		

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**MINIATURE END MILLS**

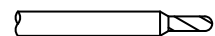
Ball – Stub & Standard (cont.)

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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
D <sub>1</sub> $\begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	D <sub>2</sub>	L <sub>1</sub>											
.046	<b>.138</b> (3x)	1/8	1-1/2	74046	74346	22.30				74346-C3	26.90			
.047 (3/64)	<b>.070</b> (1.5x)	1/8	1-1/2	24547	823447	24647	21.40	24547-C3	823447-C3	24647-C3	26.00		24647-C4	33.10
.047 (3/64)	<b>.141</b> (3x)	1/8	1-1/2	74047	835947	74347	21.40	74047-C3	835947-C3	74347-C3	26.00	74047-C4	74347-C4	33.10
.048	<b>.144</b> (3x)	1/8	1-1/2	74048		74348	22.30			74348-C3	26.90			
.049	<b>.147</b> (3x)	1/8	1-1/2	74049		74349	22.30			74349-C3	26.90			
.050	<b>.075</b> (1.5x)	1/8	1-1/2	24550	823450	24650	21.40	24550-C3	823450-C3	24650-C3	26.00		24650-C4	33.10
.050	<b>.150</b> (3x)	1/8	1-1/2	74050	835950	74350	21.40	74050-C3	835950-C3	74350-C3	26.00	74050-C4	74350-C4	33.10
.051 (1.3 mm)	<b>.153</b> (3x)	1/8	1-1/2	74051		74351	22.30			74351-C3	26.90			
.052	<b>.156</b> (3x)	1/8	1-1/2	74052		74352	22.30			74352-C3	26.90			
.053	<b>.159</b> (3x)	1/8	1-1/2	74053		74353	22.30			74353-C3	26.90			
.054	<b>.162</b> (3x)	1/8	1-1/2	74054		74354	22.30			74354-C3	26.90			
.055 (1.4 mm)	<b>.082</b> (1.5x)	1/8	1-1/2	24555	823455	24655	21.40		823455-C3	24655-C3	26.00		24655-C4	33.10
.055 (1.4 mm)	<b>.165</b> (3x)	1/8	1-1/2	74055	835955	74355	21.40	74055-C3	835955-C3	74355-C3	26.00	74055-C4	74355-C4	33.10
.056	<b>.168</b> (3x)	1/8	1-1/2	74056		74356	22.30			74356-C3	26.90			
.057	<b>.171</b> (3x)	1/8	1-1/2	74057		74357	22.30			74357-C3	26.90			
.058	<b>.174</b> (3x)	1/8	1-1/2	74058		74358	22.30			74358-C3	26.90			
.059 (1.5 mm)	<b>.089</b> (1.5x)	1/8	1-1/2	24559		24659	22.30			24659-C3	26.90			
.059 (1.5 mm)	<b>.177</b> (3x)	1/8	1-1/2	74059		74359	22.30			74359-C3	26.90			
.060	<b>.090</b> (1.5x)	1/8	1-1/2	24560	823460	24660	21.40	24560-C3	823460-C3	24660-C3	26.00		24660-C4	33.10
.060	<b>.180</b> (3x)	1/8	1-1/2	74060	835960	74360	21.40	74060-C3	835960-C3	74360-C3	26.00	74060-C4	74360-C4	33.10
.062 (1/16)	<b>.093</b> (1.5x)	1/8	1-1/2	24562	823462	24662	21.00	24562-C3	823462-C3	24662-C3	25.60	24562-C4	24662-C4	32.70
.062 (1/16)	<b>.186</b> (3x)	1/8	1-1/2	74062	835962	74362	21.00	74062-C3	835962-C3	74362-C3	25.60	74062-C4	74362-C4	32.70
.065	<b>.097</b> (1.5x)	1/8	1-1/2	24565		24665	21.00			24665-C3	25.60			
.065	<b>.195</b> (3x)	1/8	1-1/2	74065		74365	21.00			74365-C3	25.60	74065-C4	74365-C4	32.70
.070	<b>.105</b> (1.5x)	1/8	1-1/2	24570	823470	24670	21.00	24570-C3	823470-C3	24670-C3	25.60			
.070	<b>.210</b> (3x)	1/8	1-1/2	74070	835970	74370	21.00	74070-C3	835970-C3	74370-C3	25.60	74070-C4	74370-C4	32.70
.075	<b>.112</b> (1.5x)	1/8	1-1/2	24575		24675	21.00			24675-C3	25.60			
<b>NEW</b> .075	<b>.225</b> (3x)	1/8	1-1/2	74075		74375	21.00	74075-C3		74375-C3	25.60	74075-C4		32.70
.078 (5/64)	<b>.117</b> (1.5x)	1/8	1-1/2	24578	823478	24678	21.00	24578-C3	823478-C3	24678-C3	25.60		24678-C4	32.70
.078 (5/64)	<b>.234</b> (3x)	1/8	1-1/2	74078	835978	74378	21.00	74078-C3	835978-C3	74378-C3	25.60	74078-C4	74378-C4	32.70
.080	<b>.120</b> (1.5x)	1/8	1-1/2	24580	823480	24680	21.00		823480-C3	24680-C3	25.60			
.080	<b>.240</b> (3x)	1/8	1-1/2	74080	835980	74380	21.00	74080-C3	835980-C3	74380-C3	25.60	74080-C4	74380-C4	32.70
.085	<b>.127</b> (1.5x)	1/8	1-1/2	24585		24685	21.00			24685-C3	25.60			
.085	<b>.255</b> (3x)	1/8	1-1/2	74085		74385	21.00			74385-C3	25.60			
.090	<b>.135</b> (1.5x)	1/8	1-1/2	24590	823490	24690	21.00		823490-C3	24690-C3	25.60			
.090	<b>.270</b> (3x)	1/8	1-1/2	74090	835990	74390	21.00	74090-C3	835990-C3	74390-C3	25.60	74090-C4	74390-C4	32.70
.093 (3/32)	<b>.139</b> (1.5x)	1/8	1-1/2	24593	823493	24693	21.00	24593-C3	823493-C3	24693-C3	25.60	24593-C4	24693-C4	32.70
.093 (3/32)	<b>.279</b> (3x)	1/8	1-1/2	74093	835993	74393	21.00	74093-C3	835993-C3	74393-C3	25.60	74093-C4	74393-C4	32.70
.095	<b>.142</b> (1.5x)	1/8	1-1/2	24595		24695	21.00			24695-C3	25.60			
.095	<b>.285</b> (3x)	1/8	1-1/2	74095		74395	21.00			74395-C3	25.60			
.100	<b>.150</b> (1.5x)	1/8	1-1/2	24599	823500	24699	21.00		823500-C3	24699-C3	25.60			
.100	<b>.300</b> (3x)	1/8	1-1/2	74100	836000	74400	21.00	74100-C3	836000-C3	74400-C3	25.60	74100-C4	74400-C4	32.70
.105	<b>.158</b> (1.5x)	1/8	1-1/2	50900		51000	21.00			51000-C3	25.60			
.105	<b>.315</b> (3x)	1/8	1-1/2	74105		74405	21.00			74405-C3	25.60			

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BALL



# MINIATURE END MILLS

## Ball – Stub & Standard (cont.)

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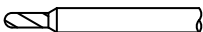
BALL

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	4 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>	L <sub>1</sub>	2 FL	3 FL	4 FL	PRICE	2 FL	3 FL	4 FL	PRICE	2 FL	4 FL	PRICE
.109 (7/64)	<b>.164</b> (1.5x)	1/8	1-1/2	50901	823502	51001	21.00	50901-C3	823502-C3	51001-C3	25.60			
.109 (7/64)	<b>.375</b> (3x)	1/8	1-1/2	74109	836002	74409	21.00	74109-C3	836002-C3	74409-C3	25.60			
.110	<b>.165</b> (1.5x)	1/8	1-1/2	50902		51002	21.00			51002-C3	25.60			
.110	<b>.330</b> (3x)	1/8	1-1/2	74110		74410	21.00			74410-C3	25.60			
.115	<b>.173</b> (1.5x)	1/8	1-1/2	50903		51003	21.00			51003-C3	25.60			
.115	<b>.345</b> (3x)	1/8	1-1/2	74115		74415	21.00			74415-C3	25.60			
.118 (3 mm)	<b>.177</b> (1.5x)	1/8	1-1/2	50904	823505	51004	21.50		823505-C3	51004-C3	26.10			
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	74118	836005	74418	21.50	74118-C3	836005-C3	74418-C3	26.10			
.120	<b>.180</b> (1.5x)	1/8	1-1/2	50905		51005	21.00			51005-C3	25.60			
.120	<b>.360</b> (3x)	1/8	1-1/2	74120		74420	21.00			74420-C3	25.60			
D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	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	PRICE
.125 (1/8)	<b>.187</b> (1.5x)	1/8	1-1/2	50908	823508	51008	20.10	50908-C3	823508-C3	51008-C3	24.70	50908-C4	51008-C4	31.80
.125 (1/8)	<b>.375</b> (3x)	1/8	1-1/2	74125	836008	74425	20.10	74125-C3	836008-C3	74425-C3	24.70	74125-C4	74425-C4	31.80
.140 (9/64)	<b>.220</b> (1.5x)	3/16	2	50909		51009	20.60			51009-C3	25.60			
.140 (9/64)	<b>.562</b> (3x)	3/16	2	74140		74440	20.60	74140-C3		74440-C3	25.60			
.156 (5/32)	<b>.281</b> (1.5x)	3/16	2	50910	823510	51010	21.40		823510-C3	51010-C3	26.40			
.156 (5/32)	<b>.562</b> (3x)	3/16	2	74156	836010	74456	21.40	74156-C3	836010-C3	74456-C3	26.40			
.172 (11/64)	<b>.625</b> (3x)	3/16	2			74472	23.90			74472-C3	28.90			
.187 (3/16)	<b>.312</b> (1.5x)	3/16	2	50912	823512	51012	21.40	50912-C3	823512-C3	51012-C3	26.40		51012-C4	37.50
.187 (3/16)	<b>.625</b> (3x)	3/16	2	74187	836012	74487	21.40	74187-C3	836012-C3	74487-C3	26.40	74187-C4	74487-C4	37.50
.203 (13/64)	<b>.625</b> (3x)	1/4	2-1/2			74490	26.20			74490-C3	33.00			
.218 (7/32)	<b>.330</b> (1.5x)	1/4	2-1/2	50914	823514	51014	23.60		823514-C3	51014-C3	30.40			
.218 (7/32)	<b>.625</b> (3x)	1/4	2-1/2	74193	836014	74493	23.60	74193-C3	836014-C3	74493-C3	30.40			
.234 (15/64)	<b>.750</b> (3x)	1/4	2-1/2			74495	26.20			74495-C3	33.00			
.250 (1/4)	<b>.375</b> (1.5x)	1/4	2-1/2	50916	823516	51016	23.60		823516-C3	51016-C3	30.40		51016-C4	41.90
.250 (1/4)	<b>.750</b> (3x)	1/4	2-1/2	74199	836016	74499	23.60	74199-C3	836016-C3	74499-C3	30.40	74199-C4	74499-C4	41.90
.312 (5/16)	<b>.470</b> (1.5x)	5/16	2-1/2			51020	30.60			51020-C3	38.50			
.312 (5/16)	<b>.812</b> (3x)	5/16	2-1/2			74620	30.60			74620-C3	38.50			
.375 (3/8)	<b>.570</b> (1.5x)	3/8	2-1/2			51024	38.10			51024-C3	47.10			
.375 (3/8)	<b>1.000</b> (3x)	3/8	2-1/2			74624	38.10			74624-C3	47.10			
.500 (1/2)	<b>1.000</b> (2x)	1/2	3			74632	58.60			74632-C3	72.00			



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# MINIATURE END MILLS

## Ball - Long Flute



**Stocked in 8 Lengths of Cut!**

⚡ **Long flute and long shank design for deep cavities**

- ⚡ Mills deep pockets
- ⚡ Center cutting
- ⚡ Solid carbide
- ⚡ CNC ground in the USA

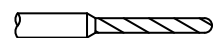
BALL

NEW

NEW  
NEW

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D1 $\begin{smallmatrix} +.0005" \\ -.0005" \end{smallmatrix}$	L2 $\begin{smallmatrix} +.010" \\ -.000" \end{smallmatrix}$		D2	L1						
.005	<b>.025</b> (5x)	3	1/8	2-1/2	32205	46.40				
.008	<b>.040</b> (5x)	3	1/8	2-1/2	32208	45.30				
.010	<b>.050</b> (5x)	3	1/8	2-1/2	12810	42.80	12810-C3	47.40	12810-C4	54.50
.010	<b>.080</b> (8x)	3	1/8	2-1/2	34010	71.90	34010-C3	76.50		
.015 (1/64)	<b>.078</b> (5x)	3	1/8	2-1/2	32215	39.50	32215-C3	44.10	32215-C4	51.20
.015 (1/64)	<b>.125</b> (8x)	3	1/8	2-1/2	34015	68.90	34015-C3	73.50	34015-C4	80.60
.015 (1/64)	<b>.187</b> (12x)	3	1/8	2-1/2	35115	87.20	35115-C3	91.80		
.020 (.5 mm)	<b>.080</b> (4x)	3	1/8	2-1/2	895720	34.00	895720-C3	38.60		
.020 (.5 mm)	<b>.100</b> (5x)	3	1/8	2-1/2	12820	34.00	12820-C3	38.60	12820-C4	45.70
.020 (.5 mm)	<b>.160</b> (8x)	3	1/8	2-1/2	34020	64.00	34020-C3	68.60		
.020 (.5 mm)	<b>.200</b> (10x)	3	1/8	2-1/2	957220	76.80	957220-C3	81.40		
.020 (.5 mm)	<b>.250</b> (12x)	3	1/8	2-1/2	35120	82.10	35120-C3	86.70		
.025	<b>.125</b> (5x)	3	1/8	2-1/2	12825	32.10	12825-C3	36.70	12825-C4	43.80
.025	<b>.203</b> (8x)	3	1/8	2-1/2	34025	62.60	34025-C3	67.20		
.030	<b>.150</b> (5x)	3	1/8	2-1/2	12830	31.30	12830-C3	35.90	12830-C4	43.00
.030	<b>.250</b> (8x)	3	1/8	2-1/2	34030	60.80	34030-C3	65.40		
.031 (1/32)	<b>.125</b> (4x)	3	1/8	2-1/2	895731	31.30	895731-C3	35.90		
.031 (1/32)	<b>.156</b> (5x)	3	1/8	2-1/2	32231	31.30	32231-C3	35.90	32231-C4	43.00
.031 (1/32)	<b>.156</b> (5x)	4	1/8	2-1/2	841031	34.40	841031-C3	39.00		
.031 (1/32)	<b>.187</b> (6x)	3	1/8	2-1/2	877131	35.20	877131-C3	39.80		
.031 (1/32)	<b>.218</b> (7x)	3	1/8	2-1/2	861431	39.50	861431-C3	44.10		
.031 (1/32)	<b>.250</b> (8x)	3	1/8	2-1/2	34031	60.80	34031-C3	65.40	34031-C4	72.50
.031 (1/32)	<b>.250</b> (8x)	4	1/8	2-1/2	845531	62.40	845531-C3	67.00		
.031 (1/32)	<b>.312</b> (10x)	3	1/8	2-1/2	957231	65.00	957231-C3	69.60		
.031 (1/32)	<b>.375</b> (12x)	3	1/8	2-1/2	35131	70.00	35131-C3	74.60	35131-C4	81.70
.031 (1/32)	<b>.470</b> (15x)	3	1/8	2-1/2	36031	87.50	36031-C3	92.10		
.035 (.9 mm)	<b>.175</b> (5x)	3	1/8	2-1/2	12835	31.30	12835-C3	35.90	12835-C4	43.00
.035 (.9 mm)	<b>.281</b> (8x)	3	1/8	2-1/2	34035	60.80	34035-C3	65.40		
.039 (1 mm)	<b>.203</b> (5x)	3	1/8	2-1/2	32239	31.30	32239-C3	35.90		
.039 (1 mm)	<b>.325</b> (8x)	3	1/8	2-1/2	34039	60.80	34039-C3	65.40		
.040	<b>.200</b> (5x)	3	1/8	2-1/2	12840	31.30	12840-C3	35.90	12840-C4	43.00
.040	<b>.240</b> (6x)	3	1/8	2-1/2	877140	35.20	877140-C3	39.80		
.040	<b>.281</b> (7x)	3	1/8	2-1/2	861440	39.50	861440-C3	44.10		
.040	<b>.325</b> (8x)	3	1/8	2-1/2	34040	60.80	34040-C3	65.40		
.040	<b>.480</b> (12x)	3	1/8	2-1/2	35140	70.00	35140-C3	74.60		
.045	<b>.225</b> (5x)	3	1/8	2-1/2	12845	31.30	12845-C3	35.90	12845-C4	43.00

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# MINIATURE END MILLS

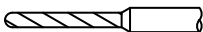
## Ball – Long Flute (cont.)

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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>						
.047 (3/64)	.250 (5x)	3	1/8	2-1/2	32247	31.30	32247-C3	35.90	32247-C4	43.00
.047 (3/64)	.250 (5x)	4	1/8	2-1/2	841047	34.40	841047-C3	39.00		
.047 (3/64)	.375 (8x)	3	1/8	2-1/2	34047	57.40	34047-C3	62.00	34047-C4	69.10
.047 (3/64)	.375 (8x)	4	1/8	2-1/2	845547	60.20	845547-C3	64.80		
.047 (3/64)	.570 (12x)	3	1/8	2-1/2	35147	70.00	35147-C3	74.60	35147-C4	81.70
.050	.300 (6x)	3	1/8	2-1/2	12850	31.30	12850-C3	35.90	12850-C4	43.00
.050	.400 (8x)	3	1/8	2-1/2	34050	60.80	34050-C3	65.40		
.055 (1.4 mm)	.275 (5x)	3	1/8	2-1/2	32255	27.80	32255-C3	32.40		
.055 (1.4 mm)	.385 (7x)	3	1/8	2-1/2	12855	31.30	12855-C3	35.90	12855-C4	43.00
.060	.312 (5x)	3	1/8	2-1/2	32260	27.80	32260-C3	32.40		
.060	.500 (8x)	3	1/8	2-1/2	12860	31.80	12860-C3	36.40	12860-C4	43.50
.062 (1/16)	.250 (4x)	3	1/8	2-1/2	895762	27.80	895762-C3	32.40		
.062 (1/16)	.312 (5x)	3	1/8	2-1/2	32262	27.80	32262-C3	32.40	32262-C4	39.50
.062 (1/16)	.312 (5x)	4	1/8	2-1/2	841062	30.60	841062-C3	35.20		
.062 (1/16)	.375 (6x)	3	1/8	2-1/2	877162	28.90	877162-C3	33.50		
.062 (1/16)	.437 (7x)	3	1/8	2-1/2	861462	30.10	861462-C3	34.70		
.062 (1/16)	.500 (8x)	3	1/8	2-1/2	34062	31.30	34062-C3	35.90	34062-C4	43.00
.062 (1/16)	.500 (8x)	4	1/8	2-1/2	845562	34.00	845562-C3	38.60		
.062 (1/16)	.625 (10x)	3	1/8	2-1/2	957262	42.70	957262-C3	47.30		
.062 (1/16)	.750 (12x)	3	1/8	2-1/2	35162	55.00	35162-C3	59.60	35162-C4	66.70
.062 (1/16)	.950 (15x)	3	1/8	2-1/2	36062	74.90	36062-C3	79.50	36062-C4	86.60
.065	.500 (8x)	3	1/8	2-1/2	12865	31.20	12865-C3	35.80	12865-C4	42.90
.070	.500 (7x)	3	1/8	2-1/2	12870	31.20	12870-C3	35.80	12870-C4	42.90
.075	.500 (7x)	3	1/8	2-1/2	12875	31.20	12875-C3	35.80	12875-C4	42.90
.078 (5/64)	.406 (5x)	3	1/8	2-1/2	32278	27.80	32278-C3	32.40	32278-C4	39.50
.078 (5/64)	.406 (5x)	4	1/8	2-1/2	841078	30.60	841078-C3	35.20		
.078 (5/64)	.625 (8x)	3	1/8	2-1/2	34078	31.30	34078-C3	35.90	34078-C4	43.00
.078 (5/64)	.625 (8x)	4	1/8	2-1/2	845578	34.00	845578-C3	38.60		
.078 (5/64)	.940 (12x)	3	1/8	2-1/2	35178	55.00	35178-C3	59.60	35178-C4	66.70
.078 (5/64)	1.187 (15x)	3	1/8	2-1/2	36078	74.90	36078-C3	79.50	36078-C4	86.60
.080	.750 (9x)	3	1/8	2-1/2	12880	31.50	12880-C3	36.10	12880-C4	43.20
.085	.750 (9x)	3	1/8	2-1/2	12885	31.50	12885-C3	36.10	12885-C4	43.20
.090	.750 (8x)	3	1/8	2-1/2	12890	31.50	12890-C3	36.10	12890-C4	43.20
.093 (3/32)	.375 (4x)	3	1/8	2-1/2	895793	27.80	895793-C3	32.40		
.093 (3/32)	.500 (5x)	3	1/8	2-1/2	32293	27.80	32293-C3	32.40	32293-C4	39.50
.093 (3/32)	.500 (5x)	4	1/8	2-1/2	841093	30.60	841093-C3	35.20		
.093 (3/32)	.585 (6x)	3	1/8	2-1/2	877193	28.90	877193-C3	33.50		
.093 (3/32)	.670 (7x)	3	1/8	2-1/2	861493	30.10	861493-C3	34.70		
.093 (3/32)	.750 (8x)	3	1/8	2-1/2	34093	31.30	34093-C3	35.90	34093-C4	43.00
.093 (3/32)	.750 (8x)	4	1/8	2-1/2	845593	34.00	845593-C3	38.60		
.093 (3/32)	.950 (10x)	3	1/8	2-1/2	957293	42.70	957293-C3	47.30		
.093 (3/32)	1.125 (12x)	3	1/8	2-1/2	35193	55.00	35193-C3	59.60	35193-C4	66.70
.093 (3/32)	1.400 (15x)	3	1/8	3	36093	76.80	36093-C3	81.40	36093-C4	88.50
.095	.750 (8x)	3	1/8	2-1/2	12895	31.20	12895-C3	35.80	12895-C4	42.90

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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 <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>						
.100	<b>.500</b> (5x)	3	1/8	2-1/2	32299	27.90	32299-C3	32.50		
.100	<b>.750</b> (7.5x)	3	1/8	2-1/2	12899	31.50	12899-C3	36.10	12899-C4	43.20
.109 (7/64)	<b>.570</b> (5x)	3	1/8	2-1/2	32302	27.80	32302-C3	32.40		
.109 (7/64)	<b>.900</b> (8x)	3	1/8	2-1/2	34102	31.30	34102-C3	35.90		
.118 (3 mm)	<b>.625</b> (5x)	3	1/8	2-1/2	32305	27.80	32305-C3	32.40		
.118 (3 mm)	<b>.950</b> (8x)	3	1/8	2-1/2	34105	31.30	34105-C3	35.90		

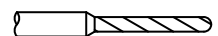
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.125 (1/8)	<b>.500</b> (4x)	3	1/8	2-1/2	895808	25.70	895808-C3	30.30		
.125 (1/8)	<b>.625</b> (5x)	3	1/8	2-1/2	32308	25.70	32308-C3	30.30	32308-C4	37.40
.125 (1/8)	<b>.625</b> (5x)	4	1/8	2-1/2	12608	28.30	12608-C3	32.90		
.125 (1/8)	<b>.750</b> (6x)	3	1/8	2-1/2	877208	27.20	877208-C3	31.80		
.125 (1/8)	<b>.875</b> (7x)	3	1/8	2-1/2	861508	28.40	861508-C3	33.00		
.125 (1/8)	<b>1.000</b> (8x)	3	1/8	2-1/2	34108	28.40	34108-C3	33.00	34108-C4	40.10
.125 (1/8)	<b>1.000</b> (8x)	4	1/8	2-1/2	845608	31.30	845608-C3	35.90		
.125 (1/8)	<b>1.250</b> (10x)	3	1/8	2-1/2	957308	42.20	957308-C3	46.80		
.125 (1/8)	<b>1.500</b> (12x)	3	1/8	3	35208	57.20	35208-C3	61.80	35208-C4	68.90
.125 (1/8)	<b>1.875</b> (15x)	3	1/8	3	36108	76.80	36108-C3	81.40	36108-C4	88.50
.140 (9/64)	<b>.750</b> (5x)	4	3/16	3	12609	30.30	12609-C3	35.30		
.140 (9/64)	<b>1.125</b> (8x)	4	3/16	3	34109	33.80	34109-C3	38.80		
.156 (5/32)	<b>1.000</b> (6x)	4	3/16	3	12610	30.30	12610-C3	35.30	12610-C4	46.40
.156 (5/32)	<b>1.250</b> (8x)	4	3/16	3	34110	33.80	34110-C3	38.80		
.187 (3/16)	<b>.750</b> (4x)	4	3/16	3	837012	27.70	837012-C3	32.70		
.187 (3/16)	<b>1.000</b> (5x)	4	3/16	3	841112	27.70	841112-C3	32.70		
.187 (3/16)	<b>1.125</b> (6x)	4	3/16	3	12612	30.30	12612-C3	35.30	77112	46.40
.187 (3/16)	<b>1.312</b> (7x)	4	3/16	3	856312	32.00	856312-C3	37.00		
.187 (3/16)	<b>1.500</b> (8x)	4	3/16	3	34112	33.80	34112-C3	38.80		
.187 (3/16)	<b>1.875</b> (10x)	4	3/16	3	957312	47.50	957312-C3	52.50		
.250 (1/4)	<b>1.000</b> (4x)	4	1/4	4	837016	32.20	837016-C3	40.10		
.250 (1/4)	<b>1.250</b> (5x)	4	1/4	4	841116	32.20	841116-C3	40.10		
.250 (1/4)	<b>1.500</b> (6x)	4	1/4	4	12616	34.00	12616-C3	41.90	77116	52.30
.250 (1/4)	<b>1.750</b> (7x)	4	1/4	4	856316	35.80	856316-C3	43.70		
.250 (1/4)	<b>2.000</b> (8x)	4	1/4	4	34116	37.70	34116-C3	45.60		
.312 (5/16)	<b>1.625</b> (5x)	4	5/16	4	12620	46.50	12620-C3	56.00		
.375 (3/8)	<b>1.750</b> (5x)	4	3/8	4	12624	58.40	12624-C3	70.70		
.500 (1/2)	<b>2.000</b> (4x)	4	1/2	4	12632	71.10	12632-C3	84.50		



### 8 Ways You're Killing Your End Mill

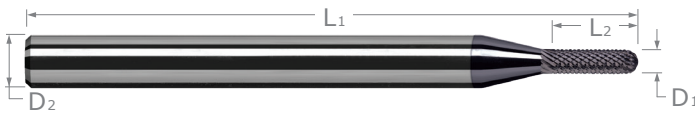
Are you making these end mill killing mistakes? You could be getting much more use from your tooling! Learn these 8 common ways machinists break their end mills prematurely in our "In the Loupe" blog post **8 Ways You're Killing Your End Mill**.

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



# 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 🇺🇸

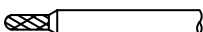
CUTTER DIAMETER	LENGTH OF CUT	RIGHT HAND TEETH	LEFT HAND TEETH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
						TOOL #	PRICE	TOOL #	PRICE
D1 <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	L2 <sup>+0.020"</sup> / <sub>-0.000"</sub>			D2	L1	TOOL #	PRICE	TOOL #	PRICE
.031 (1/32)	<b>.093</b> (3x)	12	10	1/8	2-1/2	892131	28.00	892131-C3	32.60
.062 (1/16)	<b>.186</b> (3x)	14	12	1/8	2-1/2	892162	27.00	892162-C3	31.60
.093 (3/32)	<b>.279</b> (3x)	14	12	1/8	2-1/2	892193	27.00	892193-C3	31.60
D1 <sup>+0.000"</sup> / <sub>-0.002"</sub>	L2 <sup>+0.030"</sup> / <sub>-0.000"</sub>			D2	L1	TOOL #	PRICE	TOOL #	PRICE
.125 (1/8)	<b>.375</b> (3x)	16	13	1/8	2-1/2	892208	25.60	892208-C3	30.20
.187 (3/16)	<b>.561</b> (3x)	16	13	3/16	2-1/2	892212	35.60	892212-C3	40.60
.250 (1/4)	<b>.750</b> (3x)	16	13	1/4	2-1/2	892216	45.60	892216-C3	52.40

NEW



View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)

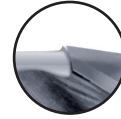


# MINIATURE END MILLS

## Ball – Long Reach, Standard Flute



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

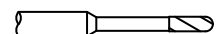


Reduced Neck Diameter to Avoid Heeling

BALL

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED			AII <sup>T</sup> N COATED	
					2 FL	4 FL	PRICE	4 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>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>					
.010	.030	<b>.050</b> (5x)	1/8	1-1/2	948610	982810	62.30	982810-C3	66.90
.010	.030	<b>.080</b> (8x)	1/8	1-1/2	76610	76810	62.60	76810-C3	67.20
.010	.030	<b>.125</b> (12x)	1/8	1-1/2	950210	991110	63.60	991110-C3	68.20
.015 (1/64)	.045	<b>.078</b> (5x)	1/8	1-1/2	948615	982815	48.40	982815-C3	53.00
.015 (1/64)	.045	<b>.128</b> (8x)	1/8	1-1/2	76615	76815	49.50	76815-C3	54.10
.015 (1/64)	.045	<b>.156</b> (10x)	1/8	1-1/2		851015	51.20	851015-C3	55.80
.015 (1/64)	.045	<b>.187</b> (12x)	1/8	1-1/2	950215	991115	51.20	991115-C3	55.80
.015 (1/64)	.045	<b>.225</b> (15x)	1/8	1-1/2		861215	53.90	861215-C3	58.50
.020 (.5 mm)	.060	<b>.100</b> (5x)	1/8	1-1/2	948620	982820	47.40	982820-C3	52.00
.020 (.5 mm)	.060	<b>.170</b> (8x)	1/8	1-1/2	76620	76820	47.60	76820-C3	52.20
.020 (.5 mm)	.060	<b>.200</b> (10x)	1/8	1-1/2		851020	49.10	851020-C3	53.70
.020 (.5 mm)	.060	<b>.250</b> (12x)	1/8	1-1/2	950220	991120	49.10	991120-C3	53.70
.020 (.5 mm)	.060	<b>.300</b> (15x)	1/8	1-1/2		861220	51.80	861220-C3	56.40
.025	.075	<b>.125</b> (5x)	1/8	1-1/2	948625	982825	43.30	982825-C3	47.90
.025	.075	<b>.213</b> (8x)	1/8	1-1/2	76625	76825	43.50	76825-C3	48.10
.025	.075	<b>.312</b> (12x)	1/8	1-1/2	950225	991125	45.10	991125-C3	49.70
.030	.090	<b>.156</b> (5x)	1/8	1-1/2	948630	982830	43.30	982830-C3	47.90
.030	.090	<b>.270</b> (9x)	1/8	1-1/2	76630	76830	43.50	76830-C3	48.10
.030	.090	<b>.375</b> (12x)	1/8	1-1/2	950230	991130	45.10	991130-C3	49.70
<b>NEW</b> .031 (1/32)	.093	<b>.156</b> (5x)	1/8	1-1/2	948631	982831	42.50	982831-C3	47.10
<b>NEW</b> .031 (1/32)	.093	<b>.250</b> (8x)	1/8	1-1/2		<b>904431</b>	43.50	<b>904431-C3</b>	48.10
.031 (1/32)	.093	<b>.279</b> (9x)	1/8	1-1/2	76631	76831	43.50	76831-C3	48.10
.031 (1/32)	.093	<b>.312</b> (10x)	1/8	1-1/2		851031	45.10	851031-C3	49.70
.031 (1/32)	.093	<b>.375</b> (12x)	1/8	1-1/2	950231	991131	45.10	991131-C3	49.70
.031 (1/32)	.093	<b>.470</b> (15x)	1/8	1-1/2		861231	47.70	861231-C3	52.30
.035 (.9 mm)	.105	<b>.187</b> (5x)	1/8	1-1/2	948635	982835	42.50	982835-C3	47.10
.035 (.9 mm)	.105	<b>.315</b> (9x)	1/8	1-1/2	76635	76835	43.50	76835-C3	48.10
.039 (1 mm)	.117	<b>.203</b> (5x)	1/8	1-1/2	948639	982839	42.50	982839-C3	47.10
.039 (1 mm)	.117	<b>.325</b> (8x)	1/8	1-1/2	903839	904439	43.50	904439-C3	48.10
.040	.120	<b>.203</b> (5x)	1/8	1-1/2	948640	982840	42.50	982840-C3	47.10
.040	.120	<b>.360</b> (9x)	1/8	1-1/2	76640	76840	43.50	76840-C3	48.10
.040	.120	<b>.480</b> (12x)	1/8	1-1/2	950240	991140	45.10	991140-C3	49.70
.045	.135	<b>.405</b> (9x)	1/8	1-1/2	76645	76845	42.20	76845-C3	46.80
.047 (3/64)	.141	<b>.250</b> (5x)	1/8	1-1/2	948647	982847	41.20	982847-C3	45.80
.047 (3/64)	.141	<b>.423</b> (9x)	1/8	1-1/2	76647	76847	42.20	76847-C3	46.80
.047 (3/64)	.141	<b>.480</b> (10x)	1/8	1-1/2		851047	43.50	851047-C3	48.10
.047 (3/64)	.141	<b>.570</b> (12x)	1/8	1-1/2	950247	991147	43.50	991147-C3	48.10
.047 (3/64)	.141	<b>.710</b> (15x)	1/8	2		861247	46.20	861247-C3	50.80

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# MINIATURE END MILLS

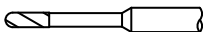
## Ball – Long Reach, Standard Flute (cont.)

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BALL

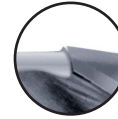
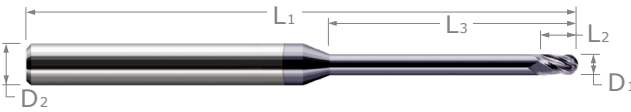
CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED			A1TiN COATED	
					2 FL	4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>					
.050	.150	.250 (5x)	1/8	1-1/2	948650	982850	41.20	982850-C3	45.80
.050	.150	.500 (10x)	1/8	1-1/2	76650	76850	42.20	76850-C3	46.80
.055 (1.4 mm)	.165	.500 (9x)	1/8	1-1/2	76655	76855	42.20	76855-C3	46.80
.060	.180	.500 (8x)	1/8	1-1/2	76660	76860	42.20	76860-C3	46.80
.060	.180	.720 (12x)	1/8	2	950260	991160	43.50	991160-C3	48.10
.062 (1/16)	.186	.312 (5x)	1/8	1-1/2	948662	982862	41.20	982862-C3	45.80
.062 (1/16)	.186	.375 (6x)	1/8	1-1/2		805762	42.20	805762-C3	46.80
.062 (1/16)	.186	.437 (7x)	1/8	1-1/2		805562	42.20	805562-C3	46.80
.062 (1/16)	.186	.500 (8x)	1/8	1-1/2	76662	76862	42.20	76862-C3	46.80
.062 (1/16)	.186	.625 (10x)	1/8	2	811062	851062	43.50	851062-C3	48.10
.062 (1/16)	.186	.750 (12x)	1/8	2	950262	991162	43.50	991162-C3	48.10
.062 (1/16)	.186	.950 (15x)	1/8	2		861262	46.20	861262-C3	50.80
.065	.195	.500 (8x)	1/8	1-1/2	76665	76865	42.20	76865-C3	46.80
.070	.210	.500 (7x)	1/8	1-1/2	76670	76870	42.20	76870-C3	46.80
.075	.225	.500 (7x)	1/8	1-1/2	76675	76875	42.20	76875-C3	46.80
.078 (5/64)	.234	.500 (6x)	1/8	1-1/2	76678	76878	42.20	76878-C3	46.80
.078 (5/64)	.234	.800 (10x)	1/8	2		851078	43.50	851078-C3	48.10
.078 (5/64)	.234	.940 (12x)	1/8	2	950278	991178	43.50	991178-C3	48.10
.078 (5/64)	.234	1.187 (15x)	1/8	2-1/2		861278	46.20	861278-C3	50.80
.080	.240	.500 (6x)	1/8	1-1/2	76680	76880	42.20	76880-C3	46.80
.085	.255	.500 (6x)	1/8	1-1/2	76685	76885	41.40	76885-C3	46.00
.090	.270	.625 (7x)	1/8	1-1/2	76690	76890	42.20	76890-C3	46.80
.093 (3/32)	.279	.500 (5x)	1/8	1-1/2	948693	982893	42.00	982893-C3	46.60
.093 (3/32)	.279	.625 (7x)	1/8	1-1/2	76693	76893	42.20	76893-C3	46.80
.093 (3/32)	.279	.950 (10x)	1/8	2		851093	43.50	851093-C3	48.10
.093 (3/32)	.279	1.125 (12x)	1/8	2	950293	991193	43.50	991193-C3	48.10
.093 (3/32)	.279	1.400 (15x)	1/8	2-1/2		861293	46.20	861293-C3	50.80
.095	.285	.625 (6x)	1/8	1-1/2	76695	76895	42.20	76895-C3	46.80
.100	.300	.625 (6x)	1/8	1-1/2	76700	76900	42.20	76900-C3	46.80
.109 (7/64)	.327	.570 (5x)	1/8	1-1/2	948602	982902	42.00	982902-C3	46.60
.109 (7/64)	.327	.900 (8x)	1/8	2	903802	904402	43.50	904402-C3	48.10
.118 (3 mm)	.354	.625 (5x)	1/8	1-1/2	948705	982905	42.00	982905-C3	46.60
.118 (3 mm)	.354	.950 (8x)	1/8	2	903805	904405	43.50	904405-C3	48.10

NEW  
NEW  
NEW



# MINIATURE END MILLS

## Ball – Long Reach, Stub Flute



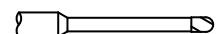
Reduced Neck Diameter to Avoid Heeling

- ⚡ Long length design for deep cavities, up to 8" overall length
- ⚡ 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>+0.0005"</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	.015	<b>.030</b> (3x)	3	1/8	2-1/2	47910	57.30	47910-C3	61.90		
.010	.015	<b>.050</b> (5x)	3	1/8	2-1/2	33410	57.30	33410-C3	61.90	33410-C4	69.00
.010	.015	<b>.080</b> (8x)	3	1/8	2-1/2	34210	57.90	34210-C3	62.50	34210-C4	69.60
.010	.015	<b>.100</b> (10x)	3	1/8	2-1/2	966010	60.40	966010-C3	65.00		
.010	.015	<b>.125</b> (12x)	3	1/8	2-1/2	35610	60.40	35610-C3	65.00	35610-C4	72.10
.010	.015	<b>.150</b> (15x)	3	1/8	2-1/2	49210	68.00	49210-C3	72.60	49210-C4	79.70
.010	.015	<b>.180</b> (18x)	3	1/8	2-1/2	970710	77.10	970710-C3	81.70		
.011	.016	<b>.055</b> (5x)	3	1/8	2-1/2	33411	57.30	33411-C3	61.90		
.011	.016	<b>.088</b> (8x)	3	1/8	2-1/2	34211	57.90	34211-C3	62.50		
.012 (.3 mm)	.018	<b>.060</b> (5x)	3	1/8	2-1/2	33412	57.30	33412-C3	61.90		
.012 (.3 mm)	.018	<b>.096</b> (8x)	3	1/8	2-1/2	34212	57.90	34212-C3	62.50		
.013	.019	<b>.065</b> (5x)	3	1/8	2-1/2	33413	57.30	33413-C3	61.90		
.013	.019	<b>.104</b> (8x)	3	1/8	2-1/2	34213	57.90	34213-C3	62.50		
.014	.021	<b>.070</b> (5x)	3	1/8	2-1/2	33414	57.30	33414-C3	61.90		
.014	.021	<b>.112</b> (8x)	3	1/8	2-1/2	34214	57.90	34214-C3	62.50		
.015 (1/64)	.022	<b>.045</b> (3x)	3	1/8	2-1/2	47915	47.80	47915-C3	52.40		
.015 (1/64)	.022	<b>.062</b> (4x)	3	1/8	2-1/2	844415	47.80	844415-C3	52.40		
.015 (1/64)	.022	<b>.078</b> (5x)	3	1/8	2-1/2	33415	47.80	33415-C3	52.40	33415-C4	59.50
.015 (1/64)	.022	<b>.093</b> (6x)	3	1/8	2-1/2	860615	47.80	860615-C3	52.40		
.015 (1/64)	.022	<b>.109</b> (7x)	3	1/8	2-1/2	868215	47.80	868215-C3	52.40		
.015 (1/64)	.022	<b>.125</b> (8x)	3	1/8	2-1/2	34215	48.90	34215-C3	53.50	34215-C4	60.60
.015 (1/64)	.022	<b>.156</b> (10x)	3	1/8	2-1/2	966015	50.20	966015-C3	54.80	966015-C4	61.90
.015 (1/64)	.022	<b>.187</b> (12x)	3	1/8	2-1/2	35615	50.20	35615-C3	54.80	35615-C4	61.90
.015 (1/64)	.022	<b>.225</b> (15x)	3	1/8	2-1/2	49215	55.60	49215-C3	60.20	49215-C4	67.30
.015 (1/64)	.022	<b>.270</b> (18x)	3	1/8	2-1/2	970715	64.50	970715-C3	69.10		
.015 (1/64)	.022	<b>.300</b> (20x)	3	1/8	2-1/2	59415	64.50	59415-C3	69.10	59415-C4	76.20
.015 (1/64)	.022	<b>.375</b> (25x)	3	1/8	2-1/2	40115	81.70	40115-C3	86.30	<b>25x Diameter!</b>	
.016 (.4 mm)	.024	<b>.080</b> (5x)	3	1/8	2-1/2	33416	50.20	33416-C3	54.80		
.016 (.4 mm)	.024	<b>.128</b> (8x)	3	1/8	2-1/2	34216	51.20	34216-C3	55.80		
.017	.026	<b>.085</b> (5x)	3	1/8	2-1/2	33417	50.20	33417-C3	54.80		
.017	.026	<b>.136</b> (8x)	3	1/8	2-1/2	34217	51.20	34217-C3	55.80		
.018	.027	<b>.090</b> (5x)	3	1/8	2-1/2	33418	50.20	33418-C3	54.80		
.018	.027	<b>.144</b> (8x)	3	1/8	2-1/2	34218	51.20	34218-C3	55.80		
.019	.029	<b>.095</b> (5x)	3	1/8	2-1/2	33419	50.20	33419-C3	54.80		
.019	.029	<b>.152</b> (8x)	3	1/8	2-1/2	34219	51.20	34219-C3	55.80		
.020 (.5 mm)	.030	<b>.060</b> (3x)	3	1/8	2-1/2	47920	46.20	47920-C3	50.80		
.020 (.5 mm)	.030	<b>.080</b> (4x)	3	1/8	2-1/2	844420	46.20	844420-C3	50.80		
.020 (.5 mm)	.030	<b>.100</b> (5x)	3	1/8	2-1/2	33420	46.20	33420-C3	50.80	33420-C4	57.90

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# MINIATURE END MILLS

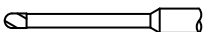
## Ball – Long Reach, Stub Flute (cont.)

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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> $\begin{matrix} +.0005'' \\ -.0005'' \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.010'' \\ -.000'' \end{matrix}$	L <sub>3</sub> $\begin{matrix} +.010'' \\ -.000'' \end{matrix}$		D <sub>2</sub>	L <sub>1</sub>						
.020 (.5 mm)	.030	<b>.120</b> (6x)	3	1/8	2-1/2	860620	46.20	860620-C3	50.80		
.020 (.5 mm)	.030	<b>.140</b> (7x)	3	1/8	2-1/2	868220	46.20	868220-C3	50.80		
.020 (.5 mm)	.030	<b>.160</b> (8x)	3	1/8	2-1/2	34220	47.50	34220-C3	52.10	34220-C4	59.20
.020 (.5 mm)	.030	<b>.200</b> (10x)	3	1/8	2-1/2	966020	48.70	966020-C3	53.30		
.020 (.5 mm)	.030	<b>.250</b> (12x)	3	1/8	2-1/2	35620	48.70	35620-C3	53.30	35620-C4	60.40
.020 (.5 mm)	.030	<b>.300</b> (15x)	3	1/8	2-1/2	49220	53.90	49220-C3	58.50	49220-C4	65.60
.020 (.5 mm)	.030	<b>.360</b> (18x)	3	1/8	2-1/2	970720	64.00	970720-C3	68.60		
.020 (.5 mm)	.030	<b>.400</b> (20x)	3	1/8	2-1/2	59420	64.00	59420-C3	68.60	59420-C4	75.70
.020 (.5 mm)	.030	<b>.500</b> (25x)	3	1/8	2-1/2	40120	79.80	40120-C3	84.40		<b>25x Diameter!</b>
.020 (.5 mm)	.030	<b>.600</b> (30x)	3	1/8	2-1/2	922720	87.80	922720-C3	96.70		<b>30x Diameter!</b>
.021	.031	<b>.105</b> (5x)	3	1/8	2-1/2	33421	50.20	33421-C3	54.80		
.021	.031	<b>.168</b> (8x)	3	1/8	2-1/2	34221	51.20	34221-C3	55.80		
.022	.033	<b>.110</b> (5x)	3	1/8	2-1/2	33422	50.20	33422-C3	54.80		
.022	.033	<b>.176</b> (8x)	3	1/8	2-1/2	34222	51.20	34222-C3	55.80		
.023	.035	<b>.115</b> (5x)	3	1/8	2-1/2	33423	50.20	33423-C3	54.80		
.023	.035	<b>.187</b> (8x)	3	1/8	2-1/2	34223	51.20	34223-C3	55.80		
.024 (.6 mm)	.036	<b>.120</b> (5x)	3	1/8	2-1/2	33424	50.20	33424-C3	54.80		
.024 (.6 mm)	.036	<b>.192</b> (8x)	3	1/8	2-1/2	34224	51.20	34224-C3	55.80		
.025	.037	<b>.075</b> (3x)	3	1/8	2-1/2	47925	40.10	47925-C3	44.70		
.025	.037	<b>.125</b> (5x)	3	1/8	2-1/2	33425	40.10	33425-C3	44.70	33425-C4	51.80
.025	.037	<b>.203</b> (8x)	3	1/8	2-1/2	34225	40.80	34225-C3	45.40	34225-C4	52.50
.025	.037	<b>.250</b> (10x)	3	1/8	2-1/2	966025	42.20	966025-C3	46.80		
.025	.037	<b>.312</b> (12x)	3	1/8	2-1/2	35625	42.20	35625-C3	46.80	35625-C4	53.90
.025	.037	<b>.375</b> (15x)	3	1/8	2-1/2	49225	48.30	49225-C3	52.90	49225-C4	60.00
.026	.039	<b>.130</b> (5x)	3	1/8	2-1/2	33426	50.20	33426-C3	54.80		
.026	.039	<b>.208</b> (8x)	3	1/8	2-1/2	34226	51.20	34226-C3	55.80		
.027	.041	<b>.135</b> (5x)	3	1/8	2-1/2	33427	50.20	33427-C3	54.80		
.027	.041	<b>.216</b> (8x)	3	1/8	2-1/2	34227	51.20	34227-C3	55.80		
.028 (.7 mm)	.042	<b>.140</b> (5x)	3	1/8	2-1/2	33428	50.20	33428-C3	54.80		
.028 (.7 mm)	.042	<b>.224</b> (8x)	3	1/8	2-1/2	34228	51.20	34228-C3	55.80		
.029	.043	<b>.145</b> (5x)	3	1/8	2-1/2	33429	50.20	33429-C3	54.80		
.029	.043	<b>.232</b> (8x)	3	1/8	2-1/2	34229	51.20	34229-C3	55.80		
.030	.045	<b>.090</b> (3x)	3	1/8	2-1/2	47930	40.10	47930-C3	44.70		
.030	.045	<b>.156</b> (5x)	3	1/8	2-1/2	33430	40.10	33430-C3	44.70	33430-C4	51.80
.030	.045	<b>.250</b> (8x)	3	1/8	2-1/2	34230	40.80	34230-C3	45.40	34230-C4	52.50
.030	.045	<b>.312</b> (10x)	3	1/8	2-1/2	966030	42.20	966030-C3	46.80		
.030	.045	<b>.375</b> (12x)	3	1/8	2-1/2	35630	42.20	35630-C3	46.80	35630-C4	53.90
.030	.045	<b>.450</b> (15x)	3	1/8	2-1/2	49230	48.30	49230-C3	52.90	49230-C4	60.00
.030	.045	<b>.540</b> (18x)	3	1/8	2-1/2	970730	58.10	970730-C3	62.70		
.031 (1/32)	.046	<b>.093</b> (3x)	3	1/8	2-1/2	47931	40.10	47931-C3	44.70	47931-C4	51.80
.031 (1/32)	.046	<b>.125</b> (4x)	3	1/8	2-1/2	844431	40.10	844431-C3	44.70		
.031 (1/32)	.046	<b>.156</b> (5x)	3	1/8	2-1/2	33431	40.10	33431-C3	44.70	33431-C4	51.80
.031 (1/32)	.046	<b>.187</b> (6x)	3	1/8	2-1/2	860631	40.10	860631-C3	44.70		
.031 (1/32)	.046	<b>.218</b> (7x)	3	1/8	2-1/2	868231	40.10	868231-C3	44.70		
.031 (1/32)	.046	<b>.250</b> (8x)	3	1/8	2-1/2	34231	40.80	34231-C3	45.40	34231-C4	52.50
.031 (1/32)	.046	<b>.312</b> (10x)	3	1/8	2-1/2	966031	42.20	966031-C3	46.80	966031-C4	53.90

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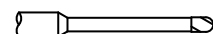
# MINIATURE END MILLS

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

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CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK FLUTES	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>						
.031 (1/32)	.046	<b>.375</b> (12x)	3	1/8	2-1/2	35631	42.20	35631-C3	46.80	35631-C4	53.90
.031 (1/32)	.046	<b>.470</b> (15x)	3	1/8	2-1/2	49231	48.30	49231-C3	52.90	49231-C4	60.00
.031 (1/32)	.046	<b>.565</b> (18x)	3	1/8	2-1/2	970731	58.10	970731-C3	62.70	970731-C4	69.80
.031 (1/32)	.046	<b>.625</b> (20x)	3	1/8	2-1/2	59431	58.10	59431-C3	62.70	59431-C4	69.80
.031 (1/32)	.046	<b>.775</b> (25x)	3	1/8	2-1/2	40131	69.50	40131-C3	74.10	40131-C4	81.20
.031 (1/32)	.046	<b>.937</b> (30x)	3	1/8	2-1/2	922731	81.30	922731-C3	85.90	<b>30x Diameter!</b>	
.035 (.9 mm)	.052	<b>.187</b> (5x)	3	1/8	2-1/2	33435	40.10	33435-C3	44.70	33435-C4	51.80
.035 (.9 mm)	.052	<b>.281</b> (8x)	3	1/8	2-1/2	34235	40.80	34235-C3	45.40	34235-C4	52.50
.035 (.9 mm)	.052	<b>.425</b> (12x)	3	1/8	2-1/2	35635	42.70	35635-C3	47.30	35635-C4	54.40
.035 (.9 mm)	.052	<b>.525</b> (15x)	3	1/8	2-1/2	49235	48.30	49235-C3	52.90		
.039 (1 mm)	.059	<b>.203</b> (5x)	3	1/8	2-1/2	33439	40.30	33439-C3	44.90		
.039 (1 mm)	.059	<b>.325</b> (8x)	3	1/8	2-1/2	34239	40.80	34239-C3	45.40		
.039 (1 mm)	.059	<b>.400</b> (10x)	3	1/8	2-1/2	966039	42.70	966039-C3	47.30		
.040	.060	<b>.120</b> (3x)	3	1/8	2-1/2	47940	40.10	47940-C3	44.70		
.040	.060	<b>.203</b> (5x)	3	1/8	2-1/2	33440	40.10	33440-C3	44.70	33440-C4	51.80
.040	.060	<b>.240</b> (6x)	3	1/8	2-1/2	860640	40.10	860640-C3	44.70		
.040	.060	<b>.281</b> (7x)	3	1/8	2-1/2	868240	40.10	868240-C3	44.70		
.040	.060	<b>.325</b> (8x)	3	1/8	2-1/2	34240	40.80	34240-C3	45.40	34240-C4	52.50
.040	.060	<b>.400</b> (10x)	3	1/8	2-1/2	966040	42.70	966040-C3	47.30	966040-C4	54.40
.040	.060	<b>.480</b> (12x)	3	1/8	2-1/2	35640	42.70	35640-C3	47.30	35640-C4	54.40
.040	.060	<b>.600</b> (15x)	3	1/8	2-1/2	49240	48.30	49240-C3	52.90	49240-C4	60.00
.040	.060	<b>.720</b> (18x)	3	1/8	2-1/2	970740	58.10	970740-C3	62.70		
.040	.060	<b>.800</b> (20x)	3	1/8	2-1/2	59440	58.10	59440-C3	62.70	59440-C4	69.80
.040	.060	<b>1.000</b> (25x)	3	1/8	2-1/2	40140	69.50	40140-C3	74.10	<b>25x Diameter!</b>	
.045	.067	<b>.225</b> (5x)	3	1/8	2-1/2	33445	39.10	33445-C3	43.70	33445-C4	50.80
.045	.067	<b>.375</b> (8x)	3	1/8	2-1/2	34245	40.00	34245-C3	44.60	34245-C4	51.70
.045	.067	<b>.550</b> (12x)	3	1/8	2-1/2	35645	41.10	35645-C3	45.70	35645-C4	52.80
.045	.067	<b>.680</b> (15x)	3	1/8	2-1/2	49245	45.70	49245-C3	50.30		
.047 (3/64)	.070	<b>.141</b> (3x)	3	1/8	2-1/2	47947	39.10	47947-C3	43.70		
.047 (3/64)	.070	<b>.187</b> (4x)	3	1/8	2-1/2	844447	39.10	844447-C3	43.70		
.047 (3/64)	.070	<b>.250</b> (5x)	3	1/8	2-1/2	33447	39.10	33447-C3	43.70	33447-C4	50.80
.047 (3/64)	.070	<b>.281</b> (6x)	3	1/8	2-1/2	860647	39.10	860647-C3	43.70		
.047 (3/64)	.070	<b>.328</b> (7x)	3	1/8	2-1/2	868247	39.10	868247-C3	43.70		
.047 (3/64)	.070	<b>.375</b> (8x)	3	1/8	2-1/2	34247	40.00	34247-C3	44.60	34247-C4	51.70
.047 (3/64)	.070	<b>.480</b> (10x)	3	1/8	2-1/2	966047	41.10	966047-C3	45.70	966047-C4	52.80
.047 (3/64)	.070	<b>.570</b> (12x)	3	1/8	2-1/2	35647	41.10	35647-C3	45.70	35647-C4	52.80
.047 (3/64)	.070	<b>.710</b> (15x)	3	1/8	2-1/2	49247	45.70	49247-C3	50.30	49247-C4	57.40
.047 (3/64)	.070	<b>.850</b> (18x)	3	1/8	2-1/2	970747	54.70	970747-C3	59.30		
.047 (3/64)	.070	<b>.950</b> (20x)	3	1/8	2-1/2	59447	54.70	59447-C3	59.30	59447-C4	66.40
.047 (3/64)	.070	<b>1.187</b> (25x)	3	1/8	2-1/2	40147	67.00	40147-C3	71.60	<b>25x Diameter!</b>	
.050	.075	<b>.150</b> (3x)	3	1/8	2-1/2	47950	39.10	47950-C3	43.70		
.050	.075	<b>.250</b> (5x)	3	1/8	2-1/2	33450	39.10	33450-C3	43.70	33450-C4	50.80
.050	.075	<b>.400</b> (8x)	3	1/8	2-1/2	34250	40.00	34250-C3	44.60	34250-C4	51.70
.050	.075	<b>.500</b> (10x)	3	1/8	2-1/2	966050	41.10	966050-C3	45.70		
.050	.075	<b>.600</b> (12x)	3	1/8	2-1/2	35650	41.10	35650-C3	45.70	35650-C4	52.80
.050	.075	<b>.750</b> (15x)	3	1/8	2-1/2	49250	45.70	49250-C3	50.30		

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BALL

# MINIATURE END MILLS

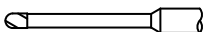
## Ball – Long Reach, Stub Flute (cont.)

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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> $\begin{matrix} +.0005'' \\ -.0005'' \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.010'' \\ -.000'' \end{matrix}$	L <sub>3</sub> $\begin{matrix} +.010'' \\ -.000'' \end{matrix}$		D <sub>2</sub>	L <sub>1</sub>						
.055 (1.4 mm)	.082	<b>.165</b> (3x)	3	1/8	2-1/2	47955	39.10	47955-C3	43.70		
.055 (1.4 mm)	.082	<b>.275</b> (5x)	3	1/8	2-1/2	33455	39.10	33455-C3	43.70	33455-C4	50.80
.055 (1.4 mm)	.082	<b>.450</b> (8x)	3	1/8	2-1/2	34255	40.00	34255-C3	44.60	34255-C4	51.70
.055 (1.4 mm)	.082	<b>.560</b> (10x)	3	1/8	2-1/2	966055	41.10	966055-C3	45.70		
.055 (1.4 mm)	.082	<b>.660</b> (12x)	3	1/8	2-1/2	35655	41.10	35655-C3	45.70	35655-C4	52.80
.060	.090	<b>.180</b> (3x)	3	1/8	2-1/2	47960	39.10	47960-C3	43.70		
.060	.090	<b>.312</b> (5x)	3	1/8	2-1/2	33460	39.10	33460-C3	43.70	33460-C4	50.80
.060	.090	<b>.500</b> (8x)	3	1/8	2-1/2	34260	40.00	34260-C3	44.60	34260-C4	51.70
.060	.090	<b>.625</b> (10x)	3	1/8	2-1/2	966060	41.10	966060-C3	45.70		
.060	.090	<b>.720</b> (12x)	3	1/8	2-1/2	35660	41.10	35660-C3	45.70	35660-C4	52.80
.060	.090	<b>.900</b> (15x)	3	1/8	2-1/2	49260	45.70	49260-C3	50.30		
.060	.090	<b>1.062</b> (18x)	3	1/8	2-1/2	970760	54.70	970760-C3	59.30		
.060	.090	<b>1.200</b> (20x)	3	1/8	2-1/2	59460	54.70	59460-C3	59.30		
.062 (1/16)	.093	<b>.186</b> (3x)	3	1/8	2-1/2	47962	39.10	47962-C3	43.70	47962-C4	50.80
.062 (1/16)	.093	<b>.250</b> (4x)	3	1/8	2-1/2	844462	39.10	844462-C3	43.70		
.062 (1/16)	.093	<b>.312</b> (5x)	3	1/8	2-1/2	33462	39.10	33462-C3	43.70	33462-C4	50.80
.062 (1/16)	.093	<b>.375</b> (6x)	3	1/8	2-1/2	860662	39.10	860662-C3	43.70	<b>860662-C4</b>	50.80
.062 (1/16)	.093	<b>.437</b> (7x)	3	1/8	2-1/2	868262	39.10	868262-C3	43.70		NEW
.062 (1/16)	.093	<b>.500</b> (8x)	3	1/8	2-1/2	34262	40.00	34262-C3	44.60	34262-C4	51.70
.062 (1/16)	.093	<b>.558</b> (9x)	3	1/8	2-1/2	<b>805362</b>	41.10	<b>805362-C3</b>	45.70		NEW
.062 (1/16)	.093	<b>.625</b> (10x)	3	1/8	2-1/2	966062	41.10	966062-C3	45.70	966062-C4	52.80
.062 (1/16)	.093	<b>.750</b> (12x)	3	1/8	2-1/2	35662	41.10	35662-C3	45.70	35662-C4	52.80
.062 (1/16)	.093	<b>.950</b> (15x)	3	1/8	2-1/2	49262	45.70	49262-C3	50.30	49262-C4	57.40
.062 (1/16)	.093	<b>1.125</b> (18x)	3	1/8	2-1/2	970762	54.70	970762-C3	59.30	970762-C4	66.40
.062 (1/16)	.093	<b>1.250</b> (20x)	3	1/8	2-1/2	59462	54.70	59462-C3	59.30	59462-C4	66.40
.062 (1/16)	.093	<b>1.550</b> (25x)	3	1/8	3	40162	67.00	40162-C3	71.60	40162-C4	78.70
.062 (1/16)	.093	<b>1.875</b> (30x)	3	1/8	3	922762	85.20	922762-C3	89.80	<b>30x Diameter!</b>	
.065	.097	<b>.325</b> (5x)	3	1/8	2-1/2	33465	39.10	33465-C3	43.70		
.065	.097	<b>.530</b> (8x)	3	1/8	2-1/2	34265	40.00	34265-C3	44.60	34265-C4	51.70
.070	.105	<b>.375</b> (5x)	3	1/8	2-1/2	33470	39.10	33470-C3	43.70		
.070	.105	<b>.570</b> (8x)	3	1/8	2-1/2	34270	40.00	34270-C3	44.60	34270-C4	51.70
.075	.112	<b>.375</b> (5x)	3	1/8	2-1/2	33475	39.10	33475-C3	43.70		
.075	.112	<b>.625</b> (8x)	3	1/8	2-1/2	34275	40.00	34275-C3	44.60	34275-C4	51.70
.078 (5/64)	.117	<b>.234</b> (3x)	3	1/8	2-1/2	47978	39.10	47978-C3	43.70		
.078 (5/64)	.117	<b>.312</b> (4x)	3	1/8	2-1/2	844478	39.10	844478-C3	43.70		
.078 (5/64)	.117	<b>.406</b> (5x)	3	1/8	2-1/2	33478	39.10	33478-C3	43.70	33478-C4	50.80
.078 (5/64)	.117	<b>.475</b> (6x)	3	1/8	2-1/2	860678	39.10	860678-C3	43.70		
.078 (5/64)	.117	<b>.550</b> (7x)	3	1/8	2-1/2	868278	39.10	868278-C3	43.70		
.078 (5/64)	.117	<b>.625</b> (8x)	3	1/8	2-1/2	34278	40.00	34278-C3	44.60	34278-C4	51.70
.078 (5/64)	.117	<b>.800</b> (10x)	3	1/8	2-1/2	966078	41.10	966078-C3	45.70		
.078 (5/64)	.117	<b>.940</b> (12x)	3	1/8	2-1/2	35678	41.10	35678-C3	45.70	35678-C4	52.80
.078 (5/64)	.117	<b>1.187</b> (15x)	3	1/8	2-1/2	49278	45.70	49278-C3	50.30	49278-C4	57.40
.078 (5/64)	.117	<b>1.400</b> (18x)	3	1/8	3	970778	54.70	970778-C3	59.30		
.078 (5/64)	.117	<b>1.562</b> (20x)	3	1/8	3	59478	54.70	59478-C3	59.30		
.078 (5/64)	.117	<b>1.950</b> (25x)	3	1/8	3	40178	67.00	40178-C3	71.60	<b>25x Diameter!</b>	

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# MINIATURE END MILLS

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

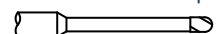
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CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK FLUTES	DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	L <sub>2</sub> <sup>+0.010"</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>						
.080	.120	<b>.406</b> (5x)	3	1/8	2-1/2	33480	39.10	33480-C3	43.70		
.080	.120	<b>.650</b> (8x)	3	1/8	2-1/2	34280	40.00	34280-C3	44.60	34280-C4	51.70
.085	.127	<b>.425</b> (5x)	3	1/8	2-1/2	33485	39.10	33485-C3	43.70		
.085	.127	<b>.700</b> (8x)	3	1/8	2-1/2	34285	40.00	34285-C3	44.60	34285-C4	51.70
.090	.135	<b>.450</b> (5x)	3	1/8	2-1/2	33490	39.10	33490-C3	43.70		
.090	.135	<b>.750</b> (8x)	3	1/8	2-1/2	34290	40.00	34290-C3	44.60	34290-C4	51.70
.093 (3/32)	.139	<b>.279</b> (3x)	3	1/8	2-1/2	47993	39.10	47993-C3	43.70		
.093 (3/32)	.139	<b>.375</b> (4x)	3	1/8	2-1/2	844493	39.10	844493-C3	43.70		
.093 (3/32)	.139	<b>.500</b> (5x)	3	1/8	2-1/2	33493	39.10	33493-C3	43.70	33493-C4	50.80
.093 (3/32)	.139	<b>.585</b> (6x)	3	1/8	2-1/2	860693	39.10	860693-C3	43.70		
.093 (3/32)	.139	<b>.670</b> (7x)	3	1/8	2-1/2	868293	39.10	868293-C3	43.70		
.093 (3/32)	.139	<b>.750</b> (8x)	3	1/8	2-1/2	34293	40.00	34293-C3	44.60	34293-C4	51.70
.093 (3/32)	.139	<b>.950</b> (10x)	3	1/8	2-1/2	966093	41.10	966093-C3	45.70	966093-C4	52.80
.093 (3/32)	.139	<b>1.125</b> (12x)	3	1/8	2-1/2	35693	41.10	35693-C3	45.70	35693-C4	52.80
.093 (3/32)	.139	<b>1.400</b> (15x)	3	1/8	3	49293	48.00	49293-C3	52.60	49293-C4	59.70
.093 (3/32)	.139	<b>1.675</b> (18x)	3	1/8	3	970793	58.00	970793-C3	62.60		
.093 (3/32)	.139	<b>1.875</b> (20x)	3	1/8	4	59493	60.50	59493-C3	65.50		
.093 (3/32)	.139	<b>2.312</b> (25x)	3	1/8	4	40193	69.30	40193-C3	74.30		<b>25x Diameter!</b>
.093 (3/32)	.139	<b>2.812</b> (30x)	3	1/8	4	922793	92.90	922793-C3	97.90		<b>30x Diameter!</b>
.095	.142	<b>.500</b> (5x)	3	1/8	2-1/2	33495	39.10	33495-C3	43.70		
.095	.142	<b>.750</b> (8x)	3	1/8	2-1/2	34295	40.00	34295-C3	44.60	34295-C4	51.70
.100	.150	<b>.300</b> (3x)	3	1/8	2-1/2	978500	39.10	978500-C3	43.70		
.100	.150	<b>.500</b> (5x)	3	1/8	2-1/2	33500	39.10	33500-C3	43.70		
.100	.150	<b>.800</b> (8x)	3	1/8	2-1/2	34300	40.00	34300-C3	44.60	34300-C4	51.70
.100	.150	<b>1.000</b> (10x)	3	1/8	2-1/2	966100	41.10	966100-C3	45.70		
.100	.150	<b>1.200</b> (12x)	3	1/8	2-1/2	35700	41.10	35700-C3	45.70		
.109 (7/64)	.163	<b>.570</b> (5x)	3	1/8	2-1/2	33502	39.10	33502-C3	43.70		
.109 (7/64)	.163	<b>.900</b> (8x)	3	1/8	2-1/2	34302	40.00	34302-C3	44.60		
.118 (3 mm)	.177	<b>.625</b> (5x)	3	1/8	2-1/2	33505	39.10	33505-C3	43.70		
.118 (3 mm)	.177	<b>.950</b> (8x)	3	1/8	2-1/2	34305	40.00	34305-C3	44.60		
.118 (3 mm)	.177	<b>1.187</b> (10x)	3	1/8	2-1/2	966105	41.10	966105-C3	45.70		

BALL

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK FLUTES	DIAMETER	OVERALL LENGTH	UNCOATED		AITIN 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>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>		D <sub>2</sub>	L <sub>1</sub>						
.125 (1/8)	.187	<b>.375</b> (3x)	3	1/8	2-1/2	978508	39.10	978508-C3	43.70	978508-C4	50.80
.125 (1/8)	.187	<b>.500</b> (4x)	3	1/8	2-1/2	844508	39.10	844508-C3	43.70		
.125 (1/8)	.187	<b>.625</b> (5x)	3	1/8	2-1/2	33508	39.10	33508-C3	43.70	33508-C4	50.80
.125 (1/8)	.187	<b>.750</b> (6x)	3	1/8	2-1/2	860708	39.10	860708-C3	43.70	<b>860708-C4</b>	50.80
.125 (1/8)	.187	<b>.875</b> (7x)	3	1/8	2-1/2	868308	39.10	868308-C3	43.70		
.125 (1/8)	.187	<b>1.000</b> (8x)	3	1/8	2-1/2	34308	40.00	34308-C3	44.60	34308-C4	51.70
.125 (1/8)	.187	<b>1.125</b> (9x)	3	1/8	2-1/2	<b>805408</b>	42.90	<b>805408-C3</b>	47.50		
.125 (1/8)	.187	<b>1.250</b> (10x)	3	1/8	2-1/2	966108	42.90	966108-C3	47.50	966108-C4	54.60
.125 (1/8)	.187	<b>1.500</b> (12x)	3	1/8	3	35708	42.90	35708-C3	47.50	35708-C4	54.60
.125 (1/8)	.187	<b>1.875</b> (15x)	3	1/8	3	49308	48.00	49308-C3	52.60	49308-C4	59.70
.125 (1/8)	.187	<b>2.250</b> (18x)	3	1/8	4	970808	58.00	970808-C3	63.00	970808-C4	69.70
.125 (1/8)	.187	<b>2.500</b> (20x)	3	1/8	4	59508	58.00	59508-C3	63.00	59508-C4	75.20
.125 (1/8)	.187	<b>3.125</b> (25x)	3	1/8	4	959108	72.30	959108-C3	77.30		<b>25x Diameter!</b>
.125 (1/8)	.187	<b>3.750</b> (30x)	3	1/8	6	922808	86.60	922808-C3	92.70		<b>30x Diameter!</b>

continued on next page



# 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> +.000" / -.002"	L <sub>2</sub> +.030" / -.000"	L <sub>3</sub> +.030" / -.000"		D <sub>2</sub>	L <sub>1</sub>						
.140 (9/64)	.220	<b>.750</b> (5x)	3	3/16	3	33509	43.10	33509-C3	48.10		
.140 (9/64)	.220	<b>1.125</b> (8x)	3	3/16	3	34309	44.00	34309-C3	49.00		
.140 (9/64)	.220	<b>1.450</b> (10x)	3	3/16	3	966109	47.00	966109-C3	52.00		
.156 (5/32)	.234	<b>.470</b> (3x)	3	3/16	3	978510	43.10	978510-C3	47.30		
.156 (5/32)	.234	<b>.750</b> (5x)	3	3/16	3	33510	43.10	33510-C3	48.10		
.156 (5/32)	.234	<b>1.250</b> (8x)	3	3/16	3	34310	44.00	34310-C3	49.00	34310-C4	60.10
.156 (5/32)	.234	<b>1.570</b> (10x)	3	3/16	3	966110	47.00	966110-C3	52.00		
.156 (5/32)	.234	<b>1.875</b> (12x)	3	3/16	4	35710	47.00	35710-C3	53.80		
.156 (5/32)	.234	<b>2.375</b> (15x)	3	3/16	4	49310	49.70	49310-C3	56.50		
.187 (3/16)	.281	<b>.570</b> (3x)	3	3/16	3	<b>978512</b>	43.10	<b>978512-C3</b>	48.10		
.187 (3/16)	.281	<b>1.000</b> (5x)	3	3/16	3	33512	43.10	33512-C3	48.10	33512-C4	59.20
.187 (3/16)	.281	<b>1.500</b> (8x)	3	3/16	3	34312	44.00	34312-C3	49.00	34312-C4	60.10
.187 (3/16)	.281	<b>1.875</b> (10x)	3	3/16	4	966112	47.00	966112-C3	53.80	966112-C4	64.20
.187 (3/16)	.281	<b>2.250</b> (12x)	3	3/16	4	35712	47.00	35712-C3	53.80	35712-C4	64.20
.187 (3/16)	.281	<b>2.812</b> (15x)	3	3/16	4	49312	49.70	49312-C3	56.50	49312-C4	66.90
.187 (3/16)	.281	<b>3.375</b> (18x)	3	3/16	6	970812	67.80	970812-C3	76.80		
.218 (7/32)	.330	<b>1.125</b> (5x)	3	1/4	4	33514	50.00	33514-C3	57.90		
.218 (7/32)	.330	<b>1.750</b> (8x)	3	1/4	4	34314	50.60	34314-C3	58.50		
.250 (1/4)	.375	<b>.750</b> (3x)	3	1/4	4	978516	47.60	978516-C3	55.50		
.250 (1/4)	.375	<b>1.250</b> (5x)	3	1/4	4	33516	47.60	33516-C3	55.50	33516-C4	65.90
.250 (1/4)	.375	<b>2.000</b> (8x)	3	1/4	4	34316	48.70	34316-C3	56.60	34316-C4	67.00
.250 (1/4)	.375	<b>2.500</b> (10x)	3	1/4	4	966116	54.40	966116-C3	62.30		
.250 (1/4)	.375	<b>3.000</b> (12x)	3	1/4	6	35716	57.30	35716-C3	66.30	35716-C4	83.80
.250 (1/4)	.375	<b>3.750</b> (15x)	3	1/4	6	49316	59.90	49316-C3	68.90		
.250 (1/4)	.375	<b>4.375</b> (17.5x)	4	1/4	6	14916	91.40	14916-C3	100.40		
.250 (1/4)	.375	<b>5.000</b> (20x)	3	1/4	8	59516	119.20	59516-C3	132.60		
.312 (5/16)	.470	<b>4.343</b> (14x)	4	5/16	6	14920	110.40	14920-C3	123.80		
.375 (3/8)	.570	<b>2.000</b> (5x)	3	3/8	4	33524	83.00	33524-C3	95.30		
.375 (3/8)	.570	<b>3.000</b> (8x)	3	3/8	6	34324	111.80	34324-C3	125.70		
.375 (3/8)	.562	<b>4.312</b> (11.5x)	4	3/8	6	14924	125.20	14924-C3	139.10		
.500 (1/2)	.750	<b>5.750</b> (11.5x)	4	1/2	8	14932	217.80	14932-C3	245.40		
.625 (5/8)	.937	<b>5.687</b> (9x)	4	5/8	8	14940	364.60				
.750 (3/4)	1.125	<b>5.625</b> (7.5x)	4	3/4	8	14948	442.40				

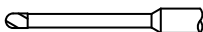
NEW



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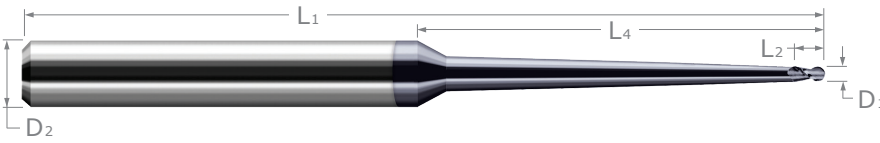
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# MINIATURE END MILLS

## Ball – Tapered Reach (Clearance Cutters)



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

**Maximum  
Reach &  
Maximum  
Rigidity!**

BALL

CUTTER DIA.	LOC	OVERALL REACH	EFFECTIVE WALL ANGLE	SHANK DIA.	OAL	INTERFERENCE DEPTH AT WALL ANGLE*						UNCOATED		AITIN NANO COATED		AMORPHOUS DIAMOND	
						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>	0°	.5°	1°	2°	3°	4°	2 FL
.015	.023	<b>1/2</b>	6.4°	1/8	2-1/2	.060	.080	.120	.375	.395	.420	29815	67.30	29815-C6	74.10	29815-C4	79.00
.015	.023	<b>1</b>	6.7°	1/4	4	.060	.080	.120	.765	.950	-	17715	79.00	17715-C6	89.00		
.031	.047	<b>1/2</b>	5.5°	1/8	2-1/2	.115	.150	.220	.380	.405	.435	29831	52.60	29831-C6	59.40	29831-C4	64.30
.031	.047	<b>1</b>	6.3°	1/4	4	.115	.150	.220	.755	.800	.850	17731	65.00	17731-C6	75.00	17731-C4	83.30
.031	.047	<b>1-1/2</b>	4.2°	1/4	4	.115	.150	.220	1.260	1.355	1.465	24831	70.00	24831-C6	80.00	24831-C4	88.30
.031	.047	<b>2</b>	3.2°	1/4	4	.115	.150	.220	1.765	1.960	-	18831	78.00	18831-C6	88.00	18831-C4	96.30
.047	.071	<b>1/2</b>	4.7°	1/8	2-1/2	.180	.235	.350	.395	.425	.465	29847	52.60	29847-C6	59.40	29847-C4	64.30
.047	.071	<b>1</b>	5.9°	1/4	4	.180	.235	.350	.765	.810	.865	17747	65.00	17747-C6	75.00	17747-C4	83.30
.047	.071	<b>1-1/2</b>	3.9°	1/4	4	.180	.235	.350	1.270	1.375	-	24847	70.00	24847-C6	80.00	24847-C4	88.30
.047	.071	<b>2</b>	2.9°	1/4	4	.180	.235	.350	1.780	-	-	18847	78.00	18847-C6	88.00	18847-C4	96.30
.062	.093	<b>1/2</b>	3.8°	1/8	2-1/2	.220	.285	.370	.405	.450	-	29862	51.00	29862-C6	57.80	29862-C4	62.70
.062	.093	<b>1</b>	5.5°	1/4	4	.220	.285	.415	.770	.820	.880	17762	63.00	17762-C6	73.00	17762-C4	81.30
.062	.093	<b>1-1/2</b>	3.7°	1/4	4	.220	.285	.415	1.280	1.400	-	24862	67.60	24862-C6	77.60	24862-C4	85.90
.062	.093	<b>2</b>	2.7°	1/4	4	.220	.285	.415	1.795	-	-	18862	76.00	18862-C6	86.00	18862-C4	94.30
.078	.118	<b>1</b>	5.1°	1/4	4	.305	.395	.575	.780	.840	.905	17778	63.00	17778-C6	73.00	17778-C4	81.30
.078	.118	<b>1-1/2</b>	3.4°	1/4	4	.305	.395	.575	1.295	1.435	-	24878	67.60	24878-C6	77.60	24878-C4	85.90
.078	.118	<b>2</b>	2.5°	1/4	4	.305	.395	.575	1.830	-	-	18878	76.00	18878-C6	86.00	18878-C4	94.30
.093	.140	<b>1</b>	4.7°	1/4	4	.340	.440	.640	.790	.855	.930	17793	63.80	17793-C6	73.80	17793-C4	82.10
.093	.140	<b>1-1/2</b>	3.1°	1/4	4	.340	.440	.640	1.310	1.475	-	24893	67.60	24893-C6	77.60	24893-C4	85.90
.093	.140	<b>2</b>	2.3°	1/4	4	.340	.440	.640	1.870	-	-	18893	74.00	18893-C6	84.00	18893-C4	92.30
.125	.188	<b>1</b>	3.8°	1/4	4	.450	.580	.750	.820	.910	-	17808	63.80	17808-C6	73.80	17808-C4	82.10
.125	.188	<b>1-1/2</b>	2.5°	1/4	4	.450	.580	.840	1.375	-	-	24908	67.60	24908-C6	77.60	24908-C4	85.90
.125	.188	<b>2</b>	1.8°	1/4	4	.450	.580	.840	-	-	-	18908	74.00	18908-C6	84.00	18908-C4	92.30
.125	.188	<b>2-1/2</b>	2.2°	5/16	4	.450	.580	.840	2.395	-	-	21408	77.70	21408-C6	88.90		
.156	.234	<b>1</b>	2.9°	1/4	4	.525	.680	.775	.875	-	-	17810	63.80	17810-C6	73.80	17810-C4	82.10
.156	.234	<b>1-1/2</b>	1.9°	1/4	4	.525	.680	.980	-	-	-	24910	67.60	24910-C6	77.60	24910-C4	85.90
.156	.234	<b>2</b>	1.4°	1/4	4	.540	.710	1.085	-	-	-	18910	74.00	18910-C6	84.00	18910-C4	92.30
.187	.281	<b>1-1/2</b>	1.3°	1/4	4	.605	.775	1.120	-	-	-	24912	69.30	24912-C6	79.30	24912-C4	87.60
.187	.281	<b>2</b>	2.7°	3/8	4	.605	.775	1.120	1.845	-	-	18912	99.40	18912-C6	110.60	18912-C4	121.50
.187	.281	<b>2-1/2</b>	2.2°	3/8	4	.605	.775	1.120	2.405	-	-	21412	102.60	21412-C6	113.80		
.250	.375	<b>1-1/2</b>	2.6°	3/8	4	.760	.975	1.260	1.395	-	-	24916	88.90	24916-C6	100.10	24916-C4	111.00
.250	.375	<b>2</b>	1.8°	3/8	4	.760	.975	1.405	-	-	-	18916	99.40	18916-C6	110.60	18916-C4	121.50
.250	.375	<b>2-1/2</b>	1.5°	3/8	4	.760	.975	1.405	-	-	-	21416	102.60	21416-C6	113.80		
.312	.468	<b>2</b>	2.7°	1/2	4	.915	1.170	1.685	1.860	-	-	18920	134.70	18920-C6	150.20	18920-C4	161.20
.375	.563	<b>2</b>	1.8°	1/2	4	1.075	1.370	1.770	-	-	-	18924	134.70	18924-C6	150.20	18924-C4	161.20

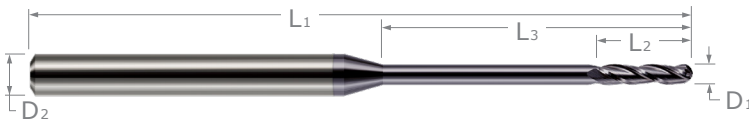
\*Values are approximate and may vary due to tolerancing.

For detailed interference charts with more angles,  
search for keyword [InterferenceChart](http://www.harveyttool.com) on [www.harveyttool.com](http://www.harveyttool.com).



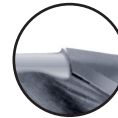
# MINIATURE END MILLS

## Ball – Long Reach, Long Flute



BALL

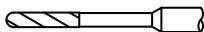
- ⚡ Long length design for deep cavities
- ⚡ Long flutes for deep pocket milling
- ⚡ Length of cut  $\geq 5x$  diameter
- ⚡ 3 flutes
- ⚡ Center cutting
- ⚡ Solid carbide
- ⚡ CNC ground in the USA



Reduced Neck Diameter to Avoid Heeling

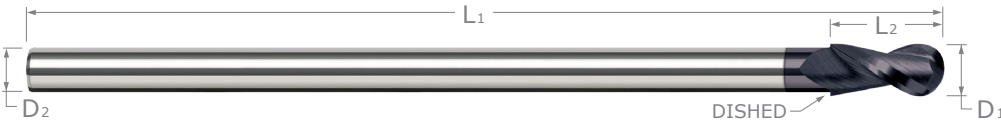
CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A TiN COATED		AMORPHOUS DIAMOND	
					3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.010	.050	.100 (10x)	1/8	2-1/2	13810	59.90	13810-C3	64.50	10210	71.60
.015 (1/64)	.075	.150 (10x)	1/8	2-1/2	13815	51.10	13815-C3	55.70	10215	62.80
.020 (.5 mm)	.100	.200 (10x)	1/8	2-1/2	13820	49.60	13820-C3	54.20	10220	61.30
.025	.125	.250 (10x)	1/8	2-1/2	13825	42.80	13825-C3	47.40	10225	54.50
.030	.150	.300 (10x)	1/8	2-1/2	13830	42.80	13830-C3	47.40	10230	54.50
.031 (1/32)	.155	.310 (10x)	1/8	2-1/2	13831	42.80	13831-C3	47.40	10231	54.50
.035 (.9 mm)	.175	.350 (10x)	1/8	2-1/2	13835	42.80	13835-C3	47.40	10235	54.50
.040	.200	.400 (10x)	1/8	2-1/2	13840	42.80	13840-C3	47.40	10240	54.50
.045	.225	.450 (10x)	1/8	2-1/2	13845	41.90	13845-C3	46.50	10245	53.60
.047 (3/64)	.250	.500 (10x)	1/8	2-1/2	13847	41.90	13847-C3	46.50	10247	53.60
.050	.300	.600 (12x)	1/8	2-1/2	13850	41.90	13850-C3	46.50	10250	53.60
.055 (1.4 mm)	.385	.770 (14x)	1/8	2-1/2	13855	41.90	13855-C3	46.50	10255	53.60
.060	.500	1.000 (16x)	1/8	2-1/2	13860	42.70	13860-C3	47.30	10260	54.40
.062 (1/16)	.500	.625 (10x)	1/8	2-1/2	803562	41.90	803562-C3	46.50	803362	53.60
.062 (1/16)	.500	1.000 (16x)	1/8	2-1/2	13862	42.70	13862-C3	47.30	10262	54.40
.065	.500	1.000 (15x)	1/8	2-1/2	13865	41.90	13865-C3	46.50	10265	53.60
.070	.500	1.000 (14x)	1/8	2-1/2	13870	41.90	13870-C3	46.50	10270	53.60
.075	.500	1.000 (13x)	1/8	2-1/2	13875	41.90	13875-C3	46.50	10275	53.60
.078 (5/64)	.500	1.000 (12x)	1/8	2-1/2	13878	41.90	13878-C3	46.50	10278	53.60
.080	.750	1.250 (15x)	1/8	2-1/2	13880	41.90	13880-C3	46.50	10280	53.60
.085	.750	1.250 (14x)	1/8	2-1/2	13885	41.90	13885-C3	46.50	10285	53.60
.090	.750	1.250 (13x)	1/8	2-1/2	13890	41.90	13890-C3	46.50	10290	53.60
.093 (3/32)	.750	1.250 (13x)	1/8	2-1/2	13893	41.90	13893-C3	46.50	10293	53.60
.095	.750	1.250 (13x)	1/8	2-1/2	13895	41.90	13895-C3	46.50	10295	53.60
.100	.750	1.250 (12x)	1/8	2-1/2	14800	41.90	14800-C3	46.50	10300	53.60
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.125 (1/8)	1.000	1.500 (12x)	1/8	2-1/2	14808	41.90	14808-C3	46.50	10308	53.60
.187 (3/16)	1.125	1.625 (8x)	3/16	3	14812	45.30	14812-C3	50.30	10312	61.40
.250 (1/4)	1.500	2.000 (8x)	1/4	4	14816	50.70	14816-C3	55.70	10316	69.00

NEW



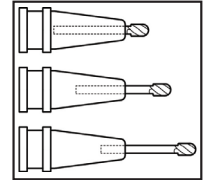
# MINIATURE END MILLS

## 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 = 1½x diameter
- ↪ 2 flutes
- ↪ Center cutting
- ↪ Solid carbide
- ↪ CNC ground in the USA

**Chuck at Any Depth!**



BALL

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
				2 FL	PRICE	2 FL	PRICE
D1 $\begin{matrix} +.000'' \\ -.002'' \end{matrix}$	L2 $\begin{matrix} +.030'' \\ -.000'' \end{matrix}$	D2 (h6)	L1				
<b>1/8</b>	3/16	<b>3 mm</b>	2-1/2	24708	91.40	24708-C3	96.00
<b>5/32</b>	15/64	<b>1/8</b>	2-1/2	24710	91.40	24710-C3	96.40
<b>3/16</b>	9/32	<b>1/8</b>	2-1/2	24712	91.40	24712-C3	96.40
<b>3/16</b>	9/32	<b>5/32</b>	2-1/2	24713	94.30	24713-C3	99.30
<b>1/4</b>	3/8	<b>3/16</b>	3	24716	99.00	24716-C3	105.80
<b>5/16</b>	15/32	<b>1/4</b>	4	24720	121.60	24720-C3	131.10
<b>3/8</b>	9/16	<b>5/16</b>	4	24724	143.60	24724-C3	155.90
<b>7/16</b>	21/32	<b>3/8</b>	6	24728	211.50	24728-C3	226.50
<b>1/2</b>	3/4	<b>7/16</b>	6	24732	221.00	24732-C3	234.90
<b>5/8</b>	15/16	<b>1/2</b>	6	24740	286.50	24740-C3	306.50
<b>3/4</b>	1-1/8	<b>5/8</b>	6	24748	354.00	24748-C3	375.00

**For Square Reduced Shank, please see page 36.**

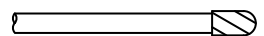
**For Corner Radius Reduced Shank, please see page 73.**



"This little guy just hit it's 1,200th detent. I was worried about making it through one! Great job Harvey Tool."

— @visionmetaldesign

**Follow us on Instagram @harveytool!**



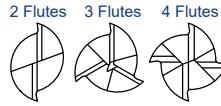
# MINIATURE END MILLS

## Corner Radius – Stub & Standard



Stub Flute & Standard Length

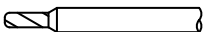
- Corner radius for improved strength
- Center cutting
- Solid carbide
- CNC ground in the USA



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	4 FL	PRICE
.008	.002	.012 (1.5x)	1/8	1-1/2			856008	48.00		856008-C3	52.60		
.008	.002	.024 (3x)	1/8	1-1/2			854208	48.00		854208-C3	52.60		
.010	.003	.015 (1.5x)	1/8	1-1/2			987510	43.30		987510-C3	47.90		
.010	.003	.030 (3x)	1/8	1-1/2			47210	43.30		47210-C3	47.90		
.015 (1/64)	.003	.023 (1.5x)	1/8	1-1/2			987515	43.30		987515-C3	47.90		
.015 (1/64)	.003	.045 (3x)	1/8	1-1/2	45415		47215	43.30		47215-C3	47.90	47215-C4	55.00
.015 (1/64)	.005	.023 (1.5x)	1/8	1-1/2			993815	43.30		993815-C3	47.90		
.015 (1/64)	.005	.045 (3x)	1/8	1-1/2	44715		26315	43.30		26315-C3	47.90		
.018	.005	.054 (3x)	1/8	1-1/2			26318	43.30		26318-C3	47.90		NEW
.020 (.5 mm)	.003	.030 (1.5x)	1/8	1-1/2			987520	41.50		987520-C3	46.10		
.020 (.5 mm)	.003	.060 (3x)	1/8	1-1/2			47220	41.50		47220-C3	46.10		
.020 (.5 mm)	.005	.030 (1.5x)	1/8	1-1/2			993820	41.50		993820-C3	46.10		
.020 (.5 mm)	.005	.060 (3x)	1/8	1-1/2	44720		26320	41.50		26320-C3	46.10	26320-C4	53.20
.022	.005	.066 (3x)	1/8	1-1/2			26322	37.80		26322-C3	42.40		NEW
.024 (.6 mm)	.005	.072 (3x)	1/8	1-1/2			26324	37.80		26324-C3	42.40		NEW
.025	.003	.075 (3x)	1/8	1-1/2			47225	37.80		47225-C3	42.40		
.025	.005	.038 (1.5x)	1/8	1-1/2			993825	37.80		993825-C3	42.40		
.025	.005	.075 (3x)	1/8	1-1/2	44725		26325	37.80		26325-C3	42.40	26325-C4	49.50
.025	.008	.075 (3x)	1/8	1-1/2			953025	37.80		953025-C3	42.40		
.028 (.7mm)	.005	.084 (3x)	1/8	1-1/2			26328	35.00		26328-C3	39.60		NEW
.030	.003	.090 (3x)	1/8	1-1/2			47230	35.00		47230-C3	39.60		
.030	.005	.045 (1.5x)	1/8	1-1/2			993830	35.00		993830-C3	39.60		
.030	.005	.090 (3x)	1/8	1-1/2	44730		26330	35.00		26330-C3	39.60	26330-C4	46.70
.030	.008	.090 (3x)	1/8	1-1/2			953030	35.00		953030-C3	39.60		
.030	.010	.045 (1.5x)	1/8	1-1/2			994530	35.00		994530-C3	39.60		
.030	.010	.090 (3x)	1/8	1-1/2	45230		27230	35.00		27230-C3	39.60	27230-C4	46.70
.031 (1/32)	.003	.047 (1.5x)	1/8	1-1/2			987531	35.00		987531-C3	39.60		
.031 (1/32)	.003	.093 (3x)	1/8	1-1/2			47231	35.00		47231-C3	39.60		
.031 (1/32)	.005	.047 (1.5x)	1/8	1-1/2			993831	35.00		993831-C3	39.60		
.031 (1/32)	.005	.093 (3x)	1/8	1-1/2	44731	848331	26331	35.00	848331-C3	26331-C3	39.60	26331-C4	46.70
.031 (1/32)	.008	.047 (1.5x)	1/8	1-1/2			913731	35.00		913731-C3	39.60		
.031 (1/32)	.008	.093 (3x)	1/8	1-1/2			953031	35.00		953031-C3	39.60		
.031 (1/32)	.010	.047 (1.5x)	1/8	1-1/2			994531	35.00		994531-C3	39.60		
.031 (1/32)	.010	.093 (3x)	1/8	1-1/2	45231	854131	27231	35.00	854131-C3	27231-C3	39.60	27231-C4	46.70
.034	.005	.102 (3x)	1/8	1-1/2			26334	29.40		26334-C3	34.00		NEW
.035 (.9 mm)	.005	.053 (1.5x)	1/8	1-1/2			993835	29.40		993835-C3	34.00		
.035 (.9 mm)	.005	.105 (3x)	1/8	1-1/2	44735		26335	29.40		26335-C3	34.00	26335-C4	41.10
.035 (.9 mm)	.010	.053 (1.5x)	1/8	1-1/2			994535	29.40		994535-C3	34.00		
.035 (.9 mm)	.010	.105 (3x)	1/8	1-1/2	45235		27235	29.40		27235-C3	34.00	27235-C4	41.10
.037	.005	.111 (3x)	1/8	1-1/2			26337	29.40		26337-C3	34.00		NEW
.039 (1 mm)	.003	.117 (3x)	1/8	1-1/2			47239	22.80		47239-C3	27.40		
.039 (1 mm)	.005	.059 (1.5x)	1/8	1-1/2			993839	22.80		993839-C3	27.40		

continued on next page





# MINIATURE END MILLS

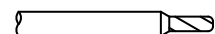
## Corner Radius – Stub & Standard (cont.)

continued from previous page

	CUTTER DIA.	CORNER RADIUS	LOC	SHANK DIA	OAL	UNCOATED				AITIN COATED			AMORPHOUS DIAMOND			
						D <sub>1</sub>	R	L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	3 FL	4 FL	PRICE	3 FL	4 FL
	.039 (1 mm)	.005	.117 (3x)	1/8	1-1/2				26339	22.80			26339-C3	27.40		
	.039 (1 mm)	.008	.117 (3x)	1/8	1-1/2				953039	22.80			953039-C3	27.40		
	.039 (1 mm)	.010	.059 (1.5x)	1/8	1-1/2				994539	22.80			994539-C3	27.40		
	.039 (1 mm)	.010	.117 (3x)	1/8	1-1/2				27239	22.80			27239-C3	27.40		
	.040	.003	.120 (3x)	1/8	1-1/2				47240	22.40			47240-C3	27.00		
	.040	.005	.060 (1.5x)	1/8	1-1/2				865140	993840	22.40	865140-C3	993840-C3	27.00		
	.040	.005	.120 (3x)	1/8	1-1/2	44740	848340	26340	22.40			848340-C3	26340-C3	27.00	26340-C4	34.10
	.040	.008	.120 (3x)	1/8	1-1/2				953040	22.40			953040-C3	27.00		
	.040	.010	.060 (1.5x)	1/8	1-1/2				994540	22.40			994540-C3	27.00		
	.040	.010	.120 (3x)	1/8	1-1/2	45240		27240	22.40				27240-C3	27.00	27240-C4	34.10
	.045	.005	.068 (1.5x)	1/8	1-1/2				993845	22.40			993845-C3	27.00		
	.045	.005	.135 (3x)	1/8	1-1/2	44745		26345	22.40				26345-C3	27.00	26345-C4	34.10
	.045	.010	.068 (1.5x)	1/8	1-1/2				994545	22.40			994545-C3	27.00		
	.045	.010	.135 (3x)	1/8	1-1/2	45245		27245	22.40				27245-C3	27.00	27245-C4	34.10
	.045	.015	.068 (1.5x)	1/8	1-1/2				997945	22.40			997945-C3	27.00		
	.045	.015	.135 (3x)	1/8	1-1/2	45545		28145	22.40				28145-C3	27.00	28145-C4	34.10
NEW	.046	.005	.138 (3x)	1/8	1-1/2				26346	22.40			26346-C3	27.00		
	.047 (3/64)	.003	.071 (1.5x)	1/8	1-1/2				987547	22.40			987547-C3	27.00		
	.047 (3/64)	.003	.141 (3x)	1/8	1-1/2				47247	22.40			47247-C3	27.00		
	.047 (3/64)	.005	.071 (1.5x)	1/8	1-1/2				993847	22.40			993847-C3	27.00		
	.047 (3/64)	.005	.141 (3x)	1/8	1-1/2	44747	848347	26347	22.40			848347-C3	26347-C3	27.00	26347-C4	34.10
	.047 (3/64)	.008	.071 (1.5x)	1/8	1-1/2				913747	22.40			913747-C3	27.00		
	.047 (3/64)	.008	.141 (3x)	1/8	1-1/2				953047	22.40			953047-C3	27.00		
	.047 (3/64)	.010	.071 (1.5x)	1/8	1-1/2				994547	22.40			994547-C3	27.00		
	.047 (3/64)	.010	.141 (3x)	1/8	1-1/2	45247		27247	22.40				27247-C3	27.00	27247-C4	34.10
	.047 (3/64)	.012	.141 (3x)	1/8	1-1/2				966947	22.40			966947-C3	27.00		
NEW	.047 (3/64)	.015	.071 (1.5x)	1/8	1-1/2	830147	860847	997947	22.40			860847-C3	997947-C3	27.00		
	.047 (3/64)	.015	.141 (3x)	1/8	1-1/2	45547	867247	28147	22.40			867247-C3	28147-C3	27.00	28147-C4	34.10
	.050	.003	.150 (3x)	1/8	1-1/2				47250	22.40			47250-C3	27.00		
	.050	.005	.075 (1.5x)	1/8	1-1/2				993850	22.40			993850-C3	27.00		
	.050	.005	.150 (3x)	1/8	1-1/2	44750	848350	26350	22.40			848350-C3	26350-C3	27.00	26350-C4	34.10
NEW	.050	.008	.075 (1.5x)	1/8	1-1/2				913750	22.40			913750-C3	27.00		
	.050	.008	.150 (3x)	1/8	1-1/2				953050	22.40			953050-C3	27.00		
	.050	.010	.075 (1.5x)	1/8	1-1/2				994550	22.40			994550-C3	27.00		
	.050	.010	.150 (3x)	1/8	1-1/2	45250		27250	22.40				27250-C3	27.00	27250-C4	34.10
	.050	.015	.075 (1.5x)	1/8	1-1/2				997950	22.40			997950-C3	27.00		
	.050	.015	.150 (3x)	1/8	1-1/2	45550		28150	22.40				28150-C3	27.00	28150-C4	34.10
	.055 (1.4 mm)	.003	.165 (3x)	1/8	1-1/2				47255	22.40			47255-C3	27.00		
	.055 (1.4 mm)	.005	.083 (1.5x)	1/8	1-1/2				993855	22.40			993855-C3	27.00		
	.055 (1.4 mm)	.005	.165 (3x)	1/8	1-1/2	44755		26355	22.40				26355-C3	27.00	26355-C4	34.10
	.055 (1.4 mm)	.008	.165 (3x)	1/8	1-1/2				953055	22.40			953055-C3	27.00		
	.055 (1.4 mm)	.010	.083 (1.5x)	1/8	1-1/2				994555	22.40			994555-C3	27.00		
	.055 (1.4 mm)	.010	.165 (3x)	1/8	1-1/2	45255		27255	22.40				27255-C3	27.00	27255-C4	34.10
	.055 (1.4 mm)	.015	.083 (1.5x)	1/8	1-1/2				997955	22.40			997955-C3	27.00		
	.055 (1.4 mm)	.015	.165 (3x)	1/8	1-1/2	45555		28155	22.40				28155-C3	27.00	28155-C4	34.10
NEW	.059	.005	.177 (3x)	1/8	1-1/2				26359	22.40			26359-C3	27.00		

CORNER RADIUS

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# MINIATURE END MILLS

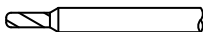
## Corner Radius – Stub & Standard (cont.)

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CORNER RADIUS

CUTTER DIA.	CORNER RADIUS	LOC	SHANK DIA	OAL	UNCOATED				AITIN COATED			AMORPHOUS DIAMOND			
					D <sub>1</sub>	R	L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	3 FL	4 FL	PRICE	3 FL	4 FL
.060	.003	.180 (3x)	1/8	1-1/2				47260	22.40			47260-C3	27.00		
.060	.005	.090 (1.5x)	1/8	1-1/2				993860	22.40			993860-C3	27.00		
.060	.005	.180 (3x)	1/8	1-1/2	44760	848360	26360	22.40		848360-C3	26360-C3	27.00	26360-C4	34.10	
.060	.008	.180 (3x)	1/8	1-1/2				953060	22.40			953060-C3	27.00		
.060	.010	.090 (1.5x)	1/8	1-1/2				994560	22.40			994560-C3	27.00		
.060	.010	.180 (3x)	1/8	1-1/2	45260			27260	22.40			27260-C3	27.00	27260-C4	34.10
.060	.015	.090 (1.5x)	1/8	1-1/2				997960	22.40			997960-C3	27.00		
.060	.015	.180 (3x)	1/8	1-1/2	45560			28160	22.40			28160-C3	27.00	28160-C4	34.10
.060	.020	.090 (1.5x)	1/8	1-1/2				966460	22.40			966460-C3	27.00		
.060	.020	.180 (3x)	1/8	1-1/2				51660	22.40			51660-C3	27.00		
.062 (1/16)	.003	.093 (1.5x)	1/8	1-1/2				987562	22.40			987562-C3	27.00		
.062 (1/16)	.003	.186 (3x)	1/8	1-1/2	45462			47262	22.40			47262-C3	27.00		
.062 (1/16)	.005	.093 (1.5x)	1/8	1-1/2	804562	865162	993862	22.40		865162-C3	993862-C3	27.00			NEW
.062 (1/16)	.005	.186 (3x)	1/8	1-1/2	44762	848362	26362	22.40		848362-C3	26362-C3	27.00	26362-C4	34.10	
.062 (1/16)	.008	.093 (1.5x)	1/8	1-1/2				913762	22.40			913762-C3	27.00		
.062 (1/16)	.008	.186 (3x)	1/8	1-1/2	843962			953062	22.40			953062-C3	27.00		
.062 (1/16)	.010	.093 (1.5x)	1/8	1-1/2	830362	864662	994562	22.40		864662-C3	994562-C3	27.00	994562-C4	34.10	NEW
.062 (1/16)	.010	.186 (3x)	1/8	1-1/2	45262	854162	27262	22.40		854162-C3	27262-C3	27.00	27262-C4	34.10	
.062 (1/16)	.012	.093 (1.5x)	1/8	1-1/2				904862	22.40			904862-C3	27.00		
.062 (1/16)	.012	.186 (3x)	1/8	1-1/2				966962	22.40			966962-C3	27.00		
.062 (1/16)	.015	.093 (1.5x)	1/8	1-1/2	830162	860862	997962	22.40		860862-C3	997962-C3	27.00			
.062 (1/16)	.015	.186 (3x)	1/8	1-1/2	45562	867262	28162	22.40		867262-C3	28162-C3	27.00	28162-C4	34.10	
.062 (1/16)	.020	.093 (1.5x)	1/8	1-1/2				966462	22.40			966462-C3	27.00		
.062 (1/16)	.020	.186 (3x)	1/8	1-1/2	51362	857762	51662	22.40		857762-C3	51662-C3	27.00	51662-C4	34.10	
.065	.005	.098 (1.5x)	1/8	1-1/2				993865	22.40			993865-C3	27.00		
.065	.005	.195 (3x)	1/8	1-1/2	44765			26365	22.40			26365-C3	27.00	26365-C4	34.10
.065	.010	.098 (1.5x)	1/8	1-1/2				994565	22.40			994565-C3	27.00		
.065	.010	.195 (3x)	1/8	1-1/2	45265			27265	22.40			27265-C3	27.00	27265-C4	34.10
.065	.015	.195 (3x)	1/8	1-1/2	45565			28165	22.40			28165-C3	27.00	28165-C4	34.10
.065	.020	.195 (3x)	1/8	1-1/2				51665	22.40			51665-C3	27.00		
.070	.003	.210 (3x)	1/8	1-1/2				47270	22.40			47270-C3	27.00		
.070	.005	.105 (1.5x)	1/8	1-1/2				993870	22.40			993870-C3	27.00		
.070	.005	.210 (3x)	1/8	1-1/2	44770			26370	22.40			26370-C3	27.00	26370-C4	34.10
.070	.008	.210 (3x)	1/8	1-1/2				953070	22.40			953070-C3	27.00		
.070	.010	.105 (1.5x)	1/8	1-1/2				994570	22.40			994570-C3	27.00		
.070	.010	.210 (3x)	1/8	1-1/2	45270			27270	22.40			27270-C3	27.00	27270-C4	34.10
.070	.015	.210 (3x)	1/8	1-1/2	45570			28170	22.40			28170-C3	27.00	28170-C4	34.10
.070	.020	.210 (3x)	1/8	1-1/2				51670	22.40			51670-C3	27.00		
.075	.005	.113 (1.5x)	1/8	1-1/2				993875	22.40			993875-C3	27.00		
.075	.005	.225 (3x)	1/8	1-1/2	44775			26375	22.40			26375-C3	27.00	26375-C4	34.10
.075	.010	.113 (1.5x)	1/8	1-1/2				994575	22.40			994575-C3	27.00		
.075	.010	.225 (3x)	1/8	1-1/2	45275			27275	22.40			27275-C3	27.00	27275-C4	34.10
.075	.015	.225 (3x)	1/8	1-1/2	45575			28175	22.40			28175-C3	27.00	28175-C4	34.10
.078 (5/64)	.003	.234 (3x)	1/8	1-1/2				47278	22.40			47278-C3	27.00		
.078 (5/64)	.005	.117 (1.5x)	1/8	1-1/2				993878	22.40			993878-C3	27.00		
.078 (5/64)	.005	.234 (3x)	1/8	1-1/2	44778	848378	26378	22.40		848378-C3	26378-C3	27.00	26378-C4	34.10	
.078 (5/64)	.008	.117 (1.5x)	1/8	1-1/2				913778	22.40			913778-C3	27.00		
.078 (5/64)	.008	.234 (3x)	1/8	1-1/2				953078	22.40			953078-C3	27.00		

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**MINIATURE END MILLS**

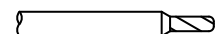
Corner Radius – Stub & Standard (cont.)

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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	4 FL	PRICE
.078 (5/64)	<b>.010</b>	.117 (1.5x)	1/8	1-1/2	830378	864678	994578	22.40	864678-C3	994578-C3	27.00		
.078 (5/64)	<b>.010</b>	.234 (3x)	1/8	1-1/2	45278	854178	27278	22.40	854178-C3	27278-C3	27.00	27278-C4	34.10
.078 (5/64)	<b>.012</b>	.234 (3x)	1/8	1-1/2			966978	22.40		966978-C3	27.00		
.078 (5/64)	<b>.015</b>	.117 (1.5x)	1/8	1-1/2		860878	997978	22.40	860878-C3	997978-C3	27.00		
.078 (5/64)	<b>.015</b>	.234 (3x)	1/8	1-1/2	45578	867278	28178	22.40	867278-C3	28178-C3	27.00	28178-C4	34.10
<b>NEW</b> .078 (5/64)	<b>.020</b>	.117 (1.5x)	1/8	1-1/2	810678		966478	22.40		966478-C3	27.00		
.078 (5/64)	<b>.020</b>	.234 (3x)	1/8	1-1/2	51378		51678	22.40		51678-C3	27.00	51678-C4	34.10
.078 (5/64)	<b>.025</b>	.117 (1.5x)	1/8	1-1/2			964078	22.40		964078-C3	27.00		
.078 (5/64)	<b>.025</b>	.234 (3x)	1/8	1-1/2		842678	957178	22.40	842678-C3	957178-C3	27.00		
.080	<b>.003</b>	.240 (3x)	1/8	1-1/2			47280	22.40		47280-C3	27.00		
.080	<b>.005</b>	.120 (1.5x)	1/8	1-1/2			993880	22.40		993880-C3	27.00		
.080	<b>.005</b>	.240 (3x)	1/8	1-1/2	44780		26380	22.40		26380-C3	27.00	26380-C4	34.10
.080	<b>.008</b>	.240 (3x)	1/8	1-1/2			953080	22.40		953080-C3	27.00		
.080	<b>.010</b>	.120 (1.5x)	1/8	1-1/2			994580	22.40		994580-C3	27.00		
.080	<b>.010</b>	.240 (3x)	1/8	1-1/2	45280		27280	22.40		27280-C3	27.00	27280-C4	34.10
.080	<b>.015</b>	.240 (3x)	1/8	1-1/2	45580		28180	22.40		28180-C3	27.00	28180-C4	34.10
.080	<b>.020</b>	.240 (3x)	1/8	1-1/2			51680	22.40		51680-C3	27.00		
.085	<b>.005</b>	.128 (1.5x)	1/8	1-1/2			993885	22.40		993885-C3	27.00		
.085	<b>.005</b>	.255 (3x)	1/8	1-1/2	44785		26385	22.40		26385-C3	27.00	26385-C4	34.10
.085	<b>.010</b>	.128 (1.5x)	1/8	1-1/2			994585	22.40		994585-C3	27.00		
.085	<b>.010</b>	.255 (3x)	1/8	1-1/2	45285		27285	22.40		27285-C3	27.00	27285-C4	34.10
.085	<b>.015</b>	.255 (3x)	1/8	1-1/2	45585		28185	22.40		28185-C3	27.00	28185-C4	34.10
.090	<b>.003</b>	.270 (3x)	1/8	1-1/2			47290	22.40		47290-C3	27.00		
.090	<b>.005</b>	.135 (1.5x)	1/8	1-1/2			993890	22.40		993890-C3	27.00		
.090	<b>.005</b>	.270 (3x)	1/8	1-1/2	44790		26390	22.40		26390-C3	27.00	26390-C4	34.10
.090	<b>.008</b>	.270 (3x)	1/8	1-1/2			953090	22.40		953090-C3	27.00		
.090	<b>.010</b>	.135 (1.5x)	1/8	1-1/2			994590	22.40		994590-C3	27.00		
.090	<b>.010</b>	.270 (3x)	1/8	1-1/2	45290		27290	22.40		27290-C3	27.00	27290-C4	34.10
.090	<b>.015</b>	.135 (1.5x)	1/8	1-1/2			997990	22.40		997990-C3	27.00		
.090	<b>.015</b>	.270 (3x)	1/8	1-1/2	45590		28190	22.40		28190-C3	27.00	28190-C4	34.10
.090	<b>.020</b>	.135 (1.5x)	1/8	1-1/2			966490	22.40		966490-C3	27.00		
.090	<b>.020</b>	.270 (3x)	1/8	1-1/2			51690	22.40		51690-C3	27.00		
.090	<b>.030</b>	.135 (1.5x)	1/8	1-1/2			958890	22.40		958890-C3	27.00		
.090	<b>.030</b>	.270 (3x)	1/8	1-1/2			28690	22.40		28690-C3	27.00		
.093 (3/32)	<b>.003</b>	.140 (1.5x)	1/8	1-1/2			987593	22.40		987593-C3	27.00		
.093 (3/32)	<b>.003</b>	.279 (3x)	1/8	1-1/2	45493		47293	22.40		47293-C3	27.00		
<b>NEW</b> .093 (3/32)	<b>.005</b>	.140 (1.5x)	1/8	1-1/2	804593	865193	993893	22.40	865193-C3	993893-C3	27.00		
.093 (3/32)	<b>.005</b>	.279 (3x)	1/8	1-1/2	44793	848393	26393	22.40	848393-C3	26393-C3	27.00	26393-C4	34.10
.093 (3/32)	<b>.008</b>	.140 (1.5x)	1/8	1-1/2			913793	22.40		913793-C3	27.00		
.093 (3/32)	<b>.008</b>	.279 (3x)	1/8	1-1/2	843993		953093	22.40		953093-C3	27.00		
<b>NEW</b> .093 (3/32)	<b>.010</b>	.140 (1.5x)	1/8	1-1/2	830393		994593	22.40		994593-C3	27.00	994593-C4	34.10
.093 (3/32)	<b>.010</b>	.279 (3x)	1/8	1-1/2	45293	854193	27293	22.40	854193-C3	27293-C3	27.00	27293-C4	34.10
.093 (3/32)	<b>.012</b>	.140 (1.5x)	1/8	1-1/2			904893	22.40		904893-C3	27.00		
.093 (3/32)	<b>.012</b>	.279 (3x)	1/8	1-1/2			966993	22.40		966993-C3	27.00		
<b>NEW</b> .093 (3/32)	<b>.015</b>	.140 (1.5x)	1/8	1-1/2	830193	860893	997993	22.40	860893-C3	997993-C3	27.00		
.093 (3/32)	<b>.015</b>	.279 (3x)	1/8	1-1/2	45593	867293	28193	22.40	867293-C3	28193-C3	27.00	28193-C4	34.10
<b>NEW</b> .093 (3/32)	<b>.020</b>	.140 (1.5x)	1/8	1-1/2	810693	858793	966493	22.40	858793-C3	966493-C3	27.00		
.093 (3/32)	<b>.020</b>	.279 (3x)	1/8	1-1/2	51393	857793	51693	22.40	857793-C3	51693-C3	27.00	51693-C4	34.10

CORNER RADIUS

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# MINIATURE END MILLS

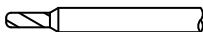
## Corner Radius – Stub & Standard (cont.)

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CORNER RADIUS

CUTTER DIA.	CORNER RADIUS	LOC	SHANK DIA	OAL	UNCOATED				ATIN COATED			AMORPHOUS DIAMOND	
					2 FL	3 FL	4 FL	PRICE	3 FL	4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	R <sup>+0.01"</sup> / <sub>-0.01"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>									
.093 (3/32)	.025	.140 (1.5x)	1/8	1-1/2			964093	22.40		964093-C3	27.00		
.093 (3/32)	.025	.279 (3x)	1/8	1-1/2			957193	22.40		957193-C3	27.00		
.093 (3/32)	.030	.140 (1.5x)	1/8	1-1/2			958893	22.40		958893-C3	27.00		
.093 (3/32)	.030	.279 (3x)	1/8	1-1/2	73993	853493	28693	22.40	853493-C3	28693-C3	27.00	28693-C4	34.10
.095	.005	.143 (1.5x)	1/8	1-1/2			993895	22.40		993895-C3	27.00		
.095	.005	.285 (3x)	1/8	1-1/2	44795		26395	22.40		26395-C3	27.00	26395-C4	34.10
.095	.010	.143 (1.5x)	1/8	1-1/2			994595	22.40		994595-C3	27.00		
.095	.010	.285 (3x)	1/8	1-1/2	45295		27295	22.40		27295-C3	27.00	27295-C4	34.10
.095	.015	.285 (3x)	1/8	1-1/2	45595		28195	22.40		28195-C3	27.00	28195-C4	34.10
.095	.020	.285 (3x)	1/8	1-1/2			51695	22.40		51695-C3	27.00		
.095	.030	.285 (3x)	1/8	1-1/2			28695	22.40		28695-C3	27.00		
.100	.005	.150 (1.5x)	1/8	1-1/2			993899	22.40		993899-C3	27.00		
.100	.005	.300 (3x)	1/8	1-1/2	44799		26399	22.40		26399-C3	27.00	26399-C4	34.10
.100	.008	.300 (3x)	1/8	1-1/2			953099	22.40		953099-C3	27.00		
.100	.010	.150 (1.5x)	1/8	1-1/2			994599	22.40		994599-C3	27.00		
.100	.010	.300 (3x)	1/8	1-1/2	45299		27299	22.40		27299-C3	27.00	27299-C4	34.10
.100	.015	.150 (1.5x)	1/8	1-1/2			997999	22.40		997999-C3	27.00		
.100	.015	.300 (3x)	1/8	1-1/2	45599		28199	22.40		28199-C3	27.00	28199-C4	34.10
.100	.020	.150 (1.5x)	1/8	1-1/2			966499	22.40		966499-C3	27.00		
.100	.020	.300 (3x)	1/8	1-1/2			51699	22.40		51699-C3	27.00		
.100	.030	.150 (1.5x)	1/8	1-1/2			958899	22.40		958899-C3	27.00		
.100	.030	.300 (3x)	1/8	1-1/2			28699	22.40		28699-C3	27.00		
.109 (7/64)	.003	.327 (3x)	1/8	1-1/2			10802	22.40		10802-C3	27.00		
.109 (7/64)	.005	.164 (1.5x)	1/8	1-1/2			941402	22.40		941402-C3	27.00		
.109 (7/64)	.005	.327 (3x)	1/8	1-1/2			72902	22.40		72902-C3	27.00		
.109 (7/64)	.008	.327 (3x)	1/8	1-1/2			75502	22.40		75502-C3	27.00		
.109 (7/64)	.010	.164 (1.5x)	1/8	1-1/2			936902	22.40		936902-C3	27.00		
.109 (7/64)	.010	.327 (3x)	1/8	1-1/2			75802	22.40		75802-C3	27.00		
.109 (7/64)	.015	.164 (1.5x)	1/8	1-1/2			935002	22.40		935002-C3	27.00		
.109 (7/64)	.015	.327 (3x)	1/8	1-1/2			74202	22.40		74202-C3	27.00		
.109 (7/64)	.020	.164 (1.5x)	1/8	1-1/2			872002	22.40		872002-C3	27.00		
.109 (7/64)	.020	.327 (3x)	1/8	1-1/2			986302	22.40		986302-C3	27.00		
.109 (7/64)	.030	.164 (1.5x)	1/8	1-1/2			892402	22.40		892402-C3	27.00		
.109 (7/64)	.030	.327 (3x)	1/8	1-1/2			937602	22.40		937602-C3	27.00		
.118 (3 mm)	.005	.177 (1.5x)	1/8	1-1/2			941405	22.80		941405-C3	27.40		
.118 (3 mm)	.005	.354 (3x)	1/8	1-1/2			72905	22.80		72905-C3	27.40		
.118 (3 mm)	.008	.354 (3x)	1/8	1-1/2			916705	22.80		916705-C3	27.40		
.118 (3 mm)	.010	.177 (1.5x)	1/8	1-1/2			936905	22.80		936905-C3	27.40		
.118 (3 mm)	.010	.354 (3x)	1/8	1-1/2			75805	22.80		75805-C3	27.40		
.118 (3 mm)	.015	.177 (1.5x)	1/8	1-1/2			935005	22.80		935005-C3	27.40		
.118 (3 mm)	.015	.354 (3x)	1/8	1-1/2			74205	22.80		74205-C3	27.40		
.118 (3 mm)	.020	.177 (1.5x)	1/8	1-1/2			872005	22.80		872005-C3	27.40		
.118 (3 mm)	.020	.354 (3x)	1/8	1-1/2			986305	22.80		986305-C3	27.40		
.118 (3 mm)	.030	.177 (1.5x)	1/8	1-1/2			892405	22.80		892405-C3	27.40		
.118 (3 mm)	.030	.354 (3x)	1/8	1-1/2			937605	22.80		937605-C3	27.40		
.118 (3 mm)	.040	.354 (3x)	1/8	1-1/2			874005	22.80		874005-C3	27.40		

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# MINIATURE END MILLS

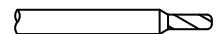
## Corner Radius – Stub & Standard (cont.)

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	CUTTER DIA.	CORNER RADIUS	LOC	SHANK DIA	OAL	UNCOATED				A1TiN COATED			AMORPHOUS DIAMOND	
						2 FL	3 FL	4 FL	PRICE	3 FL	4 FL	PRICE	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>	D <sub>2</sub>	L <sub>1</sub>									
	.125 (1/8)	<b>.003</b>	.187 (1.5x)	1/8	1-1/2			980203	21.60		980203-C3	26.20		
	.125 (1/8)	<b>.003</b>	.500 (4x)	1/8	1-1/2	46403		32403	21.60		32403-C3	26.20		
<b>NEW</b>	.125 (1/8)	<b>.005</b>	.187 (1.5x)	1/8	1-1/2	<b>832905</b>	833405	980205	22.40	833405-C3	980205-C3	27.00		
	.125 (1/8)	<b>.005</b>	.500 (4x)	1/8	1-1/2	46405	870905	32405	22.40	870905-C3	32405-C3	27.00	32405-C4	34.10
	.125 (1/8)	<b>.008</b>	.187 (1.5x)	1/8	1-1/2			980208	22.40		980208-C3	27.00		
	.125 (1/8)	<b>.008</b>	.500 (4x)	1/8	1-1/2	46408		32408	22.40		32408-C3	27.00		
	.125 (1/8)	<b>.010</b>	.187 (1.5x)	1/8	1-1/2	832910	833410	980210	21.60	833410-C3	980210-C3	26.20	980210-C4	33.30
	.125 (1/8)	<b>.010</b>	.500 (4x)	1/8	1-1/2	46410	870910	32410	21.60	870910-C3	32410-C3	26.20	32410-C4	33.30
	.125 (1/8)	<b>.012</b>	.187 (1.5x)	1/8	1-1/2			980212	22.40		980212-C3	27.00		
	.125 (1/8)	<b>.012</b>	.500 (4x)	1/8	1-1/2			32412	22.40		32412-C3	27.00		
	.125 (1/8)	<b>.015</b>	.187 (1.5x)	1/8	1-1/2			833415	980215	21.60	833415-C3	980215-C3	26.20	
	.125 (1/8)	<b>.015</b>	.500 (4x)	1/8	1-1/2	46415	870915	32415	21.60	870915-C3	32415-C3	26.20	32415-C4	33.30
	.125 (1/8)	<b>.020</b>	.187 (1.5x)	1/8	1-1/2	832920	833420	980220	21.60	833420-C3	980220-C3	26.20		
	.125 (1/8)	<b>.020</b>	.500 (4x)	1/8	1-1/2	46420	870920	32420	21.60	870920-C3	32420-C3	26.20	32420-C4	33.30
	.125 (1/8)	<b>.025</b>	.187 (1.5x)	1/8	1-1/2			980225	22.40		980225-C3	27.00		
	.125 (1/8)	<b>.025</b>	.500 (4x)	1/8	1-1/2	46425		32425	22.40		32425-C3	27.00		
	.125 (1/8)	<b>.030</b>	.187 (1.5x)	1/8	1-1/2	832930	833430	980230	21.60	833430-C3	980230-C3	26.20		
	.125 (1/8)	<b>.030</b>	.500 (4x)	1/8	1-1/2	46430	870930	32430	21.60	870930-C3	32430-C3	26.20	32430-C4	33.30
	.125 (1/8)	<b>.040</b>	.187 (1.5x)	1/8	1-1/2			833440	980240	22.40	833440-C3	980240-C3	27.00	
	.125 (1/8)	<b>.040</b>	.500 (4x)	1/8	1-1/2	46440		32440	22.40		32440-C3	27.00		
	.125 (1/8)	<b>.045</b>	.187 (1.5x)	1/8	1-1/2			980245	21.60		980245-C3	26.20		
	.125 (1/8)	<b>.045</b>	.500 (4x)	1/8	1-1/2			32445	21.60		32445-C3	26.20		
	.140 (9/64)	<b>.005</b>	.220 (1.5x)	3/16	2			857105	27.20		857105-C3	32.20		
	.140 (9/64)	<b>.005</b>	.425 (3x)	3/16	2			966705	27.20		966705-C3	32.20		
	.140 (9/64)	<b>.010</b>	.220 (1.5x)	3/16	2			857110	26.10		857110-C3	31.10		
<b>NEW</b>	.140 (9/64)	<b>.010</b>	.425 (3x)	3/16	2	<b>810910</b>		966710	26.10		966710-C3	31.10		
	.140 (9/64)	<b>.015</b>	.220 (1.5x)	3/16	2			833315	857115	26.10	833315-C3	857115-C3	31.10	
<b>NEW</b>	.140 (9/64)	<b>.015</b>	.425 (3x)	3/16	2	<b>810915</b>	832115	966715	26.10	832115-C3	966715-C3	31.10		
	.140 (9/64)	<b>.020</b>	.220 (1.5x)	3/16	2			857120	26.10		857120-C3	31.10		
	.140 (9/64)	<b>.020</b>	.425 (3x)	3/16	2			966720	26.10		966720-C3	31.10		
	.140 (9/64)	<b>.030</b>	.220 (1.5x)	3/16	2			857130	26.10		857130-C3	31.10		
	.140 (9/64)	<b>.030</b>	.425 (3x)	3/16	2			966730	26.10		966730-C3	31.10		
	.140 (9/64)	<b>.040</b>	.220 (1.5x)	3/16	2			857140	27.20		857140-C3	31.80		
	.140 (9/64)	<b>.040</b>	.425 (3x)	3/16	2			966740	27.20		966740-C3	32.20		
	.140 (9/64)	<b>.045</b>	.220 (1.5x)	3/16	2			857145	26.10		857145-C3	31.10		
	.140 (9/64)	<b>.045</b>	.425 (3x)	3/16	2			966745	26.10		966745-C3	31.10		
	.156 (5/32)	<b>.005</b>	.235 (1.5x)	3/16	2			954805	24.90		954805-C3	29.90		
	.156 (5/32)	<b>.005</b>	.562 (3x)	3/16	2			75205	24.90		75205-C3	29.90		
	.156 (5/32)	<b>.010</b>	.235 (1.5x)	3/16	2			954810	23.90		954810-C3	28.90		
	.156 (5/32)	<b>.010</b>	.562 (3x)	3/16	2	71910		75210	23.90		75210-C3	28.90		
	.156 (5/32)	<b>.015</b>	.235 (1.5x)	3/16	2			954815	23.90		954815-C3	28.90		
	.156 (5/32)	<b>.015</b>	.562 (3x)	3/16	2	71915		75215	23.90		75215-C3	28.90		
	.156 (5/32)	<b>.020</b>	.235 (1.5x)	3/16	2			954820	23.90		954820-C3	28.90		
	.156 (5/32)	<b>.020</b>	.562 (3x)	3/16	2			75220	23.90		75220-C3	28.90	75220-C4	40.00
<b>NEW</b>	.156 (5/32)	<b>.025</b>	.562 (3x)	3/16	2			<b>75225</b>	23.90		<b>75225-C3</b>	28.90		
	.156 (5/32)	<b>.030</b>	.235 (1.5x)	3/16	2			954830	23.90		954830-C3	28.90		
	.156 (5/32)	<b>.030</b>	.562 (3x)	3/16	2	71930	832030	75230	23.90	832030-C3	75230-C3	28.90	75230-C4	40.00
	.156 (5/32)	<b>.040</b>	.235 (1.5x)	3/16	2			954840	24.90		954840-C3	29.90		

CORNER RADIUS

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# MINIATURE END MILLS

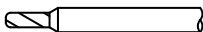
## Corner Radius – Stub & Standard (cont.)

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CORNER RADIUS

CUTTER DIA.	CORNER RADIUS	LOC	SHANK DIA	OAL	UNCOATED				AITIN COATED			AMORPHOUS DIAMOND		
					2 FL	3 FL	4 FL	PRICE	3 FL	4 FL	PRICE	4 FL	PRICE	
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	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>	L <sub>1</sub>										
.156 (5/32)	.040	.562 (3x)	3/16	2			75240	24.90		75240-C3	29.90			
.156 (5/32)	.045	.235 (1.5x)	3/16	2			954845	23.90		954845-C3	28.90			
.156 (5/32)	.045	.562 (3x)	3/16	2			75245	23.90		75245-C3	28.90			
.172 (11/64)	.010	.515 (3x)	3/16	2			855310	23.90		855310-C3	28.90			
.172 (11/64)	.030	.515 (3x)	3/16	2			855330	23.90		855330-C3	28.90			
.187 (3/16)	.005	.285 (1.5x)	3/16	2			937905	24.90		937905-C3	29.90			
.187 (3/16)	.005	.625 (3x)	3/16	2	46705		34805	24.90		34805-C3	29.90			
.187 (3/16)	.008	.285 (1.5x)	3/16	2			937908	24.90		937908-C3	29.90			
.187 (3/16)	.008	.625 (3x)	3/16	2			831908	34808	24.90	831908-C3	34808-C3	29.90		
.187 (3/16)	.010	.285 (1.5x)	3/16	2			833210	937910	23.90	833210-C3	937910-C3	28.90		
.187 (3/16)	.010	.625 (3x)	3/16	2	46710	831910	34810	23.90		831910-C3	34810-C3	28.90	34810-C4	40.00
.187 (3/16)	.012	.285 (1.5x)	3/16	2			937912	24.90		937912-C3	29.90			
.187 (3/16)	.012	.625 (3x)	3/16	2			34812	24.90		34812-C3	29.90			
.187 (3/16)	.015	.285 (1.5x)	3/16	2			937915	23.90		937915-C3	28.90			
.187 (3/16)	.015	.625 (3x)	3/16	2	46715		34815	23.90		34815-C3	28.90	34815-C4	40.00	
.187 (3/16)	.020	.285 (1.5x)	3/16	2			937920	23.90		937920-C3	28.90			
.187 (3/16)	.020	.625 (3x)	3/16	2	46720		34820	23.90		34820-C3	28.90			
.187 (3/16)	.025	.285 (1.5x)	3/16	2			937925	24.90		937925-C3	29.90			
.187 (3/16)	.025	.625 (3x)	3/16	2	46725		34825	24.90		34825-C3	29.90			
.187 (3/16)	.030	.285 (1.5x)	3/16	2			937930	23.90		937930-C3	28.90			
.187 (3/16)	.030	.625 (3x)	3/16	2	46730		34830	23.90		34830-C3	28.90	34830-C4	40.00	
.187 (3/16)	.040	.285 (1.5x)	3/16	2			937940	24.90		937940-C3	29.90			
.187 (3/16)	.040	.625 (3x)	3/16	2	46740		34840	24.90		34840-C3	29.90			
.187 (3/16)	.045	.285 (1.5x)	3/16	2			937945	23.90		937945-C3	28.90			
.187 (3/16)	.045	.625 (3x)	3/16	2	46745		34845	23.90		34845-C3	28.90	34845-C4	40.00	
.187 (3/16)	.050	.625 (3x)	3/16	2			34850	24.90		34850-C3	29.90			
.187 (3/16)	.060	.285 (1.5x)	3/16	2		810560	833260	937960	23.90	833260-C3	937960-C3	28.90		
.187 (3/16)	.060	.625 (3x)	3/16	2	46760	831960	34860	23.90		831960-C3	34860-C3	28.90	34860-C4	40.00
.203 (13/64)	.010	.610 (3x)	1/4	2-1/2			865610	29.40		865610-C3	36.20			
.203 (13/64)	.030	.610 (3x)	1/4	2-1/2			865630	29.40		865630-C3	36.20			
.218 (7/32)	.010	.660 (3x)	1/4	2-1/2			863910	29.40		863910-C3	36.20			
.218 (7/32)	.030	.660 (3x)	1/4	2-1/2			863930	29.40		863930-C3	36.20			
.234 (15/64)	.010	.705 (3x)	1/4	2-1/2			863510	29.40		863510-C3	36.20			
.234 (15/64)	.030	.705 (3x)	1/4	2-1/2			863530	29.40		863530-C3	36.20			
.250 (1/4)	.005	.375 (1.5x)	1/4	2-1/2		810805	833005	941105	30.60	833005-C3	941105-C3	37.40		
.250 (1/4)	.005	.750 (3x)	1/4	2-1/2	47405	831805	36205	30.60		831805-C3	36205-C3	37.40	36205-C4	48.90
.250 (1/4)	.008	.375 (1.5x)	1/4	2-1/2			941108	30.60		941108-C3	37.40			
.250 (1/4)	.008	.750 (3x)	1/4	2-1/2			36208	30.60		36208-C3	37.40			
.250 (1/4)	.010	.375 (1.5x)	1/4	2-1/2		810810	833010	941110	29.40	833010-C3	941110-C3	36.20		
.250 (1/4)	.010	.750 (3x)	1/4	2-1/2	47410	831810	36210	29.40		831810-C3	36210-C3	36.20	36210-C4	47.70
.250 (1/4)	.012	.750 (3x)	1/4	2-1/2			36212	30.60		36212-C3	37.40			
.250 (1/4)	.015	.375 (1.5x)	1/4	2-1/2			833015	941115	29.40	833015-C3	941115-C3	36.20		
.250 (1/4)	.015	.750 (3x)	1/4	2-1/2	47415	831815	36215	29.40		831815-C3	36215-C3	36.20	36215-C4	47.70
.250 (1/4)	.020	.375 (1.5x)	1/4	2-1/2			941120	29.40		941120-C3	36.20			
.250 (1/4)	.020	.750 (3x)	1/4	2-1/2	47420		36220	29.40		36220-C3	36.20	36220-C4	47.70	

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# MINIATURE END MILLS

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

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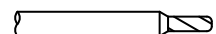
	CUTTER DIA. D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	CORNER RADIUS R <sup>+0.001"</sup> / <sub>-.001"</sub>	LOC L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	SHANK DIA D <sub>2</sub>	OAL L <sub>1</sub>	UNCOATED				AITIN COATED			AMORPHOUS DIAMOND		
						2 FL	3 FL	4 FL	PRICE	3 FL	4 FL	PRICE	4 FL	PRICE	
	.250 (1/4)	.025	.375 (1.5x)	1/4	2-1/2			941125	30.60		941125-C3	37.40			
	.250 (1/4)	.025	.750 (3x)	1/4	2-1/2			36225	30.60		36225-C3	37.40			
	.250 (1/4)	.030	.375 (1.5x)	1/4	2-1/2			941130	29.40		941130-C3	36.20			
	.250 (1/4)	.030	.750 (3x)	1/4	2-1/2	47430		36230	29.40		36230-C3	36.20	36230-C4	47.70	
	.250 (1/4)	.040	.375 (1.5x)	1/4	2-1/2			833040	941140	30.60	833040-C3	941140-C3	37.40		
	.250 (1/4)	.040	.750 (3x)	1/4	2-1/2			831840	36240	30.60	831840-C3	36240-C3	37.40		
	.250 (1/4)	.045	.375 (1.5x)	1/4	2-1/2				941145	29.40		941145-C3	36.20		
	.250 (1/4)	.045	.750 (3x)	1/4	2-1/2	47445		36245	29.40		36245-C3	36.20	36245-C4	47.70	
NEW	.250 (1/4)	.050	.375 (1.5x)	1/4	2-1/2				941150	30.60		941150-C3	37.40		
	.250 (1/4)	.050	.750 (3x)	1/4	2-1/2				36250	30.60		36250-C3	37.40		
	.250 (1/4)	.060	.375 (1.5x)	1/4	2-1/2				941160	29.40		941160-C3	36.20		
	.250 (1/4)	.060	.750 (3x)	1/4	2-1/2	47460	831860	36260	29.40		831860-C3	36260-C3	36.20	36260-C4	47.70
	.250 (1/4)	.075	.375 (1.5x)	1/4	2-1/2				941175	30.60		941175-C3	37.40		
	.250 (1/4)	.075	.750 (3x)	1/4	2-1/2				36275	30.60		36275-C3	37.40		
	.312 (5/16)	.005	1.000 (3x)	5/16	2-1/2				945105	34.20		945105-C3	42.10		
	.312 (5/16)	.010	1.000 (3x)	5/16	2-1/2				945110	32.90		945110-C3	40.80		
	.312 (5/16)	.030	1.000 (3x)	5/16	2-1/2				945130	32.90		945130-C3	40.80		
	.312 (5/16)	.060	1.000 (3x)	5/16	2-1/2				945160	32.90		945160-C3	40.80		
NEW	.375 (3/8)	.005	.570 (1.5x)	3/8	2-1/2				915205	46.50		915205-C3	55.50		
NEW	.375 (3/8)	.005	1.000 (3x)	3/8	2-1/2				72805	46.50		72805-C3	55.50	72805-C4	68.60
	.375 (3/8)	.010	.570 (1.5x)	3/8	2-1/2				915210	44.70		915210-C3	53.70		
	.375 (3/8)	.010	1.000 (3x)	3/8	2-1/2				72810	44.70		72810-C3	53.70		
	.375 (3/8)	.015	1.000 (3x)	3/8	2-1/2				72815	44.70		72815-C3	53.70		
	.375 (3/8)	.020	1.000 (3x)	3/8	2-1/2				72820	44.70		72820-C3	53.70		
	.375 (3/8)	.030	.570 (1.5x)	3/8	2-1/2				915230	44.70		915230-C3	53.70		
	.375 (3/8)	.030	1.000 (3x)	3/8	2-1/2				72830	44.70		72830-C3	53.70	72830-C4	66.80
NEW	.375 (3/8)	.040	.570 (1.5x)	3/8	2-1/2				915240	46.50		915240-C3	55.50		
NEW	.375 (3/8)	.040	1.000 (3x)	3/8	2-1/2	804340	831740	72840	46.50		831740-C3	72840-C3	55.50	72840-C4	68.60
	.375 (3/8)	.045	1.000 (3x)	3/8	2-1/2				72845	44.70		72845-C3	53.70		
NEW	.375 (3/8)	.050	1.000 (3x)	3/8	2-1/2				72850	44.70		72850-C3	53.70		
	.375 (3/8)	.060	1.000 (3x)	3/8	2-1/2				72860	44.70		72860-C3	53.70		
NEW	.375 (3/8)	.075	1.000 (3x)	3/8	2-1/2				72875	44.70		72875-C3	53.70		
	.500 (1/2)	.010	1.000 (2x)	1/2	3				74510	69.00		74510-C3	82.40		
	.500 (1/2)	.015	1.000 (2x)	1/2	3				74515	69.00		74515-C3	82.40		
	.500 (1/2)	.020	1.000 (2x)	1/2	3				74520	69.00		74520-C3	82.40		
	.500 (1/2)	.030	1.000 (2x)	1/2	3				74530	69.00		74530-C3	82.40	74530-C4	95.60
NEW	.500 (1/2)	.040	1.000 (2x)	1/2	3				74540	69.00		74540-C3	82.40		
	.500 (1/2)	.045	1.000 (2x)	1/2	3				74545	69.00		74545-C3	82.40		
	.500 (1/2)	.060	1.000 (2x)	1/2	3				74560	69.00		74560-C3	82.40		

CORNER RADIUS



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# MINIATURE END MILLS

## Corner Radius – Long Flute



Flute Lengths  
5x  
8x  
10x

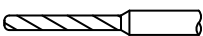


- ⚡ Long flute and long shank design for deep cavities
- ⚡ Mills deep pockets
- ⚡ 4 flutes
- ⚡ Center cutting
- ⚡ Solid carbide
- ⚡ CNC ground in the USA

CORNER RADIUS

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITiN COATED	
						4 FL	PRICE	4 FL	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>+0.10"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>				
.015 (1/64)	.003	.078 (5x)	4	1/8	2-1/2	981415	65.50	981415-C3	70.10
.015 (1/64)	.003	.125 (8x)	4	1/8	2-1/2	933615	75.10	933615-C3	79.70
.020 (.5 mm)	.005	.100 (5x)	4	1/8	2-1/2	959620	58.70	959620-C3	63.30
.020 (.5 mm)	.005	.160 (8x)	4	1/8	2-1/2	949820	68.20	949820-C3	72.80
.025	.005	.125 (5x)	4	1/8	2-1/2	959625	55.90	959625-C3	60.50
.025	.005	.203 (8x)	4	1/8	2-1/2	949825	65.40	949825-C3	70.00
.031 (1/32)	.005	.156 (5x)	4	1/8	2-1/2	959631	54.20	959631-C3	58.80
.031 (1/32)	.005	.250 (8x)	4	1/8	2-1/2	949831	63.60	949831-C3	68.20
.031 (1/32)	.008	.156 (5x)	4	1/8	2-1/2	884231	54.40	884231-C3	59.00
.031 (1/32)	.008	.250 (8x)	4	1/8	2-1/2	887431	63.60	887431-C3	68.20
.031 (1/32)	.010	.156 (5x)	4	1/8	2-1/2	964331	54.20	964331-C3	58.80
.031 (1/32)	.010	.250 (8x)	4	1/8	2-1/2	938031	63.60	938031-C3	68.20
.039 (1 mm)	.005	.203 (5x)	4	1/8	2-1/2	959639	51.60	959639-C3	56.20
.039 (1 mm)	.005	.325 (8x)	4	1/8	2-1/2	949839	57.50	949839-C3	62.10
.039 (1 mm)	.010	.203 (5x)	4	1/8	2-1/2	964339	51.60	964339-C3	56.20
.039 (1 mm)	.010	.325 (8x)	4	1/8	2-1/2	938039	57.50	938039-C3	62.10
.040	.005	.203 (5x)	4	1/8	2-1/2	959640	51.60	959640-C3	56.20
.040	.005	.325 (8x)	4	1/8	2-1/2	949840	57.50	949840-C3	62.10
.047 (3/64)	.005	.250 (5x)	4	1/8	2-1/2	959647	28.40	959647-C3	33.00
.047 (3/64)	.005	.375 (8x)	4	1/8	2-1/2	949847	32.20	949847-C3	36.80
.047 (3/64)	.010	.250 (5x)	4	1/8	2-1/2	964347	28.40	964347-C3	33.00
.047 (3/64)	.010	.375 (8x)	4	1/8	2-1/2	938047	32.20	938047-C3	36.80
.047 (3/64)	.015	.250 (5x)	4	1/8	2-1/2	885047	28.40	885047-C3	33.00
.047 (3/64)	.015	.375 (8x)	4	1/8	2-1/2	888247	32.20	888247-C3	36.80
.050	.005	.250 (5x)	4	1/8	2-1/2	959650	28.40	959650-C3	33.00
.050	.005	.400 (8x)	4	1/8	2-1/2	949850	32.20	949850-C3	36.80
.060	.005	.312 (5x)	4	1/8	2-1/2	959660	28.40	959660-C3	33.00
.060	.005	.500 (8x)	4	1/8	2-1/2	949860	32.20	949860-C3	36.80
.062 (1/16)	.005	.312 (5x)	4	1/8	2-1/2	959662	28.40	959662-C3	33.00
.062 (1/16)	.005	.500 (8x)	4	1/8	2-1/2	949862	32.20	949862-C3	36.80
.062 (1/16)	.005	.625 (10x)	4	1/8	2-1/2	870562	37.60	870562-C3	42.20
.062 (1/16)	.008	.312 (5x)	4	1/8	2-1/2	884262	28.60	884262-C3	33.20
.062 (1/16)	.008	.500 (8x)	4	1/8	2-1/2	887462	32.20	887462-C3	36.80

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# MINIATURE END MILLS

## Corner Radius – Long Flute (cont.)

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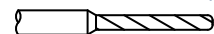
CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI 316L COATED	
						4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>				
.062 (1/16)	.010	.312 (5x)	4	1/8	2-1/2	964362	28.40	964362-C3	33.00
.062 (1/16)	.010	.500 (8x)	4	1/8	2-1/2	938062	32.20	938062-C3	36.80
.062 (1/16)	.010	.625 (10x)	4	1/8	2-1/2	849262	37.60	849262-C3	42.20
.062 (1/16)	.015	.312 (5x)	4	1/8	2-1/2	885062	28.40	885062-C3	33.00
.062 (1/16)	.015	.500 (8x)	4	1/8	2-1/2	888262	32.20	888262-C3	36.80
.062 (1/16)	.020	.312 (5x)	4	1/8	2-1/2	885862	28.40	885862-C3	33.00
.062 (1/16)	.020	.500 (8x)	4	1/8	2-1/2	889062	32.20	889062-C3	36.80
.078 (5/64)	.005	.406 (5x)	4	1/8	2-1/2	959678	28.40	959678-C3	33.00
.078 (5/64)	.005	.625 (8x)	4	1/8	2-1/2	949878	32.20	949878-C3	36.80
.078 (5/64)	.010	.406 (5x)	4	1/8	2-1/2	964378	28.40	964378-C3	33.00
.078 (5/64)	.010	.625 (8x)	4	1/8	2-1/2	938078	32.20	938078-C3	36.80
.078 (5/64)	.015	.406 (5x)	4	1/8	2-1/2	885078	28.40	885078-C3	33.00
.078 (5/64)	.015	.625 (8x)	4	1/8	2-1/2	888278	32.20	888278-C3	36.80
.078 (5/64)	.020	.406 (5x)	4	1/8	2-1/2	885878	28.40	885878-C3	33.00
.078 (5/64)	.020	.625 (8x)	4	1/8	2-1/2	889078	32.20	889078-C3	36.80
.093 (3/32)	.005	.500 (5x)	4	1/8	2-1/2	959693	28.40	959693-C3	33.00
.093 (3/32)	.005	.750 (8x)	4	1/8	2-1/2	949893	32.20	949893-C3	36.80
.093 (3/32)	.005	.950 (10x)	4	1/8	2-1/2	870593	37.60	870593-C3	42.20
.093 (3/32)	.008	.500 (5x)	4	1/8	2-1/2	884293	28.60	884293-C3	33.20
.093 (3/32)	.008	.750 (8x)	4	1/8	2-1/2	887493	32.20	887493-C3	36.80
.093 (3/32)	.010	.500 (5x)	4	1/8	2-1/2	964393	28.40	964393-C3	33.00
.093 (3/32)	.010	.750 (8x)	4	1/8	2-1/2	938093	32.20	938093-C3	36.80
.093 (3/32)	.010	.950 (10x)	4	1/8	2-1/2	849293	37.60	849293-C3	42.20
.093 (3/32)	.015	.500 (5x)	4	1/8	2-1/2	885093	28.40	885093-C3	33.00
.093 (3/32)	.015	.750 (8x)	4	1/8	2-1/2	888293	32.20	888293-C3	36.80
.093 (3/32)	.020	.500 (5x)	4	1/8	2-1/2	885893	28.40	885893-C3	33.00
.093 (3/32)	.020	.750 (8x)	4	1/8	2-1/2	889093	32.20	889093-C3	36.80
.093 (3/32)	.030	.500 (5x)	4	1/8	2-1/2	886693	28.40	886693-C3	33.00
.093 (3/32)	.030	.750 (8x)	4	1/8	2-1/2	889893	32.20	889893-C3	36.80
.100	.010	.500 (5x)	4	1/8	2-1/2	964400	28.40	964400-C3	33.00
.100	.010	.800 (8x)	4	1/8	2-1/2	938100	32.20	938100-C3	36.80
.118 (3 mm)	.005	.625 (5x)	4	1/8	2-1/2	912505	28.40	912505-C3	33.00
.118 (3 mm)	.005	.950 (8x)	4	1/8	2-1/2	905305	32.20	905305-C3	36.80
.118 (3 mm)	.010	.625 (5x)	4	1/8	2-1/2	912605	28.40	912605-C3	33.00
.118 (3 mm)	.010	.950 (8x)	4	1/8	2-1/2	905405	32.20	905405-C3	36.80

CORNER RADIUS

NEW  
NEW

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>	L <sub>1</sub>	4 FL	PRICE	4 FL	PRICE
.125 (1/8)	.005	.625 (5x)	4	1/8	2-1/2	950905	26.80	950905-C3	31.40
.125 (1/8)	.005	1.000 (8x)	4	1/8	2-1/2	981905	29.40	981905-C3	34.00
.125 (1/8)	.010	.625 (5x)	4	1/8	2-1/2	950910	26.80	950910-C3	31.40
.125 (1/8)	.010	1.000 (8x)	4	1/8	2-1/2	981910	29.40	981910-C3	34.00
.125 (1/8)	.015	.625 (5x)	4	1/8	2-1/2	950915	26.80	950915-C3	31.40
.125 (1/8)	.015	1.000 (8x)	4	1/8	2-1/2	981915	29.40	981915-C3	34.00
.125 (1/8)	.020	.625 (5x)	4	1/8	2-1/2	950920	26.80	950920-C3	31.40
.125 (1/8)	.020	1.000 (8x)	4	1/8	2-1/2	981920	29.40	981920-C3	34.00
.125 (1/8)	.030	.625 (5x)	4	1/8	2-1/2	950930	26.80	950930-C3	31.40
.125 (1/8)	.030	1.000 (8x)	4	1/8	2-1/2	981930	29.40	981930-C3	34.00

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# MINIATURE END MILLS

## Corner Radius – Long Flute (cont.)

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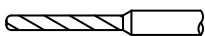
CORNER RADIUS

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
						4 FL	PRICE	4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	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>	L <sub>1</sub>				
.156 (5/32)	.010	.750 (5x)	4	3/16	3	830910	33.20	830910-C3	38.20
.156 (5/32)	.030	.750 (5x)	4	3/16	3	830930	33.20	830930-C3	38.20
.187 (3/16)	.005	1.000 (5x)	4	3/16	3	932405	31.60	932405-C3	36.60
.187 (3/16)	.010	1.000 (5x)	4	3/16	3	932410	31.60	932410-C3	36.60
.187 (3/16)	.010	1.680 (8x)	4	3/16	3	830810	32.40	830810-C3	37.40
.187 (3/16)	.030	1.000 (5x)	4	3/16	3	932430	31.60	932430-C3	36.60
.250 (1/4)	.005	1.250 (5x)	4	1/4	4	917105	35.30	917105-C3	43.20
.250 (1/4)	.010	1.250 (5x)	4	1/4	4	917110	35.30	917110-C3	43.20
.250 (1/4)	.030	1.250 (5x)	4	1/4	4	917130	35.30	917130-C3	43.20



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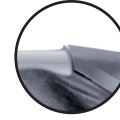


## MINIATURE END MILLS

## Corner Radius – Long Reach, Standard Flute



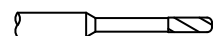
- ↪ Corner radius for improved strength
- ↪ Length of cut = 3x diameter
- ↪ Center cutting
- ↪ Solid carbide
- ↪ CNC ground in the USA



Reduced Neck Diameter  
to Avoid Heeling

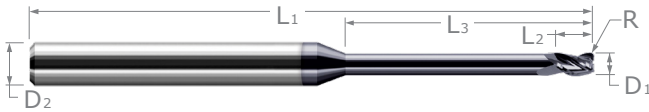
CORNER RADIUS

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED			A1TiN COATED	
						2 FL	4 FL	PRICE	4 FL	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					
.031 (1/32)	<b>.005</b>	.093	<b>.156</b> (5x)	1/8	1-1/2	864131	875231	42.70	875231-C3	47.30
.031 (1/32)	<b>.005</b>	.093	<b>.250</b> (8x)	1/8	1-1/2	865731	876831	43.50	876831-C3	48.10
.031 (1/32)	<b>.010</b>	.093	<b>.156</b> (5x)	1/8	1-1/2	864931	876031	42.70	876031-C3	47.30
.031 (1/32)	<b>.010</b>	.093	<b>.250</b> (8x)	1/8	1-1/2	866531	877631	43.50	877631-C3	48.10
.047 (3/64)	<b>.005</b>	.141	<b>.250</b> (5x)	1/8	1-1/2	864147	875247	41.40	875247-C3	46.00
.047 (3/64)	<b>.005</b>	.141	<b>.375</b> (8x)	1/8	1-1/2	865747	876847	42.20	876847-C3	46.80
.047 (3/64)	<b>.010</b>	.141	<b>.250</b> (5x)	1/8	1-1/2	864947	876047	41.40	876047-C3	46.00
.047 (3/64)	<b>.010</b>	.141	<b>.375</b> (8x)	1/8	1-1/2	866547	877647	42.20	877647-C3	46.80
.062 (1/16)	<b>.005</b>	.186	<b>.312</b> (5x)	1/8	1-1/2	864162	875262	41.40	875262-C3	46.00
.062 (1/16)	<b>.005</b>	.186	<b>.500</b> (8x)	1/8	1-1/2	865762	876862	42.20	876862-C3	46.80
.062 (1/16)	<b>.010</b>	.186	<b>.312</b> (5x)	1/8	1-1/2	864962	876062	41.40	876062-C3	46.00
.062 (1/16)	<b>.010</b>	.186	<b>.500</b> (8x)	1/8	1-1/2	866562	877662	42.20	877662-C3	46.80
.078 (5/64)	<b>.005</b>	.234	<b>.406</b> (5x)	1/8	1-1/2	864178	875278	41.40	875278-C3	46.00
.078 (5/64)	<b>.005</b>	.234	<b>.625</b> (8x)	1/8	2	865778	876878	42.70	876878-C3	47.30
.078 (5/64)	<b>.010</b>	.234	<b>.406</b> (5x)	1/8	1-1/2	864978	876078	41.40	876078-C3	46.00
.078 (5/64)	<b>.010</b>	.234	<b>.625</b> (8x)	1/8	2	866578	877678	42.70	877678-C3	47.30
.093 (3/32)	<b>.005</b>	.279	<b>.500</b> (5x)	1/8	1-1/2	864193	875293	42.20	875293-C3	46.80
.093 (3/32)	<b>.005</b>	.279	<b>.750</b> (8x)	1/8	2	865793	876893	42.70	876893-C3	47.30
.093 (3/32)	<b>.010</b>	.279	<b>.500</b> (5x)	1/8	1-1/2	864993	876093	42.20	876093-C3	46.80
.093 (3/32)	<b>.010</b>	.279	<b>.750</b> (8x)	1/8	2	866593	877693	42.70	877693-C3	47.30
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					
.125 (1/8)	<b>.005</b>	.375	<b>.625</b> (5x)	1/8	1-1/2	864208	875308	42.20	875308-C3	46.80
.125 (1/8)	<b>.005</b>	.375	<b>1.000</b> (8x)	1/8	2	865808	876908	42.20	876908-C3	46.80
.125 (1/8)	<b>.010</b>	.375	<b>.625</b> (5x)	1/8	1-1/2	865008	876108	42.20	876108-C3	46.80
.125 (1/8)	<b>.010</b>	.375	<b>1.000</b> (8x)	1/8	2	866608	877708	42.20	877708-C3	46.80

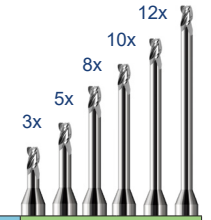


# MINIATURE END MILLS

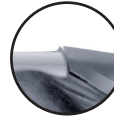
## Corner Radius – Long Reach, Stub Flute



Stocked in **Six** Reach Lengths! 15x



- **Long length design for deep cavities, up to 8" overall length**
- Corner radius for improved strength
- Length of cut = 1 1/2 x diameter
- Solid carbide    ➤ CNC ground in the USA

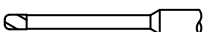


Reduced Neck Diameter to Avoid Heeling

CORNER RADIUS

CUTTER DIA.	CORNER RADIUS	LOC	OVERALL REACH	FLUTES	SHANK DIA.	OAL	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D1 <sup>+0.005"</sup> / <sub>-0.005"</sub>	R <sup>+0.01"</sup> / <sub>-0.01"</sub>	L2 <sup>+0.010"</sup> / <sub>-0.000"</sub>	L3 <sup>+0.010"</sup> / <sub>-0.000"</sub>		D2	L1						
.010	.003	.015	.050 (5x)	3	1/8	2-1/2	968210	53.00	968210-C3	57.60		
.010	.003	.015	.080 (8x)	3	1/8	2-1/2	972710	53.90	972710-C3	58.50		
.015 (1/64)	.003	.022	.078 (5x)	3	1/8	2-1/2	968215	47.40	968215-C3	52.00		
.015 (1/64)	.003	.022	.125 (8x)	3	1/8	2-1/2	972715	48.60	972715-C3	53.20		
.015 (1/64)	.005	.022	.078 (5x)	3	1/8	2-1/2	37115	47.60	37115-C3	52.20		
.015 (1/64)	.005	.022	.125 (8x)	3	1/8	2-1/2	38315	48.60	38315-C3	53.20		
.020 (.5 mm)	.005	.030	.100 (5x)	3	1/8	2-1/2	37120	45.90	37120-C3	50.50		
.020 (.5 mm)	.005	.030	.160 (8x)	3	1/8	2-1/2	38320	47.20	38320-C3	51.80		
.020 (.5 mm)	.005	.030	.200 (10x)	3	1/8	2-1/2	917820	49.40	917820-C3	54.00		
.025	.005	.037	.125 (5x)	3	1/8	2-1/2	37125	45.90	37125-C3	50.50		
.025	.005	.037	.203 (8x)	3	1/8	2-1/2	38325	47.20	38325-C3	51.80		
.025	.005	.037	.250 (10x)	3	1/8	2-1/2	917825	49.40	917825-C3	54.00		
.030	.005	.045	.156 (5x)	3	1/8	2-1/2	37130	39.50	37130-C3	44.10		
.030	.005	.045	.250 (8x)	3	1/8	2-1/2	38330	40.50	38330-C3	45.10		
.031 (1/32)	.003	.046	.156 (5x)	3	1/8	2-1/2	968231	39.50	968231-C3	44.10		
.031 (1/32)	.003	.046	.250 (8x)	3	1/8	2-1/2	972731	40.50	972731-C3	45.10		
.031 (1/32)	.005	.046	.156 (5x)	3	1/8	2-1/2	37131	39.50	37131-C3	44.10	37131-C4	51.20
.031 (1/32)	.005	.046	.250 (8x)	3	1/8	2-1/2	38331	40.50	38331-C3	45.10	38331-C4	52.20
.031 (1/32)	.005	.046	.312 (10x)	3	1/8	2-1/2	917831	42.80	917831-C3	47.40		
.031 (1/32)	.005	.046	.375 (12x)	3	1/8	2-1/2	39431	42.80	39431-C3	47.40	39431-C4	54.50
.031 (1/32)	.008	.046	.156 (5x)	3	1/8	2-1/2	912731	39.50	912731-C3	44.10		
.031 (1/32)	.008	.046	.250 (8x)	3	1/8	2-1/2	909331	40.50	909331-C3	45.10		
.031 (1/32)	.010	.046	.093 (3x)	3	1/8	2-1/2	925631	39.50	925631-C3	44.10		
.031 (1/32)	.010	.046	.156 (5x)	3	1/8	2-1/2	41531	39.50	41531-C3	44.10		
.031 (1/32)	.010	.046	.250 (8x)	3	1/8	2-1/2	41731	40.50	41731-C3	45.10		
.031 (1/32)	.010	.046	.312 (10x)	3	1/8	2-1/2	953731	42.80	953731-C3	47.40		
.031 (1/32)	.010	.046	.375 (12x)	3	1/8	2-1/2	41931	42.80	41931-C3	47.40		
.031 (1/32)	.010	.046	.470 (15x)	3	1/8	2-1/2	947831	49.20	947831-C3	53.80		
.039 (1 mm)	.005	.059	.203 (5x)	3	1/8	2-1/2	37139	39.50	37139-C3	44.10		
.039 (1 mm)	.005	.059	.325 (8x)	3	1/8	2-1/2	38339	40.50	38339-C3	45.10		
.039 (1 mm)	.010	.059	.325 (8x)	3	1/8	2-1/2	41739	40.50	41739-C3	45.10		
.040	.005	.060	.203 (5x)	3	1/8	2-1/2	37140	39.50	37140-C3	44.10		
.040	.005	.060	.325 (8x)	3	1/8	2-1/2	38340	40.50	38340-C3	45.10		
.040	.010	.060	.203 (5x)	3	1/8	2-1/2	41540	39.50	41540-C3	44.10		
.040	.010	.060	.325 (8x)	3	1/8	2-1/2	41740	40.50	41740-C3	45.10		
.047 (3/64)	.005	.070	.250 (5x)	3	1/8	2-1/2	37147	38.80	37147-C3	43.40	37147-C4	50.50
.047 (3/64)	.005	.070	.375 (8x)	3	1/8	2-1/2	38347	39.70	38347-C3	44.30	38347-C4	51.40
.047 (3/64)	.005	.070	.480 (10x)	3	1/8	2-1/2	917847	41.90	917847-C3	46.50		
.047 (3/64)	.005	.070	.570 (12x)	3	1/8	2-1/2	39447	41.90	39447-C3	46.50	39447-C4	53.60

continued on next page



# MINIATURE END MILLS

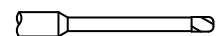
## Corner Radius – Long Reach, Stub Flute (cont.)

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		AIIIN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.047 (3/64)	<b>.010</b>	.070	<b>.141</b> (3x)	3	1/8	2-1/2	925647	38.80	925647-C3	43.40		
.047 (3/64)	<b>.010</b>	.070	<b>.250</b> (5x)	3	1/8	2-1/2	41547	38.80	41547-C3	43.40		
.047 (3/64)	<b>.010</b>	.070	<b>.375</b> (8x)	3	1/8	2-1/2	41747	39.70	41747-C3	44.30		
.047 (3/64)	<b>.010</b>	.070	<b>.480</b> (10x)	3	1/8	2-1/2	953747	41.90	953747-C3	46.50		
.047 (3/64)	<b>.010</b>	.070	<b>.570</b> (12x)	3	1/8	2-1/2	41947	41.30	41947-C3	45.90		
.047 (3/64)	<b>.010</b>	.070	<b>.710</b> (15x)	3	1/8	2-1/2	947847	47.10	947847-C3	51.70		
.047 (3/64)	<b>.015</b>	.070	<b>.250</b> (5x)	3	1/8	2-1/2	42747	38.80	42747-C3	43.40		
.047 (3/64)	<b>.015</b>	.070	<b>.375</b> (8x)	3	1/8	2-1/2	42947	39.70	42947-C3	44.30		
.050	<b>.005</b>	.075	<b>.250</b> (5x)	3	1/8	2-1/2	37150	38.80	37150-C3	43.40		
.050	<b>.005</b>	.075	<b>.400</b> (8x)	3	1/8	2-1/2	38350	39.70	38350-C3	44.30		
.050	<b>.010</b>	.075	<b>.250</b> (5x)	3	1/8	2-1/2	41550	38.80	41550-C3	43.40		
.050	<b>.010</b>	.075	<b>.400</b> (8x)	3	1/8	2-1/2	41750	39.70	41750-C3	44.30		
.060	<b>.005</b>	.090	<b>.312</b> (5x)	3	1/8	2-1/2	37160	38.80	37160-C3	43.40		
.060	<b>.005</b>	.090	<b>.500</b> (8x)	3	1/8	2-1/2	38360	39.70	38360-C3	44.30		
.060	<b>.010</b>	.090	<b>.312</b> (5x)	3	1/8	2-1/2	41560	38.80	41560-C3	43.40		
.060	<b>.010</b>	.090	<b>.500</b> (8x)	3	1/8	2-1/2	41760	39.70	41760-C3	44.30		
.060	<b>.015</b>	.090	<b>.500</b> (8x)	3	1/8	2-1/2	42960	39.70	42960-C3	44.30		
.060	<b>.020</b>	.090	<b>.500</b> (8x)	3	1/8	2-1/2	970160	39.70	970160-C3	44.30		
.062 (1/16)	<b>.003</b>	.093	<b>.312</b> (5x)	3	1/8	2-1/2	968262	38.80	968262-C3	43.40		
.062 (1/16)	<b>.003</b>	.093	<b>.500</b> (8x)	3	1/8	2-1/2	972762	39.70	972762-C3	44.30		
.062 (1/16)	<b>.005</b>	.093	<b>.312</b> (5x)	3	1/8	2-1/2	37162	38.80	37162-C3	43.40		
.062 (1/16)	<b>.005</b>	.093	<b>.500</b> (8x)	3	1/8	2-1/2	38362	39.70	38362-C3	44.30		
.062 (1/16)	<b>.005</b>	.093	<b>.625</b> (10x)	3	1/8	2-1/2	917862	41.90	917862-C3	46.50		
.062 (1/16)	<b>.005</b>	.093	<b>.750</b> (12x)	3	1/8	2-1/2	39462	41.90	39462-C3	46.50		
.062 (1/16)	<b>.008</b>	.093	<b>.312</b> (5x)	3	1/8	2-1/2	912762	38.80	912762-C3	43.40		
.062 (1/16)	<b>.008</b>	.093	<b>.500</b> (8x)	3	1/8	2-1/2	909362	39.70	909362-C3	44.30		
.062 (1/16)	<b>.010</b>	.093	<b>.187</b> (3x)	3	1/8	2-1/2	925662	38.80	925662-C3	43.40		
.062 (1/16)	<b>.010</b>	.093	<b>.312</b> (5x)	3	1/8	2-1/2	41562	38.80	41562-C3	43.40	41562-C4	50.50
.062 (1/16)	<b>.010</b>	.093	<b>.500</b> (8x)	3	1/8	2-1/2	41762	39.70	41762-C3	44.30	41762-C4	51.40
.062 (1/16)	<b>.010</b>	.093	<b>.625</b> (10x)	3	1/8	2-1/2	953762	41.90	953762-C3	46.50		
.062 (1/16)	<b>.010</b>	.093	<b>.750</b> (12x)	3	1/8	2-1/2	41962	41.90	41962-C3	46.50	41962-C4	53.60
.062 (1/16)	<b>.010</b>	.093	<b>.950</b> (15x)	3	1/8	2-1/2	947862	47.10	947862-C3	51.70		
.062 (1/16)	<b>.012</b>	.093	<b>.312</b> (5x)	3	1/8	2-1/2	901962	38.80	901962-C3	43.40		
.062 (1/16)	<b>.012</b>	.093	<b>.500</b> (8x)	3	1/8	2-1/2	913562	39.70	913562-C3	44.30		
.062 (1/16)	<b>.015</b>	.093	<b>.312</b> (5x)	3	1/8	2-1/2	42762	38.80	42762-C3	43.40		
.062 (1/16)	<b>.015</b>	.093	<b>.500</b> (8x)	3	1/8	2-1/2	42962	39.70	42962-C3	44.30		
.062 (1/16)	<b>.015</b>	.093	<b>.625</b> (10x)	3	1/8	2-1/2	965662	41.90	965662-C3	46.50		
.062 (1/16)	<b>.015</b>	.093	<b>.750</b> (12x)	3	1/8	2-1/2	43162	41.90	43162-C3	46.50		
.062 (1/16)	<b>.020</b>	.093	<b>.312</b> (5x)	3	1/8	2-1/2	953562	38.80	953562-C3	43.40		
.062 (1/16)	<b>.020</b>	.093	<b>.500</b> (8x)	3	1/8	2-1/2	970162	39.70	970162-C3	44.30		
.062 (1/16)	<b>.020</b>	.093	<b>.625</b> (10x)	3	1/8	2-1/2	923262	41.90	923262-C3	46.50		
.062 (1/16)	<b>.020</b>	.093	<b>.750</b> (12x)	3	1/8	2-1/2	872662	41.90	872662-C3	46.50		
.070	<b>.005</b>	.105	<b>.375</b> (5x)	3	1/8	2-1/2	37170	38.80	37170-C3	43.40		
.070	<b>.005</b>	.105	<b>.570</b> (8x)	3	1/8	2-1/2	38370	39.70	38370-C3	44.30		
.070	<b>.010</b>	.105	<b>.375</b> (5x)	3	1/8	2-1/2	41570	38.80	41570-C3	43.40		
.070	<b>.010</b>	.105	<b>.570</b> (8x)	3	1/8	2-1/2	41770	39.70	41770-C3	44.30		

continued on next page

CORNER RADIUS



# MINIATURE END MILLS

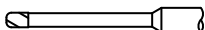
## Corner Radius – Long Reach, Stub Flute (cont.)

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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
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>						
.078 (5/64)	.005	.117	.406 (5x)	3	1/8	2-1/2	37178	38.80	37178-C3	43.40		
.078 (5/64)	.005	.117	.625 (8x)	3	1/8	2-1/2	38378	39.70	38378-C3	44.30		
.078 (5/64)	.005	.117	.800 (10x)	3	1/8	2-1/2	917878	41.90	917878-C3	46.50		
.078 (5/64)	.005	.117	.940 (12x)	3	1/8	2-1/2	39478	41.90	39478-C3	46.50		
.078 (5/64)	.010	.117	.406 (5x)	3	1/8	2-1/2	41578	38.80	41578-C3	43.40	41578-C4	50.50
.078 (5/64)	.010	.117	.625 (8x)	3	1/8	2-1/2	41778	39.70	41778-C3	44.30	41778-C4	51.40
.078 (5/64)	.010	.117	.800 (10x)	3	1/8	2-1/2	953778	41.90	953778-C3	46.50		
.078 (5/64)	.010	.117	.940 (12x)	3	1/8	2-1/2	41978	41.90	41978-C3	46.50	41978-C4	53.60
.078 (5/64)	.015	.117	.234 (3x)	3	1/8	2-1/2	944978	38.80	944978-C3	43.40		
.078 (5/64)	.015	.117	.406 (5x)	3	1/8	2-1/2	42778	38.80	42778-C3	43.40		
.078 (5/64)	.015	.117	.625 (8x)	3	1/8	2-1/2	42978	39.70	42978-C3	44.30		
.078 (5/64)	.015	.117	.800 (10x)	3	1/8	2-1/2	965678	41.90	965678-C3	46.50		
.078 (5/64)	.015	.117	.940 (12x)	3	1/8	2-1/2	43178	41.90	43178-C3	46.50		
.078 (5/64)	.015	.117	1.187 (15x)	3	1/8	2-1/2	939378	47.10	939378-C3	51.70		
.078 (5/64)	.020	.117	.406 (5x)	3	1/8	2-1/2	953578	38.80	953578-C3	43.40		
.078 (5/64)	.020	.117	.625 (8x)	3	1/8	2-1/2	970178	39.70	970178-C3	44.30		
.078 (5/64)	.020	.117	.800 (10x)	3	1/8	2-1/2	923278	41.90	923278-C3	46.50		
.080	.005	.120	.406 (5x)	3	1/8	2-1/2	37180	38.80	37180-C3	43.40		
.080	.005	.120	.650 (8x)	3	1/8	2-1/2	38380	39.70	38380-C3	44.30		
.080	.010	.120	.406 (5x)	3	1/8	2-1/2	41580	38.80	41580-C3	43.40		
.080	.010	.120	.650 (8x)	3	1/8	2-1/2	41780	39.70	41780-C3	44.30		
.090	.005	.135	.450 (5x)	3	1/8	2-1/2	37190	38.80	37190-C3	43.40		
.090	.005	.135	.750 (8x)	3	1/8	2-1/2	38390	39.70	38390-C3	44.30		
.090	.010	.135	.450 (5x)	3	1/8	2-1/2	41590	38.80	41590-C3	43.40		
.090	.010	.135	.750 (8x)	3	1/8	2-1/2	41790	39.70	41790-C3	44.30		
.093 (3/32)	.003	.139	.500 (5x)	3	1/8	2-1/2	968293	38.80	968293-C3	43.40		
.093 (3/32)	.003	.139	.750 (8x)	3	1/8	2-1/2	972793	39.70	972793-C3	44.30		
.093 (3/32)	.005	.139	.500 (5x)	3	1/8	2-1/2	37193	38.80	37193-C3	43.40		
.093 (3/32)	.005	.139	.750 (8x)	3	1/8	2-1/2	38393	39.70	38393-C3	44.30		
.093 (3/32)	.005	.139	.950 (10x)	3	1/8	2-1/2	917893	41.90	917893-C3	46.50		
.093 (3/32)	.005	.139	1.125 (12x)	3	1/8	2-1/2	39493	41.90	39493-C3	46.50		
.093 (3/32)	.008	.139	.500 (5x)	3	1/8	2-1/2	912793	38.80	912793-C3	43.40		
.093 (3/32)	.008	.139	.750 (8x)	3	1/8	2-1/2	909393	39.50	909393-C3	44.10		
.093 (3/32)	.010	.139	.500 (5x)	3	1/8	2-1/2	41593	38.80	41593-C3	43.40		
.093 (3/32)	.010	.139	.750 (8x)	3	1/8	2-1/2	41793	39.70	41793-C3	44.30		
.093 (3/32)	.010	.139	.950 (10x)	3	1/8	2-1/2	953793	41.90	953793-C3	46.50		
.093 (3/32)	.010	.139	1.125 (12x)	3	1/8	2-1/2	41993	41.90	41993-C3	46.50		
.093 (3/32)	.012	.139	.500 (5x)	3	1/8	2-1/2	901993	38.80	901993-C3	43.40		
.093 (3/32)	.012	.139	.750 (8x)	3	1/8	2-1/2	913593	39.70	913593-C3	44.30		
.093 (3/32)	.015	.139	.279 (3x)	3	1/8	2-1/2	944993	38.80	944993-C3	43.40		
.093 (3/32)	.015	.139	.500 (5x)	3	1/8	2-1/2	42793	38.80	42793-C3	43.40	42793-C4	50.50
.093 (3/32)	.015	.139	.750 (8x)	3	1/8	2-1/2	42993	39.70	42993-C3	44.30	42993-C4	51.40
.093 (3/32)	.015	.139	.950 (10x)	3	1/8	2-1/2	965693	41.90	965693-C3	46.50		
.093 (3/32)	.015	.139	1.125 (12x)	3	1/8	2-1/2	43193	41.90	43193-C3	46.50	43193-C4	53.60
.093 (3/32)	.015	.139	1.400 (15x)	3	1/8	3	939393	47.10	939393-C3	51.70		
.093 (3/32)	.020	.139	.500 (5x)	3	1/8	2-1/2	953593	38.80	953593-C3	43.40		
.093 (3/32)	.020	.139	.750 (8x)	3	1/8	2-1/2	970193	39.70	970193-C3	44.30		
.093 (3/32)	.020	.139	.950 (10x)	3	1/8	2-1/2	923293	41.90	923293-C3	46.50		

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# MINIATURE END MILLS

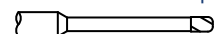
## Corner Radius – Long Reach, Stub Flute (cont.)

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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
D <sub>1</sub> $\begin{matrix} +.0005" \\ -.0005" \end{matrix}$	R $\begin{matrix} +.001" \\ -.001" \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.010" \\ -.000" \end{matrix}$	L <sub>3</sub> $\begin{matrix} +.010" \\ -.000" \end{matrix}$		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.093 (3/32)	<b>.030</b>	.139	<b>.500 (5x)</b>	3	1/8	2-1/2	42193	38.80	42193-C3	43.40		
.093 (3/32)	<b>.030</b>	.139	<b>.750 (8x)</b>	3	1/8	2-1/2	42393	39.70	42393-C3	44.30		
.093 (3/32)	<b>.030</b>	.139	<b>.950 (10x)</b>	3	1/8	2-1/2	921493	41.90	921493-C3	46.50		
.100	<b>.005</b>	.150	<b>.500 (5x)</b>	3	1/8	2-1/2	37200	38.80	37200-C3	43.40		
.100	<b>.005</b>	.150	<b>.800 (8x)</b>	3	1/8	2-1/2	38400	39.70	38400-C3	44.30		
.100	<b>.010</b>	.150	<b>.500 (5x)</b>	3	1/8	2-1/2	41600	38.80	41600-C3	43.40		
.100	<b>.010</b>	.150	<b>.800 (8x)</b>	3	1/8	2-1/2	41800	39.70	41800-C3	44.30		
.109 (7/64)	<b>.005</b>	.163	<b>.570 (5x)</b>	3	1/8	2-1/2	37202	38.80	37202-C3	43.40		
.109 (7/64)	<b>.005</b>	.163	<b>.900 (8x)</b>	3	1/8	2-1/2	38402	39.70	38402-C3	44.30		
.109 (7/64)	<b>.010</b>	.163	<b>.570 (5x)</b>	3	1/8	2-1/2	41602	38.80	41602-C3	43.40		
.109 (7/64)	<b>.010</b>	.163	<b>.900 (8x)</b>	3	1/8	2-1/2	41802	39.70	41802-C3	44.30		
.118 (3 mm)	<b>.005</b>	.177	<b>.950 (8x)</b>	3	1/8	2-1/2	38405	39.70	38405-C3	44.30		
.118 (3 mm)	<b>.010</b>	.177	<b>.950 (8x)</b>	3	1/8	2-1/2	41805	39.70	41805-C3	44.30		

D <sub>1</sub> $\begin{matrix} +.000" \\ -.002" \end{matrix}$	R $\begin{matrix} +.001" \\ -.001" \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.030" \\ -.000" \end{matrix}$	L <sub>3</sub> $\begin{matrix} +.030" \\ -.000" \end{matrix}$		D <sub>2</sub>	L <sub>1</sub>	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.125 (1/8)	<b>.005</b>	.187	<b>.625 (5x)</b>	3	1/8	2-1/2	37208	38.80	37208-C3	43.40	37208-C4	50.50
.125 (1/8)	<b>.005</b>	.187	<b>1.000 (8x)</b>	3	1/8	2-1/2	38408	39.70	38408-C3	44.30		
.125 (1/8)	<b>.005</b>	.187	<b>1.250 (10x)</b>	3	1/8	2-1/2	917908	43.50	917908-C3	48.10		
.125 (1/8)	<b>.005</b>	.187	<b>1.500 (12x)</b>	3	1/8	3	39508	42.70	39508-C3	47.30		
.125 (1/8)	<b>.008</b>	.187	<b>.625 (5x)</b>	3	1/8	2-1/2	912808	38.80	912808-C3	43.40		
.125 (1/8)	<b>.008</b>	.187	<b>1.000 (8x)</b>	3	1/8	2-1/2	909408	39.50	909408-C3	44.10		
.125 (1/8)	<b>.010</b>	.187	<b>.375 (3x)</b>	3	1/8	2-1/2	925708	38.80	925708-C3	43.40		
.125 (1/8)	<b>.010</b>	.187	<b>.625 (5x)</b>	3	1/8	2-1/2	41608	38.80	41608-C3	43.40	41608-C4	50.50
.125 (1/8)	<b>.010</b>	.187	<b>1.000 (8x)</b>	3	1/8	2-1/2	41808	39.70	41808-C3	44.30		
.125 (1/8)	<b>.010</b>	.187	<b>1.250 (10x)</b>	3	1/8	2-1/2	953808	42.50	953808-C3	47.10		
.125 (1/8)	<b>.010</b>	.187	<b>1.500 (12x)</b>	3	1/8	3	42008	42.70	42008-C3	47.30		
.125 (1/8)	<b>.010</b>	.187	<b>1.875 (15x)</b>	3	1/8	3	947908	48.30	947908-C3	52.90		
.125 (1/8)	<b>.015</b>	.187	<b>.625 (5x)</b>	3	1/8	2-1/2	42808	38.80	42808-C3	43.40	42808-C4	50.50
.125 (1/8)	<b>.015</b>	.187	<b>1.000 (8x)</b>	3	1/8	2-1/2	43008	39.70	43008-C3	44.30	43008-C4	51.40
.125 (1/8)	<b>.015</b>	.187	<b>1.250 (10x)</b>	3	1/8	2-1/2	965708	42.50	965708-C3	47.10		
.125 (1/8)	<b>.015</b>	.187	<b>1.500 (12x)</b>	3	1/8	3	43208	42.70	43208-C3	47.30	43208-C4	54.40
.125 (1/8)	<b>.015</b>	.187	<b>1.875 (15x)</b>	3	1/8	3	939408	48.10	939408-C3	52.70		
.125 (1/8)	<b>.020</b>	.187	<b>.625 (5x)</b>	3	1/8	2-1/2	953608	38.80	953608-C3	43.40	953608-C4	50.50
.125 (1/8)	<b>.020</b>	.187	<b>1.000 (8x)</b>	3	1/8	2-1/2	970208	39.70	970208-C3	44.30		
.125 (1/8)	<b>.020</b>	.187	<b>1.250 (10x)</b>	3	1/8	2-1/2	923308	42.50	923308-C3	47.10		
.125 (1/8)	<b>.025</b>	.187	<b>.625 (5x)</b>	3	1/8	2-1/2	839908	38.80	839908-C3	43.40		
.125 (1/8)	<b>.025</b>	.187	<b>1.000 (8x)</b>	3	1/8	2-1/2	840208	39.50	840208-C3	44.10		
.125 (1/8)	<b>.030</b>	.187	<b>.375 (3x)</b>	3	1/8	2-1/2	827108	38.80	827108-C3	43.40		
.125 (1/8)	<b>.030</b>	.187	<b>.625 (5x)</b>	3	1/8	2-1/2	42208	38.80	42208-C3	43.40	42208-C4	50.50
.125 (1/8)	<b>.030</b>	.187	<b>1.000 (8x)</b>	3	1/8	2-1/2	42408	39.70	42408-C3	44.30		
.125 (1/8)	<b>.030</b>	.187	<b>1.250 (10x)</b>	3	1/8	2-1/2	921508	42.70	921508-C3	47.30		
.125 (1/8)	<b>.030</b>	.187	<b>1.500 (12x)</b>	3	1/8	3	42608	42.70	42608-C3	47.30		
.125 (1/8)	<b>.030</b>	.187	<b>1.875 (15x)</b>	3	1/8	3	919708	48.10	919708-C3	52.70		
.125 (1/8)	<b>.040</b>	.187	<b>.625 (5x)</b>	3	1/8	2-1/2	930208	38.80	930208-C3	43.40		
.125 (1/8)	<b>.040</b>	.187	<b>1.000 (8x)</b>	3	1/8	2-1/2	924308	39.50	924308-C3	44.10		
.140 (9/64)	<b>.010</b>	.220	<b>.750 (5x)</b>	3	3/16	3	41609	38.80	41609-C3	43.80		
.140 (9/64)	<b>.010</b>	.220	<b>1.125 (8x)</b>	3	3/16	3	41809	39.70	41809-C3	44.70		
.140 (9/64)	<b>.015</b>	.220	<b>.750 (5x)</b>	3	3/16	3	42809	38.80	42809-C3	43.80		
.140 (9/64)	<b>.015</b>	.220	<b>1.125 (8x)</b>	3	3/16	3	43009	39.70	43009-C3	44.70		

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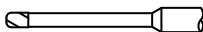
# MINIATURE END MILLS

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

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CORNER RADIUS

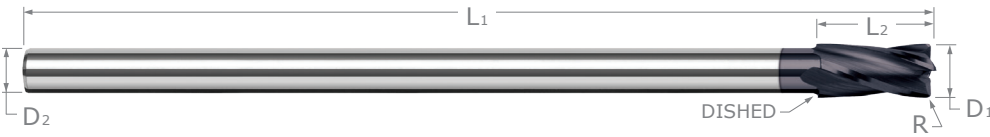
CUTTER DIA.	CORNER RADIUS	LOC	OVERALL REACH	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D1 $\pm .000''$ $-.002''$	R $\pm .001''$ $-.001''$	L2 $\pm .030''$ $-.000''$	L3 $\pm .030''$ $-.000''$		D2	L1						
.156 (5/32)	<b>.010</b>	.234	<b>.750</b> (5x)	3	3/16	3	41610	42.70	41610-C3	47.70		
.156 (5/32)	<b>.010</b>	.234	<b>1.250</b> (8x)	3	3/16	3	41810	43.50	41810-C3	48.50		
.156 (5/32)	<b>.010</b>	.234	<b>1.570</b> (10x)	3	3/16	3	953810	46.20	953810-C3	51.20		
.156 (5/32)	<b>.015</b>	.234	<b>.750</b> (5x)	3	3/16	3	42810	42.70	42810-C3	47.70		
.156 (5/32)	<b>.015</b>	.234	<b>1.250</b> (8x)	3	3/16	3	43010	43.50	43010-C3	48.50		
.156 (5/32)	<b>.015</b>	.234	<b>1.570</b> (10x)	3	3/16	3	965710	46.20	965710-C3	51.20		
.156 (5/32)	<b>.020</b>	.234	<b>.750</b> (5x)	3	3/16	3	953610	42.70	953610-C3	47.70		
.156 (5/32)	<b>.020</b>	.234	<b>1.250</b> (8x)	3	3/16	3	970210	43.50	970210-C3	48.50		
.156 (5/32)	<b>.030</b>	.234	<b>.750</b> (5x)	3	3/16	3	42210	42.70	42210-C3	47.70		
.156 (5/32)	<b>.030</b>	.234	<b>1.250</b> (8x)	3	3/16	3	42410	43.50	42410-C3	48.50		
.187 (3/16)	<b>.005</b>	.281	<b>1.000</b> (5x)	3	3/16	3	37212	42.70	37212-C3	47.70		
.187 (3/16)	<b>.010</b>	.281	<b>1.000</b> (5x)	3	3/16	3	41612	42.70	41612-C3	47.70		
.187 (3/16)	<b>.010</b>	.281	<b>1.500</b> (8x)	3	3/16	3	41812	43.50	41812-C3	48.50		
.187 (3/16)	<b>.015</b>	.281	<b>1.000</b> (5x)	3	3/16	3	42812	42.70	42812-C3	47.70	42812-C4	58.80
.187 (3/16)	<b>.015</b>	.281	<b>1.500</b> (8x)	3	3/16	3	43012	43.50	43012-C3	48.50	43012-C4	59.60
.187 (3/16)	<b>.015</b>	.281	<b>1.875</b> (10x)	3	3/16	4	965712	46.20	965712-C3	53.00		
.187 (3/16)	<b>.015</b>	.281	<b>2.250</b> (12x)	3	3/16	4	43212	46.40	43212-C3	53.20	43212-C4	63.60
.187 (3/16)	<b>.020</b>	.281	<b>1.000</b> (5x)	3	3/16	3	953612	42.70	953612-C3	47.70		
.187 (3/16)	<b>.020</b>	.281	<b>1.500</b> (8x)	3	3/16	3	970212	43.50	970212-C3	48.50		
.187 (3/16)	<b>.030</b>	.281	<b>1.000</b> (5x)	3	3/16	3	42212	42.70	42212-C3	47.70		
.187 (3/16)	<b>.030</b>	.281	<b>1.500</b> (8x)	3	3/16	3	42412	43.50	42412-C3	48.50		
.187 (3/16)	<b>.030</b>	.281	<b>1.875</b> (10x)	3	3/16	4	921512	46.40	921512-C3	53.20		
.187 (3/16)	<b>.030</b>	.281	<b>2.250</b> (12x)	3	3/16	4	42612	46.40	42612-C3	53.20		
.187 (3/16)	<b>.045</b>	.281	<b>1.000</b> (5x)	3	3/16	3	978812	42.70	978812-C3	47.70		
.187 (3/16)	<b>.045</b>	.281	<b>1.500</b> (8x)	3	3/16	3	961812	43.50	961812-C3	48.50		
.187 (3/16)	<b>.060</b>	.281	<b>1.000</b> (5x)	3	3/16	3	949112	42.70	949112-C3	47.70		
.187 (3/16)	<b>.060</b>	.281	<b>1.500</b> (8x)	3	3/16	3	866012	43.30	866012-C3	48.30		
.250 (1/4)	<b>.005</b>	.375	<b>1.250</b> (5x)	3	1/4	4	37216	47.20	37216-C3	52.20		
.250 (1/4)	<b>.010</b>	.375	<b>1.250</b> (5x)	3	1/4	4	41616	47.20	41616-C3	55.10		
.250 (1/4)	<b>.015</b>	.375	<b>1.250</b> (5x)	3	1/4	4	42816	47.20	42816-C3	55.10		
.250 (1/4)	<b>.015</b>	.375	<b>2.000</b> (8x)	3	1/4	4	43016	48.30	43016-C3	56.20		
.250 (1/4)	<b>.015</b>	.375	<b>3.000</b> (12x)	3	1/4	6	43216	54.20	43216-C3	63.20		
.250 (1/4)	<b>.015</b>	.375	<b>4.375</b> (17.5x)	4	1/4	6	24016	87.20	24016-C3	96.20		
.250 (1/4)	<b>.020</b>	.375	<b>1.250</b> (5x)	3	1/4	4	953616	47.20	953616-C3	55.10		
.250 (1/4)	<b>.020</b>	.375	<b>2.000</b> (8x)	3	1/4	4	970216	48.30	970216-C3	56.20		
.250 (1/4)	<b>.030</b>	.375	<b>1.250</b> (5x)	3	1/4	4	42216	47.20	42216-C3	55.10	42216-C4	65.50
.250 (1/4)	<b>.030</b>	.375	<b>2.000</b> (8x)	3	1/4	4	42416	48.30	42416-C3	56.20	42416-C4	66.60
.250 (1/4)	<b>.030</b>	.375	<b>3.000</b> (12x)	3	1/4	6	42616	54.20	42616-C3	63.20	42616-C4	80.70
.250 (1/4)	<b>.045</b>	.375	<b>1.250</b> (5x)	3	1/4	4	978816	47.20	978816-C3	55.10		
.250 (1/4)	<b>.060</b>	.375	<b>1.250</b> (5x)	3	1/4	4	949116	47.20	949116-C3	55.10		
.312 (5/16)	<b>.015</b>	.470	<b>1.625</b> (5x)	3	5/16	4	42820	75.10	42820-C3	84.60		
.312 (5/16)	<b>.015</b>	.470	<b>2.500</b> (8x)	3	5/16	4	43020	76.40	43020-C3	85.90		
.312 (5/16)	<b>.015</b>	.470	<b>4.343</b> (14x)	4	5/16	6	24020	102.80	24020-C3	116.20		
.375 (3/8)	<b>.030</b>	.570	<b>2.000</b> (5x)	3	3/8	4	42224	79.50	42224-C3	91.80		
.375 (3/8)	<b>.030</b>	.570	<b>3.000</b> (8x)	3	3/8	6	42424	107.80	42424-C3	121.70		
.375 (3/8)	<b>.030</b>	.562	<b>4.312</b> (11.5x)	4	3/8	6	24024	116.60	24024-C3	130.50		
.500 (1/2)	<b>.030</b>	.750	<b>5.750</b> (11.5x)	4	1/2	8	24032	203.00	24032-C3	230.60		
.625 (5/8)	<b>.030</b>	.937	<b>5.687</b> (9x)	4	5/8	8	24040	342.50	24040-C3	366.80		
.750 (3/4)	<b>.030</b>	1.125	<b>5.625</b> (7.5x)	4	3/4	8	24048	422.70	24048-C3	451.00		





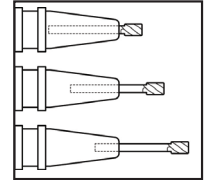
# END MILLS

## 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	CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
					4 FL	PRICE	4 FL	PRICE
D1 <sup>+0.000"</sup> / <sub>-.002"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L2 <sup>+0.030"</sup> / <sub>-.000"</sub>	D2 (h6)	L1	4 FL	PRICE	4 FL	PRICE
<b>1/8</b>	.015	3/16	<b>3 mm</b>	2-1/2	829008	86.40	829008-C3	91.00
<b>5/32</b>	.010	15/64	<b>1/8</b>	2-1/2	17610	86.40	17610-C3	91.40
<b>5/32</b>	.015	15/64	<b>1/8</b>	2-1/2	829010	86.40	829010-C3	91.00
<b>3/16</b>	.015	9/32	<b>1/8</b>	2-1/2	17612	86.40	17612-C3	91.40
<b>3/16</b>	.015	9/32	<b>5/32</b>	2-1/2	17613	89.00	17613-C3	94.00
<b>3/16</b>	.030	9/32	<b>1/8</b>	2-1/2	844912	89.00	844912-C3	93.60
<b>1/4</b>	.015	3/8	<b>3/16</b>	3	17616	93.60	17616-C3	100.40
<b>1/4</b>	.030	3/8	<b>3/16</b>	3	844916	93.60	844916-C3	98.60
<b>5/16</b>	.015	15/32	<b>1/4</b>	4	17620	114.00	17620-C3	123.50
<b>5/16</b>	.030	15/32	<b>1/4</b>	4	844920	114.00	844920-C3	123.50
<b>3/8</b>	.015	9/16	<b>5/16</b>	4	829024	135.60	829024-C3	147.90
<b>3/8</b>	.030	9/16	<b>5/16</b>	4	17624	135.60	17624-C3	147.90
<b>7/16</b>	.015	21/32	<b>3/8</b>	6	829028	199.20	829028-C3	213.10
<b>7/16</b>	.030	21/32	<b>3/8</b>	6	17628	199.20	17628-C3	214.20
<b>1/2</b>	.015	3/4	<b>7/16</b>	6	829032	208.40	829032-C3	216.00
<b>1/2</b>	.030	3/4	<b>7/16</b>	6	17632	208.40	17632-C3	222.30
<b>5/8</b>	.030	15/16	<b>1/2</b>	6	17640	270.70	17640-C3	290.70
<b>3/4</b>	.030	1-1/8	<b>5/8</b>	6	17648	334.00	17648-C3	355.00

**For Square Reduced Shank, please see page 36.**

**For Ball Reduced Shank, please see page 55.**



### The Anatomy of an End Mill

With how specific part blueprints are, understanding every geometry feature of your tool is pivotal to ensuring your final product is perfect. Understand each detail of your tool and the role it plays in your machining operation in our "In the Loupe" blog post **The Anatomy of an End Mill**.

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

# MINIATURE END MILLS

## Corner Chamfer – Standard



- ⚡ 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

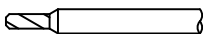
CORNER CHAMFER

CUTTER DIAMETER	CORNER CHAMFER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN 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	22.40	805162-C3	27.00 <span>NEW</span>
.078 (5/64)	<b>.005</b>	.234 (3x)	1/8	1-1/2	805178	22.40	805178-C3	27.00 <span>NEW</span>
.093 (3/32)	<b>.005</b>	.279 (3x)	1/8	1-1/2	805193	22.40	805193-C3	27.00 <span>NEW</span>
.093 (3/32)	<b>.010</b>	.279 (3x)	1/8	1-1/2	804993	22.40	804993-C3	27.00 <span>NEW</span>
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_4 \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	4 FL	PRICE	4 FL	PRICE
.125 (1/8)	<b>.005</b>	.375 (3x)	1/8	1-1/2	805208	22.40	805208-C3	27.00 <span>NEW</span>
.125 (1/8)	<b>.010</b>	.375 (3x)	1/8	1-1/2	805008	22.40	805008-C3	27.00 <span>NEW</span>
.125 (1/8)	<b>.020</b>	.375 (3x)	1/8	1-1/2	804808	22.40	804808-C3	27.00 <span>NEW</span>
.187 (3/16)	<b>.005</b>	.570 (3x)	3/16	2	805212	24.90	805212-C3	29.90 <span>NEW</span>
.187 (3/16)	<b>.010</b>	.570 (3x)	3/16	2	805012	24.90	805012-C3	29.90 <span>NEW</span>
.187 (3/16)	<b>.020</b>	.570 (3x)	3/16	2	804812	24.90	804812-C3	29.90 <span>NEW</span>
.250 (1/4)	<b>.005</b>	.750 (3x)	1/4	2-1/2	805216	30.60	805216-C3	37.40 <span>NEW</span>
.250 (1/4)	<b>.010</b>	.750 (3x)	1/4	2-1/2	805016	30.60	805016-C3	37.40 <span>NEW</span>
.250 (1/4)	<b>.020</b>	.750 (3x)	1/4	2-1/2	804816	30.60	804816-C3	37.40 <span>NEW</span>
.375 (3/8)	<b>.005</b>	1.125 (3x)	3/8	2-1/2	805224	44.70	805224-C3	53.70 <span>NEW</span>
.375 (3/8)	<b>.010</b>	1.125 (3x)	3/8	2-1/2	805024	44.70	805024-C3	53.70 <span>NEW</span>
.375 (3/8)	<b>.020</b>	1.125 (3x)	3/8	2-1/2	804824	44.70	804824-C3	53.70 <span>NEW</span>
.500 (1/2)	<b>.005</b>	1.500 (3x)	1/2	3	805232	69.00	805232-C3	82.40 <span>NEW</span>
.500 (1/2)	<b>.010</b>	1.500 (3x)	1/2	3	805032	69.00	805032-C3	82.40 <span>NEW</span>
.500 (1/2)	<b>.020</b>	1.500 (3x)	1/2	3	804832	69.00	804832-C3	82.40 <span>NEW</span>



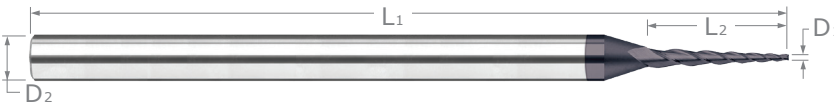
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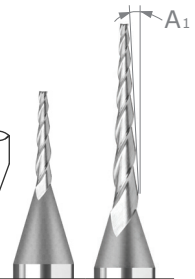
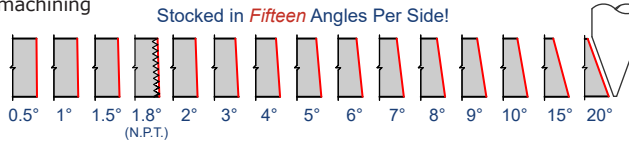


# MINIATURE END MILLS

## Tapered – Square



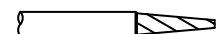
- Length of cut up to 10x end diameter
- Long length design for deep cavity machining
- 3 flutes
- Center cutting
- Solid carbide
- CNC ground in the USA



ANGLE PER SIDE $A_1$	CUTTER DIAMETER $D_1$	LENGTH OF CUT $L_2$	SHANK DIAMETER $D_2$ (h6)	OVERALL LENGTH $L_1$	UNCOATED		AITIN NANO COATED		TiB <sub>2</sub> COATED	
					3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
0.5°	.015 (1/64)	.078 (5x)	1/8	1-1/2	997015	40.10	997015-C6	46.90		
	.015 (1/64)	.150 (10x)	1/8	2-1/2	20515	66.00	20515-C6	72.80		
	.030	.156 (5x)	1/8	1-1/2	997030	34.80	997030-C6	41.60		
	.030	.300 (10x)	3/16	3	20530	59.90	20530-C6	67.20		
	.045	.250 (5x)	1/8	1-1/2	997045	34.80	997045-C6	41.60		
	.045	.450 (10x)	3/16	3	20545	59.90	20545-C6	67.20		
	.060	.312 (5x)	1/8	1-1/2	997060	34.80	997060-C6	41.60		
	.060	.600 (10x)	3/16	3	20560	59.90	20560-C6	67.20		
	.075	.750 (10x)	3/16	3	20575	59.90	20575-C6	67.20		
	.090	.500 (5x)	1/8	1-1/2	997090	34.80	997090-C6	41.60		
	.090	.900 (10x)	1/4	4	20590	65.10	20590-C6	75.10		
	.125 (1/8)	.625 (5x)	3/16	2	997099	54.00	997099-C6	61.30		
.125 (1/8)	1.250 (10x)	1/4	4	20599	65.10	20599-C6	75.10			
1.0°	.015 (1/64)	.078 (5x)	1/8	1-1/2	992715	40.10	992715-C6	46.90		
	.015 (1/64)	.150 (10x)	1/8	2-1/2	20615	66.00	20615-C6	72.80		
	.030	.156 (5x)	1/8	1-1/2	992730	34.80	992730-C6	41.60	992730-C8	41.60
	.030	.300 (10x)	3/16	3	20630	59.90	20630-C6	67.20	20630-C8	66.70
	.045	.250 (5x)	1/8	1-1/2	992745	34.80	992745-C6	41.60		
	.045	.450 (10x)	3/16	3	20645	59.90	20645-C6	67.20		
	.060	.312 (5x)	1/8	1-1/2	992760	34.80	992760-C6	41.60		
	.060	.600 (10x)	3/16	3	20660	59.90	20660-C6	67.20		
	.075	.750 (10x)	3/16	3	20675	59.90	20675-C6	67.20		
	.090	.500 (5x)	1/8	1-1/2	992790	34.80	992790-C6	41.60		
	.090	.900 (10x)	1/4	4	20690	65.10	20690-C6	75.10		
	.125 (1/8)	.625 (5x)	3/16	2	992799	54.00	992799-C6	61.30		
.125 (1/8)	1.250 (10x)	1/4	4	20699	65.10	20699-C6	75.10			
1.5°	.015 (1/64)	.078 (5x)	1/8	1-1/2	991815	40.10	991815-C6	46.90		
	.015 (1/64)	.150 (10x)	1/8	2-1/2	20715	66.00	20715-C6	72.80		
	.030	.156 (5x)	1/8	1-1/2	991830	34.80	991830-C6	41.60		
	.030	.300 (10x)	3/16	3	20730	59.90	20730-C6	67.20		
	.045	.250 (5x)	1/8	1-1/2	991845	34.80	991845-C6	41.60		
	.045	.450 (10x)	3/16	3	20745	59.90	20745-C6	67.20		
	.060	.312 (5x)	1/8	1-1/2	991860	34.80	991860-C6	41.60		
	.060	.600 (10x)	3/16	3	20760	59.90	20760-C6	67.20		
	.075	.750 (10x)	1/4	4	20775	66.30	20775-C6	76.30		
	.090	.500 (5x)	1/8	1-1/2	991890	34.80	991890-C6	41.60		
	.090	.900 (10x)	1/4	4	20790	65.10	20790-C6	75.10		
	.125 (1/8)	1.250 (10x)	1/4	4	20799	65.10	20799-C6	75.10		

TAPERED

continued on next page



# MINIATURE END MILLS

Tapered – Square (cont.)

continued from previous page

TAPERED

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>+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>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
<b>1.8°</b> (N.P.T.)	.200	.625 (3x)	1/4	2	912282	56.10	912282-C6	66.10		
	.300	.900 (3x)	3/8	2-1/2	912286	70.00	912286-C6	81.20		
	.400	1.250 (3x)	1/2	3	912292	94.10	912292-C6	108.60		
<b>2.0°</b>	.015 (1/64)	.078 (5x)	1/8	1-1/2	991015	40.10	991015-C6	46.90		
	.015 (1/64)	.150 (10x)	1/8	2-1/2	20815	66.00	20815-C6	72.80		
	.030	.156 (5x)	1/8	1-1/2	991030	34.80	991030-C6	41.60		
	.030	.300 (10x)	3/16	3	20830	59.90	20830-C6	67.20		
	.045	.250 (5x)	1/8	1-1/2	991045	34.80	991045-C6	41.60		
	.045	.450 (10x)	3/16	3	20845	59.90	20845-C6	67.20		
	.060	.312 (5x)	1/8	1-1/2	991060	34.80	991060-C6	41.60		
	.060	.600 (10x)	3/16	3	20860	59.90	20860-C6	67.20		
	.075	.750 (10x)	1/4	4	20875	66.30	20875-C6	76.30		
	.090	.500 (5x)	1/8	1-1/2	991090	34.80	991090-C6	41.60		
	.090	.900 (10x)	1/4	4	20890	65.10	20890-C6	75.10		
	.125 (1/8)	.625 (5x)	3/16	2	991099	54.00	991099-C6	61.30		
.125 (1/8)	1.250 (10x)	1/4	4	20899	65.10	20899-C6	75.10			
<b>3.0°</b>	.015 (1/64)	.078 (5x)	1/8	1-1/2	990415	40.10	990415-C6	46.90		
	.015 (1/64)	.150 (10x)	1/8	2-1/2	20915	66.00	20915-C6	72.80		
	.030	.156 (5x)	1/8	1-1/2	990430	34.80	990430-C6	41.60	990430-C8	41.60
	.030	.300 (10x)	3/16	3	20930	59.90	20930-C6	67.20	20930-C8	66.70
	.045	.250 (5x)	1/8	1-1/2	990445	34.80	990445-C6	41.60		
	.045	.450 (10x)	3/16	3	20945	59.90	20945-C6	67.20		
	.060	.312 (5x)	1/8	1-1/2	990460	34.80	990460-C6	41.60		
	.060	.600 (10x)	3/16	3	20960	59.90	20960-C6	67.20		
	.075	.750 (10x)	1/4	4	20975	66.30	20975-C6	76.30		
	.090	.500 (5x)	3/16	2	990490	54.00	990490-C6	61.30		
	.090	.900 (10x)	1/4	4	20990	65.10	20990-C6	75.10		
	.125 (1/8)	.625 (5x)	1/4	2-1/2	990499	79.50	990499-C6	89.50		
.125 (1/8)	1.190 (10x)	1/4	4	20999	65.10	20999-C6	75.10			
<b>4.0°</b>	.015 (1/64)	.150 (10x)	1/8	2-1/2	996215	66.00	996215-C6	72.80		
	.030	.300 (10x)	3/16	3	996230	59.90	996230-C6	67.20		
	.045	.450 (10x)	3/16	3	996245	59.90	996245-C6	67.20		
	.060	.600 (10x)	3/16	3	996260	59.90	996260-C6	67.20		
	.075	.750 (10x)	1/4	4	996275	66.30	996275-C6	76.30		
	.090	.900 (10x)	1/4	4	996290	66.30	996290-C6	76.30		
	.125 (1/8)	1.250 (10x)	3/8	4	996299	89.60	996299-C6	100.80		
	<b>5.0°</b>	.010	.050 (5x)	1/8	1-1/2	989610	47.60	989610-C6	54.40	
.010		.100 (10x)	1/8	2-1/2	27110	71.90	27110-C6	78.70		
.015 (1/64)		.078 (5x)	1/8	1-1/2	989615	40.10	989615-C6	46.90		
.015 (1/64)		.150 (10x)	1/8	2-1/2	27115	66.00	27115-C6	72.80		
.020		.100 (5x)	1/8	1-1/2	989620	39.30	989620-C6	46.10		
.020		.200 (10x)	1/8	2-1/2	27120	64.80	27120-C6	71.60		
.030		.156 (5x)	1/8	1-1/2	989630	34.80	989630-C6	41.60	989630-C8	41.60
.030		.300 (10x)	3/16	3	27130	59.90	27130-C6	67.20	27130-C8	66.70

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# MINIATURE END MILLS

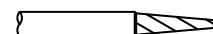
Tapered – Square (cont.)

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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	
5.0°	A <sub>1</sub> <sup>+0°30'</sup> -0°30'	D <sub>1</sub> <sup>+0.0005"</sup> -0.0005"	L <sub>2</sub> <sup>+0.020"</sup> -0.000"	D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
	.045	.250 (5x)	1/8	1-1/2	989645	34.80	989645-C6	41.60			
	.045	.450 (10x)	3/16	3	27145	59.90	27145-C6	67.20			
	.060	.312 (5x)	1/8	1-1/2	989660	34.80	989660-C6	41.60			
	.060	.600 (10x)	3/16	3	27160	59.90	27160-C6	67.20			
	.075	.375 (5x)	3/16	2	989675	54.00	989675-C6	61.30			
	.075	.750 (10x)	1/4	4	27175	66.30	27175-C6	76.30			
	.090	.500 (5x)	3/16	2	989690	54.00	989690-C6	61.30			
	.090	.900 (10x)	1/4	4	27190	65.10	27190-C6	75.10			
	.125 (1/8)	.625 (5x)	1/4	2-1/2	989699	79.50	989699-C6	89.50			
	.125 (1/8)	1.250 (10x)	3/8	4	27199	87.90	27199-C6	99.10			
	.187 (3/16)	1.000 (5x)	3/8	2-1/2	989681	87.90	989681-C6	99.10			
	.250 (1/4)	1.250 (5x)	1/2	3	989684	118.70	989684-C6	133.20			
6.0°	.015 (1/64)	.150 (10x)	1/8	2-1/2	993315	69.50	993315-C6	76.30			
	.030	.300 (10x)	3/16	3	993330	64.50	993330-C6	71.80			
	.045	.450 (10x)	3/16	3	993345	64.50	993345-C6	71.80			
	.060	.600 (10x)	3/16	3	993360	64.50	993360-C6	71.80			
	.090	.500 (5x)	1/4	2-1/2	904390	81.50	904390-C6	91.50			
	.125 (1/8)	.625 (5x)	5/16	2-1/2	904399	78.30	904399-C6	89.50			
7.0°	.015 (1/64)	.078 (5x)	1/8	1-1/2	922615	41.10	922615-C6	47.90			
	.015 (1/64)	.150 (10x)	1/8	2-1/2	28015	67.60	28015-C6	74.40			
	.030	.156 (5x)	1/8	1-1/2	922630	35.60	922630-C6	42.40			
	.030	.300 (10x)	3/16	3	28030	61.30	28030-C6	68.60			
	.045	.250 (5x)	1/8	1-1/2	922645	35.60	922645-C6	42.40			
	.045	.450 (10x)	3/16	3	28045	61.30	28045-C6	68.60			
	.060	.312 (5x)	3/16	2	922660	55.30	922660-C6	62.60			
	.060	.600 (10x)	1/4	4	28060	66.70	28060-C6	76.70			
	.075	.750 (10x)	3/8	4	28075	91.80	28075-C6	103.00			
	.090	.500 (5x)	1/4	2-1/2	922690	66.70	922690-C6	76.70			
	.090	.900 (10x)	3/8	4	28090	91.10	28090-C6	102.30			
	.125 (1/8)	.625 (5x)	5/16	2-1/2	922699	78.30	922699-C6	89.50			
8.0°	.015 (1/64)	.150 (10x)	1/8	2-1/2	995415	69.50	995415-C6	76.30			
	.030	.300 (10x)	3/16	3	995430	64.50	995430-C6	71.80			
	.045	.450 (10x)	3/16	3	995445	64.50	995445-C6	71.80			
	.060	.600 (10x)	1/4	4	995460	68.90	995460-C6	78.90			
	.090	.500 (5x)	1/4	2-1/2	903790	66.70	903790-C6	76.70			
	.125 (1/8)	.625 (5x)	5/16	2-1/2	903799	78.30	903799-C6	89.50			
9.0°	.015 (1/64)	.150 (10x)	1/8	2-1/2	992115	69.50	992115-C6	76.30			
	.030	.300 (10x)	3/16	3	992130	64.50	992130-C6	71.80			
	.045	.450 (10x)	3/16	3	992145	64.50	992145-C6	71.80			
	.060	.600 (10x)	1/4	4	992160	68.90	992160-C6	78.90			
	.090	.500 (5x)	1/4	2-1/2	902490	66.70	902490-C6	76.70			
	.125 (1/8)	.625 (5x)	3/8	2-1/2	902499	90.00	902499-C6	101.20			

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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	
10.0°	A <sub>1</sub> <sup>+0°30'</sup> / <sub>-0°30'</sub>	D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.005"</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
		.010	.050 (5x)	1/8	1-1/2	988210	47.60	988210-C6	54.40		
		.010	.100 (10x)	1/8	2-1/2	29410	71.90	29410-C6	78.70		
		.015 (1/64)	.078 (5x)	1/8	1-1/2	988215	40.10	988215-C6	46.90		
		.015 (1/64)	.150 (10x)	1/8	2-1/2	29415	66.00	29415-C6	72.80		
		.020	.100 (5x)	1/8	1-1/2	988220	40.10	988220-C6	46.90		
		.020	.200 (10x)	1/8	2-1/2	29420	64.80	29420-C6	71.60		
		.030	.156 (5x)	1/8	1-1/2	988230	34.80	988230-C6	41.60	988230-C8	41.60
		.030	.300 (10x)	3/16	3	29430	59.90	29430-C6	67.20	29430-C8	66.70
		.045	.250 (5x)	3/16	2	988245	59.90	988245-C6	67.20		
		.045	.450 (10x)	1/4	4	29445	66.30	29445-C6	76.30		
		.060	.312 (5x)	3/16	2	988260	59.90	988260-C6	67.20		
		.060	.600 (10x)	3/8	4	29460	87.90	29460-C6	99.10		
		.075	.375 (5x)	1/4	2-1/2	988275	63.00	988275-C6	73.00		
		.075	.750 (10x)	3/8	4	29475	89.60	29475-C6	100.80		
		.090	.500 (5x)	5/16	2-1/2	988290	74.50	988290-C6	85.70		
		.125 (1/8)	.625 (5x)	3/8	2-1/2	988299	87.90	988299-C6	99.10		
	.187 (3/16)	.890 (5x)	1/2	3	988281	118.70	988281-C6	133.20			
	.250 (1/4)	1.065 (5x)	5/8	3-1/2	988284	127.60	988284-C6	144.30			
15.0°		.015 (1/64)	.078 (5x)	1/8	1-1/2	919515	40.10	919515-C6	46.90		
		.015 (1/64)	.150 (10x)	1/8	1-1/2	41115	63.00	41115-C6	69.80		
		.030	.156 (5x)	1/8	1-1/2	919530	40.10	919530-C6	46.90		
		.030	.294 (10x)	3/16	2	41130	61.60	41130-C6	68.90		
		.045	.250 (5x)	3/16	2	919545	54.00	919545-C6	61.30		
		.045	.383 (8x)	1/4	2-1/2	41145	66.00	41145-C6	76.00		
		.060	.312 (5x)	1/4	2-1/2	919560	64.80	919560-C6	74.80		
		.060	.588 (10x)	3/8	2-1/2	41160	89.60	41160-C6	100.80		
		.075	.750 (10x)	1/2	3	41175	124.60	41175-C6	139.10		
		.090	.765 (8x)	1/2	3	41190	122.20	41190-C6	136.70		
		.125 (1/8)	.700 (5x)	1/2	3	41199	122.20	41199-C6	136.70		
20°		.015	.078 (5x)	1/8	1-1/2	832815	40.10	832815-C6	46.90		
		.030	.156 (5x)	3/16	2	832830	40.10	832830-C6	47.40		
		.045	.250 (5x)	1/4	2-1/2	832845	54.00	832845-C6	64.00		

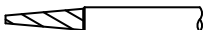
*For larger angles, please see Chamfer Cutters on page 249.*



### Introduction to Tapered End Mills

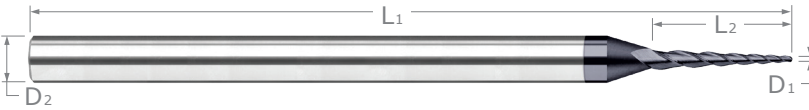
Interested in boosting your shop's productivity? Tapered end mills are a great place to look! Learn the benefits of opting for a tapered end mill in our "In the Loupe" blog post titled **Introduction to Tapered End Mills**.

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

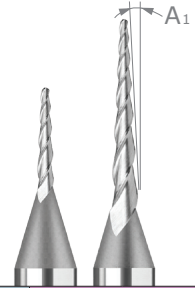
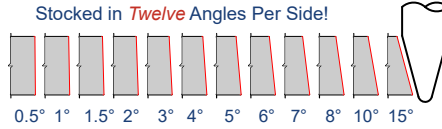


# MINIATURE END MILLS

## Tapered – Ball



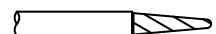
- ↻ Stocked in 0.5° to 15° tapers
- ↻ Long length design for deep cavity machining
- ↻ 3 flutes
- ↻ Center cutting
- ↻ Solid carbide
- ↻ CNC ground in the USA



ANGLE PER SIDE	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN NANO COATED	
					3 FL	PRICE	3 FL	PRICE
$A_1 \begin{smallmatrix} +0^\circ30' \\ -0^\circ30' \end{smallmatrix}$	$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	D <sub>2</sub> (h6)	L <sub>1</sub>				
<b>0.5°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	21515	70.40	21515-C6	77.20
	.030	<b>.300</b> (10x)	3/16	3	21530	65.80	21530-C6	73.10
	.045	<b>.450</b> (10x)	3/16	3	21545	67.00	21545-C6	74.30
	.060	<b>.600</b> (10x)	3/16	3	21560	65.80	21560-C6	73.10
	.090	<b>.900</b> (10x)	1/4	4	21590	69.40	21590-C6	79.40
	.125 (1/8)	<b>1.250</b> (10x)	1/4	4	21599	69.40	21599-C6	79.40
<b>1.0°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	21615	70.40	21615-C6	77.20
	.030	<b>.156</b> (5x)	1/8	1-1/2	879830	38.80	879830-C6	45.60
	.030	<b>.300</b> (10x)	3/16	3	21630	65.80	21630-C6	73.10
	.045	<b>.450</b> (10x)	3/16	3	21645	67.00	21645-C6	74.30
	.060	<b>.312</b> (5x)	1/8	1-1/2	879860	38.80	879860-C6	46.10
	.060	<b>.600</b> (10x)	3/16	3	21660	65.80	21660-C6	73.10
<b>1.5°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	21715	70.40	21715-C6	77.20
	.030	<b>.300</b> (10x)	3/16	3	21730	65.80	21730-C6	73.10
	.045	<b>.450</b> (10x)	3/16	3	21745	67.00	21745-C6	74.30
	.060	<b>.600</b> (10x)	3/16	3	21760	65.80	21760-C6	73.10
	.090	<b>.900</b> (10x)	1/4	4	21790	69.40	21790-C6	79.40
	.125 (1/8)	<b>1.250</b> (10x)	1/4	4	21799	69.40	21799-C6	79.40
<b>2.0°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	21815	70.40	21815-C6	77.20
	.030	<b>.300</b> (10x)	3/16	3	21830	65.80	21830-C6	73.10
	.045	<b>.450</b> (10x)	3/16	3	21845	67.00	21845-C6	74.30
	.060	<b>.600</b> (10x)	3/16	3	21860	65.80	21860-C6	73.10
	.090	<b>.900</b> (10x)	1/4	4	21890	69.40	21890-C6	79.40
	.125 (1/8)	<b>1.250</b> (10x)	1/4	4	21899	69.40	21899-C6	79.40
<b>3.0°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	21915	70.40	21915-C6	77.20
	.030	<b>.156</b> (5x)	1/8	1-1/2	880230	38.80	880230-C6	45.60
	.030	<b>.300</b> (10x)	3/16	3	21930	65.80	21930-C6	73.10
	.045	<b>.450</b> (10x)	3/16	3	21945	67.00	21945-C6	74.30
	.060	<b>.312</b> (5x)	1/8	1-1/2	880260	38.80	880260-C6	45.60
	.060	<b>.600</b> (10x)	3/16	3	21960	65.80	21960-C6	73.10
	.090	<b>.900</b> (10x)	1/4	4	21990	69.40	21990-C6	79.40
	.125 (1/8)	<b>1.190</b> (10x)	1/4	4	21999	69.40	21999-C6	79.40

TAPERED

continued on next page



# MINIATURE END MILLS

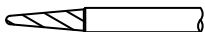
## Tapered – Ball (cont.)

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ANGLE PER SIDE	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN NANO COATED		
					3 FL	PRICE	3 FL	PRICE	
<b>4.0°</b>	$A_1 \begin{smallmatrix} +0^{\circ}30' \\ -0^{\circ}30' \end{smallmatrix}$	$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$				
	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	840415	72.10	840415-C6	78.90	
	.030	<b>.300</b> (10x)	3/16	3	840430	67.30	840430-C6	74.60	
	.060	<b>.600</b> (10x)	3/16	3	840460	67.30	840460-C6	74.60	
	.090	<b>.900</b> (10x)	1/4	4	840490	71.10	840490-C6	81.10	
<b>5.0°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	32615	70.40	32615-C6	77.20	
	.030	<b>.156</b> (5x)	1/8	1-1/2	880630	38.80	880630-C6	45.60	
	.030	<b>.300</b> (10x)	3/16	3	32630	65.80	32630-C6	73.10	
	.045	<b>.450</b> (10x)	3/16	3	32645	67.00	32645-C6	74.30	
	.060	<b>.312</b> (5x)	1/8	1-1/2	880660	38.80	880660-C6	45.60	
	.060	<b>.600</b> (10x)	3/16	3	32660	65.80	32660-C6	73.10	
	.090	<b>.900</b> (10x)	1/4	4	32690	69.40	32690-C6	79.40	
	.125 (1/8)	<b>1.250</b> (10x)	3/8	4	32699	92.40	32699-C6	103.60	
<b>6.0°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	835615	72.10	835615-C6	78.90	
	.030	<b>.300</b> (10x)	3/16	3	835630	67.30	835630-C6	74.60	
	.060	<b>.600</b> (10x)	3/16	3	835660	71.10	835660-C6	78.40	
	.090	<b>.900</b> (10x)	3/8	4	835690	94.60	835690-C6	105.80	
<b>7.0°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	34415	72.10	34415-C6	78.90	
	.030	<b>.300</b> (10x)	3/16	3	34430	67.30	34430-C6	74.60	
	.045	<b>.450</b> (10x)	3/16	3	34445	68.60	34445-C6	75.90	
	.060	<b>.600</b> (10x)	1/4	4	34460	71.10	34460-C6	81.10	
	.090	<b>.900</b> (10x)	3/8	4	34490	94.60	34490-C6	105.80	
<b>8.0°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	853815	72.10	853815-C6	78.90	
	.030	<b>.300</b> (10x)	3/16	3	853830	67.30	853830-C6	74.60	
	.060	<b>.600</b> (10x)	1/4	4	853860	71.10	853860-C6	81.10	
	.090	<b>.900</b> (10x)	3/8	4	853890	94.60	853890-C6	105.80	
<b>10.0°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	2-1/2	35315	72.10	35315-C6	78.90	
	.030	<b>.156</b> (5x)	1/8	1-1/2	881030	39.70	881030-C6	46.50	
	.030	<b>.300</b> (10x)	3/16	3	35330	67.30	35330-C6	74.60	
	.045	<b>.450</b> (10x)	1/4	4	35345	72.10	35345-C6	82.10	
	.060	<b>.312</b> (5x)	3/16	2	881060	65.20	881060-C6	72.00	
	.060	<b>.600</b> (10x)	3/8	4	35360	94.60	35360-C6	105.80	
	.090	<b>.500</b> (5x)	5/16	2-1/2	881090	105.20	881090-C6	115.40	
	.125 (1/8)	<b>.625</b> (5x)	3/8	2-1/2	881099	129.40	881099-C6	139.90	
	.187 (3/16)	<b>.937</b> (5x)	1/2	3	881081	146.80	881081-C6	161.30	
.250 (1/4)	<b>1.177</b> (5x)	5/8	3-1/2	881084	159.30	881084-C6	174.30		
<b>15.0°</b>	.015 (1/64)	<b>.150</b> (10x)	1/8	1-1/2	916115	72.50	916115-C6	79.30	
	.030	<b>.300</b> (10x)	3/16	2	916130	67.60	916130-C6	74.90	
	.045	<b>.402</b> (9x)	1/4	2-1/2	916145	72.50	916145-C6	82.50	
	.060	<b>.600</b> (10x)	3/8	2-1/2	916160	95.30	916160-C6	106.50	

TAPERED

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## FERROUS MATERIALS

HARDENED STEELS

**End Mills for Hardened Steels** *New Sizes & Styles!*  .....  82

**Recommended Materials:**

hardened steels up to 68 Rc and high temperature alloys

EXOTIC ALLOYS

**End Mills for Exotic Alloys** *New Sizes!*  .....  101

**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!*  .....  134

**Recommended Materials:**

readily machinable medium alloy steels, stainless steels, and tool steels

FREE MACHINING

**End Mills for Free Machining Steels**  .....  155

**Recommended Materials:**

free machining varieties of carbon steels and stainless steels

## NON-FERROUS MATERIALS

ALUMINUM

**End Mills for Aluminum Alloys** *New Sizes!*  .....  163

**Recommended Materials:**

aluminum, copper, brass, and bronze alloys, high silicon aluminum, magnesium alloys

DIAMOND TOOLING

**End Mills for Non-Ferrous Materials** *New Sizes!*  .....  185

**Recommended Materials:**

graphite, composites, green carbides, green ceramics

PLASTICS

**End Mills for Plastics**  .....  197

**Recommended Materials:**

filled and unfilled plastics

COMPOSITES

**End Mills for Composites** *New Sizes!* .....  215

**Recommended Materials:**

abrasive composites, fiber-reinforced materials, layered composites

WOOD

**End Mills for Wood** *New Material!* .....  221

**Recommended Materials:**

soft, hard, and engineered woods

# END MILLS FOR HARDENED STEELS

Square – For Steels Up to 55 Rc

HARDENED STEELS



5 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
- 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

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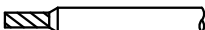
CUTTER DIAMETER			LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE
+ .0005"	+ .00mm	decimal equivalent	+ .010"				
- .0005"	- .02mm		+ .25mm				
.015 (1/64)		.0150	<b>.023</b> (1.5x)	1/4	2-1/2	907415-C6	70.00
.015 (1/64)		.0150	<b>.045</b> (3x)	1/4	2-1/2	915915-C6	70.00
.020		.0200	<b>.030</b> (1.5x)	1/4	2-1/2	907420-C6	70.00
.020		.0200	<b>.060</b> (3x)	1/4	2-1/2	915920-C6	70.00
.020		.0200	<b>.100</b> (5x)	1/4	2-1/2	885220-C6	73.40
.025		.0250	<b>.038</b> (1.5x)	1/4	2-1/2	907425-C6	70.00
.025		.0250	<b>.075</b> (3x)	1/4	2-1/2	915925-C6	70.00
.030		.0300	<b>.045</b> (1.5x)	1/4	2-1/2	907430-C6	63.60
.030		.0300	<b>.090</b> (3x)	1/4	2-1/2	915930-C6	63.60
.031 (1/32)		.0310	<b>.025</b> (0.8x)	1/4	2-1/2	859431-C6	61.70
.031 (1/32)		.0310	<b>.047</b> (1.5x)	1/4	2-1/2	907431-C6	59.00
.031 (1/32)		.0310	<b>.093</b> (3x)	1/4	2-1/2	915931-C6	59.00
.031 (1/32)		.0310	<b>.156</b> (5x)	1/4	2-1/2	885231-C6	64.30
.035		.0350	<b>.053</b> (1.5x)	1/4	2-1/2	907435-C6	59.30
.035		.0350	<b>.105</b> (3x)	1/4	2-1/2	915935-C6	59.30
.039		.0390	<b>.117</b> (3x)	1/4	2-1/2	915939-C6	59.30
	1.0 mm	.0393	<b>3.00 mm</b> (3x)	6 mm	63 mm	897822-C6	64.30
.040		.0400	<b>.060</b> (1.5x)	1/4	2-1/2	907440-C6	59.00
.040		.0400	<b>.120</b> (3x)	1/4	2-1/2	915940-C6	59.00
.040		.0400	<b>.203</b> (5x)	1/4	2-1/2	885240-C6	64.30
.045		.0450	<b>.068</b> (1.5x)	1/4	2-1/2	907445-C6	59.30
.045		.0450	<b>.135</b> (3x)	1/4	2-1/2	915945-C6	59.30
.047 (3/64)		.0470	<b>.071</b> (1.5x)	1/4	2-1/2	907447-C6	59.00
.047 (3/64)		.0470	<b>.141</b> (3x)	1/4	2-1/2	915947-C6	59.00
.047 (3/64)		.0470	<b>.250</b> (5x)	1/4	2-1/2	885247-C6	64.30
.050		.0500	<b>.075</b> (1.5x)	1/4	2-1/2	907450-C6	59.00
.050		.0500	<b>.150</b> (3x)	1/4	2-1/2	915950-C6	59.00
.055		.0550	<b>.083</b> (1.5x)	1/4	2-1/2	907455-C6	59.30
.055		.0550	<b>.165</b> (3x)	1/4	2-1/2	915955-C6	59.30
.060		.0600	<b>.090</b> (1.5x)	1/4	2-1/2	907460-C6	59.00
.060		.0600	<b>.180</b> (3x)	1/4	2-1/2	915960-C6	59.00
.062 (1/16)		.0620	<b>.050</b> (0.8x)	1/4	2-1/2	859462-C6	61.70
.062 (1/16)		.0620	<b>.093</b> (1.5x)	1/4	2-1/2	907462-C6	59.00
.062 (1/16)		.0620	<b>.186</b> (3x)	1/4	2-1/2	915962-C6	59.00
.062 (1/16)		.0620	<b>.250</b> (4x)	1/4	2-1/2	824962-C6	62.20
.062 (1/16)		.0620	<b>.312</b> (5x)	1/4	2-1/2	885262-C6	64.30
.070		.0700	<b>.105</b> (1.5x)	1/4	2-1/2	907470-C6	61.70
.070		.0700	<b>.210</b> (3x)	1/4	2-1/2	915970-C6	61.70

NEW

NEW

NEW

continued on next page



# END MILLS FOR HARDENED STEELS

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

**mm & in** continued from previous page

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" / - .0005"	+ .00mm / - .02mm	decimal equivalent	+ .010" / - .000" / + .25mm / - .00mm				
.078 (5/64)		.0780	<b>.117</b> (1.5x)	1/4	2-1/2	907478-C6	61.70
.078 (5/64)		.0780	<b>.234</b> (3x)	1/4	2-1/2	915978-C6	61.70
.078 (5/64)		.0780	<b>.406</b> (5x)	1/4	2-1/2	885278-C6	67.10
	2.0 mm	.0787	<b>6.00 mm</b> (3x)	6 mm	63 mm	897845-C6	67.40
.080		.0800	<b>.120</b> (1.5x)	1/4	2-1/2	907480-C6	61.70
.080		.0800	<b>.240</b> (3x)	1/4	2-1/2	915980-C6	61.70
.090		.0900	<b>.135</b> (1.5x)	1/4	2-1/2	907490-C6	61.70
.090		.0900	<b>.270</b> (3x)	1/4	2-1/2	915990-C6	61.70
.093 (3/32)		.0930	<b>.074</b> (0.8x)	1/4	2-1/2	859493-C6	65.30
.093 (3/32)		.0930	<b>.140</b> (1.5x)	1/4	2-1/2	907493-C6	62.60
.093 (3/32)		.0930	<b>.279</b> (3x)	1/4	2-1/2	915993-C6	62.60
<b>NEW</b> .093 (3/32)		.0930	<b>.372</b> (4x)	1/4	2-1/2	<b>824993-C6</b>	65.80
.093 (3/32)		.0930	<b>.500</b> (5x)	1/4	2-1/2	885293-C6	67.90
.100		.1000	<b>.150</b> (1.5x)	1/4	2-1/2	907500-C6	62.60
.100		.1000	<b>.300</b> (3x)	1/4	2-1/2	916000-C6	62.60
.109 (7/64)		.1090	<b>.164</b> (1.5x)	1/4	2-1/2	907502-C6	63.10
.109 (7/64)		.1090	<b>.327</b> (3x)	1/4	2-1/2	916002-C6	63.10
.118		.1180	<b>.177</b> (1.5x)	1/4	2-1/2	907505-C6	63.60
.118		.1180	<b>.354</b> (3x)	1/4	2-1/2	916005-C6	63.60
	3.0 mm	.1181	<b>9.00 mm</b> (3x)	6 mm	63 mm	897857-C6	68.70

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				
.125 (1/8)		.1250	<b>.100</b> (0.8x)	1/4	2-1/2	859508-C6	66.00
.125 (1/8)		.1250	<b>.187</b> (1.5x)	1/4	2-1/2	907508-C6	63.30
.125 (1/8)		.1250	<b>.375</b> (3x)	1/4	2-1/2	916008-C6	63.30
<b>NEW</b> .125 (1/8)		.1250	<b>.500</b> (4x)	1/4	2-1/2	<b>825008-C6</b>	66.50
.125 (1/8)		.1250	<b>.625</b> (5x)	1/4	2-1/2	885308-C6	68.60
.140 (9/64)		.1406	<b>.220</b> (1.5x)	1/4	2-1/2	907509-C6	66.60
.140 (9/64)		.1406	<b>.425</b> (3x)	1/4	2-1/2	916009-C6	66.60
.156 (5/32)		.1562	<b>.235</b> (1.5x)	1/4	2-1/2	907510-C6	63.30
.156 (5/32)		.1562	<b>.468</b> (3x)	1/4	2-1/2	916010-C6	63.30
<b>NEW</b> .156 (5/32)		.1562	<b>.625</b> (4x)	1/4	2-1/2	<b>825010-C6</b>	66.50
.156 (5/32)		.1562	<b>.750</b> (5x)	1/4	3	885310-C6	68.60
.187 (3/16)		.1875	<b>.285</b> (1.5x)	1/4	2-1/2	907512-C6	65.80
.187 (3/16)		.1875	<b>.562</b> (3x)	1/4	2-1/2	916012-C6	65.80
.187 (3/16)		.1875	<b>1.000</b> (5x)	1/4	3	885312-C6	72.40
	6.0 mm	.2362	<b>18.00 mm</b> (3x)	6 mm	63 mm	897866-C6	69.70
.250 (1/4)		.2500	<b>.375</b> (1.5x)	1/4	2-1/2	907516-C6	73.30
.250 (1/4)		.2500	<b>.750</b> (3x)	1/4	2-1/2	916016-C6	73.30
.250 (1/4)		.2500	<b>1.250</b> (5x)	1/4	4	885316-C6	79.70
.312 (5/16)		.3125	<b>.470</b> (1.5x)	5/16	2-1/2	907520-C6	79.90
.312 (5/16)		.3125	<b>1.000</b> (3x)	5/16	2-1/2	916020-C6	79.90
.375 (3/8)		.3750	<b>.570</b> (1.5x)	3/8	2-1/2	907524-C6	92.20
.375 (3/8)		.3750	<b>1.125</b> (3x)	3/8	2-1/2	916024-C6	92.20
.500 (1/2)		.5000	<b>.750</b> (1.5x)	1/2	3	907532-C6	111.40
.500 (1/2)		.5000	<b>1.500</b> (3x)	1/2	3	916032-C6	111.40

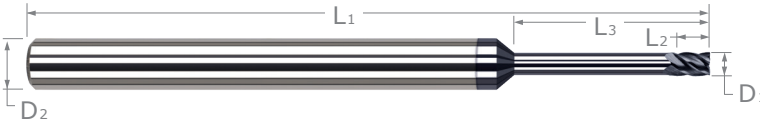
**PLEASE SEE SPEEDS & FEEDS ON PAGE 87**

HARDENED STEELS

# END MILLS FOR HARDENED STEELS

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

HARDENED STEELS



5 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
- ⚡ 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 🇺🇸

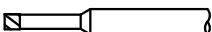
CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
					5 FL	PRICE
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.031	.047	<b>.156</b> (5x)	1/4	2-1/2	825331-C6	66.50 NEW
.031	.047	<b>.250</b> (8x)	1/4	2-1/2	819031-C6	71.80 NEW
.062	.093	<b>.312</b> (5x)	1/4	2-1/2	825362-C6	66.50 NEW
.062	.093	<b>.500</b> (8x)	1/4	2-1/2	819062-C6	71.80 NEW
.093	.140	<b>.500</b> (5x)	1/4	2-1/2	825393-C6	70.10 NEW
.093	.140	<b>.750</b> (8x)	1/4	2-1/2	819093-C6	75.40 NEW
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.125	.187	<b>.625</b> (5x)	1/4	2-1/2	825408-C6	70.80 NEW
.125	.187	<b>1.000</b> (8x)	1/4	2-1/2	819108-C6	76.10 NEW
.187	.285	<b>1.000</b> (5x)	1/4	3	825412-C6	74.60 NEW
.187	.285	<b>1.500</b> (8x)	1/4	3	819112-C6	79.90 NEW

PLEASE SEE SPEEDS & FEEDS ON PAGE 88



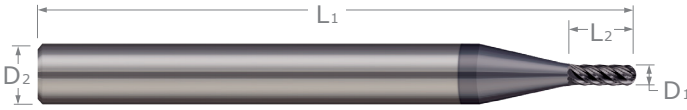
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Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)



# END MILLS FOR HARDENED STEELS

Ball – For Steels Up to 55 Rc



**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
- ⚡ 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	
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> (h6)	L <sub>1</sub>	<b>6 FL</b>	<b>PRICE</b>
.031 (1/32)	.093 (3x)	1/4	2-1/2	843431-C6	42.40
.047 (3/64)	.141 (3x)	1/4	2-1/2	843447-C6	42.40
.062 (1/16)	.186 (3x)	1/4	2-1/2	843462-C6	40.10
.078 (5/64)	.234 (3x)	1/4	2-1/2	843478-C6	40.10
.093 (3/32)	.279 (3x)	1/4	2-1/2	843493-C6	40.10
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>6 FL</b>	<b>PRICE</b>
.125 (1/8)	.375 (3x)	1/4	2-1/2	843508-C6	36.80
.187 (3/16)	.562 (3x)	1/4	2-1/2	843512-C6	39.20
.250 (1/4)	.750 (3x)	1/4	2-1/2	843516-C6	47.40

## 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 complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com).

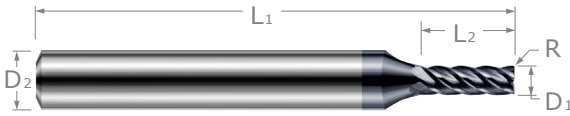
Material	Hardness	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter											Depth of Cut			
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	Radial	Axial	
Hardened Steels	38-44 Rc	100	Slotting	.00003	.00006	.00009	.00012	.00015	.00018	.00024	.00036	.00049	.00061	.00073	.00097	1 x Dia	.30 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



# END MILLS FOR HARDENED STEELS

Corner Radius – For Steels Up to 55 Rc

HARDENED STEELS



**5 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
- 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

**mm & in**

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	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>	5 FL	PRICE
+ .0005"	+ .00mm	decimal	+ .001"	+ .010"				
- .0005"	- .02mm	equivalent	- .001"	- .000"				
			+ .025mm	+ .25mm				
			- .025mm	- .00mm				
.031 (1/32)		.0310	<b>.005</b>	.047 (1.5x)	1/4	2-1/2	920431-C6	59.00
.031 (1/32)		.0310	<b>.005</b>	.093 (3x)	1/4	2-1/2	933231-C6	59.00
.031 (1/32)		.0310	<b>.005</b>	.156 (5x)	1/4	2-1/2	851731-C6	64.30
.031 (1/32)		.0310	<b>.010</b>	.093 (3x)	1/4	2-1/2	852131-C6	59.00
.039		.0390	<b>.005</b>	.117 (3x)	1/4	2-1/2	933239-C6	59.30
	1.0 mm	.0393	<b>.20 mm</b>	3.00 mm (3x)	6 mm	63 mm	894622-C6	64.30
.040		.0400	<b>.005</b>	.060 (1.5x)	1/4	2-1/2	920440-C6	59.30
.040		.0400	<b>.005</b>	.120 (3x)	1/4	2-1/2	933240-C6	59.30
.047 (3/64)		.0470	<b>.005</b>	.071 (1.5x)	1/4	2-1/2	920447-C6	59.00
.047 (3/64)		.0470	<b>.005</b>	.141 (3x)	1/4	2-1/2	933247-C6	59.00
.047 (3/64)		.0470	<b>.005</b>	.250 (5x)	1/4	2-1/2	851747-C6	64.30
.047 (3/64)		.0470	<b>.010</b>	.141 (3x)	1/4	2-1/2	852147-C6	59.00
.050		.0500	<b>.005</b>	.150 (3x)	1/4	2-1/2	933250-C6	59.30
.060		.0600	<b>.005</b>	.180 (3x)	1/4	2-1/2	933260-C6	59.30
.062 (1/16)		.0620	<b>.005</b>	.093 (1.5x)	1/4	2-1/2	920462-C6	59.00
.062 (1/16)		.0620	<b>.005</b>	.186 (3x)	1/4	2-1/2	933262-C6	59.00
.062 (1/16)		.0620	<b>.005</b>	.312 (5x)	1/4	2-1/2	851762-C6	64.30
.062 (1/16)		.0620	<b>.010</b>	.186 (3x)	1/4	2-1/2	852162-C6	59.00
.062 (1/16)		.0620	<b>.020</b>	.186 (3x)	1/4	2-1/2	813562-C6	59.00 <span style="color: red;">NEW</span>
.070		.0700	<b>.005</b>	.210 (3x)	1/4	2-1/2	933270-C6	62.10
.078 (5/64)		.0780	<b>.005</b>	.117 (1.5x)	1/4	2-1/2	920478-C6	61.70
.078 (5/64)		.0780	<b>.005</b>	.234 (3x)	1/4	2-1/2	933278-C6	61.70
.078 (5/64)		.0780	<b>.005</b>	.406 (5x)	1/4	2-1/2	851778-C6	67.10
.078 (5/64)		.0780	<b>.010</b>	.117 (1.5x)	1/4	2-1/2	872778-C6	61.70
.078 (5/64)		.0780	<b>.010</b>	.234 (3x)	1/4	2-1/2	852178-C6	61.70
	2.0 mm	.0787	<b>.20 mm</b>	6.00 mm (3x)	6 mm	63 mm	894645-C6	67.40
.080		.0800	<b>.005</b>	.240 (3x)	1/4	2-1/2	933280-C6	63.10
.090		.0900	<b>.005</b>	.270 (3x)	1/4	2-1/2	933290-C6	63.10
.093 (3/32)		.0930	<b>.005</b>	.140 (1.5x)	1/4	2-1/2	920493-C6	62.60
.093 (3/32)		.0930	<b>.005</b>	.279 (3x)	1/4	2-1/2	933293-C6	62.60
.093 (3/32)		.0930	<b>.005</b>	.500 (5x)	1/4	2-1/2	851793-C6	67.90
.093 (3/32)		.0930	<b>.010</b>	.140 (1.5x)	1/4	2-1/2	872793-C6	62.60
.093 (3/32)		.0930	<b>.010</b>	.279 (3x)	1/4	2-1/2	852193-C6	62.60
.093 (3/32)		.0930	<b>.020</b>	.279 (3x)	1/4	2-1/2	813593-C6	62.60 <span style="color: red;">NEW</span>
.093 (3/32)		.0930	<b>.030</b>	.279 (3x)	1/4	2-1/2	853293-C6	62.60
.100		.1000	<b>.005</b>	.300 (3x)	1/4	2-1/2	933300-C6	63.10
.109 (7/64)		.1090	<b>.005</b>	.327 (3x)	1/4	2-1/2	933302-C6	62.60
.118		.1180	<b>.005</b>	.354 (3x)	1/4	2-1/2	933305-C6	63.60
	3.0 mm	.1181	<b>.20 mm</b>	9.00 mm (3x)	6 mm	63 mm	894657-C6	68.70

continued on next page



# END MILLS FOR HARDENED STEELS

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

continued from previous page

**mm & in**

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
					5 FL	PRICE
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>		
.125 (1/8)	.1250	.187 (1.5x)	1/4	2-1/2	920508-C6	63.30
.125 (1/8)	.1250	.375 (3x)	1/4	2-1/2	933308-C6	63.30
.125 (1/8)	.1250	.625 (5x)	1/4	2-1/2	851808-C6	68.60
.125 (1/8)	.1250	.375 (3x)	1/4	2-1/2	852208-C6	63.30
.125 (1/8)	.1250	.375 (3x)	1/4	2-1/2	852808-C6	63.30
.125 (1/8)	.1250	.375 (3x)	1/4	2-1/2	813608-C6	63.30
.125 (1/8)	.1250	.375 (3x)	1/4	2-1/2	853308-C6	63.30
.156 (5/32)	.1562	.235 (1.5x)	1/4	2-1/2	920510-C6	63.30
.156 (5/32)	.1562	.468 (3x)	1/4	2-1/2	933310-C6	63.30
.156 (5/32)	.1562	.750 (5x)	1/4	3	851810-C6	68.60
.156 (5/32)	.1562	.468 (3x)	1/4	2-1/2	852810-C6	63.30
.156 (5/32)	.1562	.468 (3x)	1/4	2-1/2	853310-C6	63.30
.187 (3/16)	.1875	.285 (1.5x)	1/4	2-1/2	920512-C6	65.80
.187 (3/16)	.1875	.562 (3x)	1/4	2-1/2	933312-C6	65.80
.187 (3/16)	.1875	1.000 (5x)	1/4	3	851812-C6	72.40
.187 (3/16)	.1875	.562 (3x)	1/4	2-1/2	852212-C6	65.80
.187 (3/16)	.1875	.562 (3x)	1/4	2-1/2	852812-C6	65.80
.187 (3/16)	.1875	.562 (3x)	1/4	2-1/2	853312-C6	65.80
6.0 mm	.2362	.20 mm 18.00 mm (3x)	6 mm	63 mm	894666-C6	69.70
.250 (1/4)	.2500	.375 (1.5x)	1/4	2-1/2	920516-C6	73.30
.250 (1/4)	.2500	.750 (3x)	1/4	2-1/2	933316-C6	73.30
.250 (1/4)	.2500	1.250 (5x)	1/4	4	851816-C6	79.70
.250 (1/4)	.2500	.750 (3x)	1/4	2-1/2	852216-C6	73.30
.250 (1/4)	.2500	.750 (3x)	1/4	2-1/2	852816-C6	73.30
.250 (1/4)	.2500	.750 (3x)	1/4	2-1/2	853316-C6	73.30

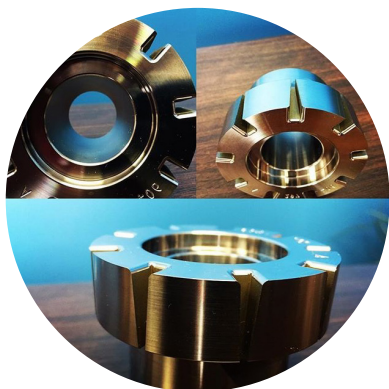
NEW

HARDENED STEELS

## 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.harveytool.com](http://www.harveytool.com).

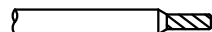
Material	Hardness	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter										Depth of Cut				
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	Radial	Axial	
Hardened Steels	38-44 Rc	100	Slotting	.00003	.00007	.00010	.00013	.00017	.00020	.00027	.00040	.00054	.00067	.00081	.00108	1 x Dia	.30 x Dia
			Profiling	.00004	.00008	.00012	.00016	.00020	.00024	.00033	.00049	.00065	.00082	.00098	.00131	.3 x Dia	.5 x Dia
Titanium Alloys Nickel 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



"Taper much? All slots and ID hole tapered. That's not a hand polished finish either, @harveytool endmills get the credit for the finish on the radii. Turned out beautifully."

— @intri\_cut

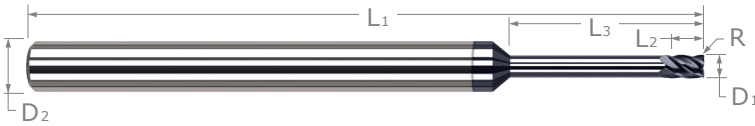
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# END MILLS FOR HARDENED STEELS

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

HARDENED STEELS



5 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
- 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> $\begin{matrix} +.0005'' \\ -.0005'' \end{matrix}$	R $\begin{matrix} +.001'' \\ -.001'' \end{matrix}$	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	.005	.047	.156 (5x)	1/4	2-1/2	812731-C6	66.50 NEW
.031	.005	.047	.250 (8x)	1/4	2-1/2	812531-C6	71.80 NEW
.062	.005	.093	.312 (5x)	1/4	2-1/2	812762-C6	66.50 NEW
.062	.005	.093	.500 (8x)	1/4	2-1/2	812562-C6	71.80 NEW
.093	.005	.140	.500 (5x)	1/4	2-1/2	812793-C6	70.10 NEW
.093	.005	.140	.750 (8x)	1/4	2-1/2	812593-C6	75.40 NEW
D <sub>1</sub> $\begin{matrix} +.000'' \\ -.002'' \end{matrix}$	R $\begin{matrix} +.001'' \\ -.001'' \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.030'' \\ -.000'' \end{matrix}$	L <sub>3</sub> $\begin{matrix} +.030'' \\ -.000'' \end{matrix}$	D <sub>2</sub> (h6)	L <sub>1</sub>	5 FL	PRICE
.125	.005	.187	.625 (5x)	1/4	2-1/2	812808-C6	70.80 NEW
.125	.005	.187	1.000 (8x)	1/4	2-1/2	812608-C6	76.10 NEW
.187	.005	.285	1.000 (5x)	1/4	3	812812-C6	74.60 NEW
.187	.005	.285	1.500 (8x)	1/4	3	812612-C6	79.90 NEW

## 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	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



View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

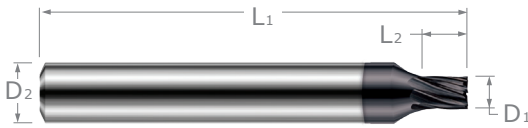
Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)





## END MILLS FOR HARDENED STEELS

Square – For Steels 45 - 68 Rc



◀ **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	
				7 FL	PRICE
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$	<b>7 FL</b>	<b>PRICE</b>
.031 (1/32)	.047 (1.5x)	1/4	2-1/2	835131-C6	61.60
.031 (1/32)	.093 (3x)	1/4	2-1/2	854831-C6	61.60
.047 (3/64)	.141 (3x)	1/4	2-1/2	854847-C6	61.60
.062 (1/16)	.093 (1.5x)	1/4	2-1/2	835162-C6	61.60
.062 (1/16)	.186 (3x)	1/4	2-1/2	854862-C6	61.60
.078 (5/64)	.234 (3x)	1/4	2-1/2	854878-C6	65.00
.093 (3/32)	.140 (1.5x)	1/4	2-1/2	835193-C6	65.70
.093 (3/32)	.279 (3x)	1/4	2-1/2	854893-C6	65.70
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$	<b>7 FL</b>	<b>PRICE</b>
.125 (1/8)	.187 (1.5x)	1/4	2-1/2	835208-C6	66.50
.125 (1/8)	.375 (3x)	1/4	2-1/2	854808-C6	66.50
.156 (5/32)	.468 (3x)	1/4	2-1/2	854810-C6	71.90
.187 (3/16)	.285 (1.5x)	1/4	2-1/2	835212-C6	69.20
.187 (3/16)	.562 (3x)	1/4	2-1/2	854812-C6	69.20
.250 (1/4)	.375 (1.5x)	1/4	2-1/2	835216-C6	77.00
.250 (1/4)	.750 (3x)	1/4	2-1/2	854816-C6	77.00
.375 (3/8)	1.125 (3x)	3/8	2-1/2	854824-C6	96.00
.500 (1/2)	1.500 (3x)	1/2	3	854832-C6	116.80

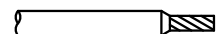
**PLEASE SEE SPEEDS & FEEDS ON PAGE 91**



### Why Flute Count Matters

7 flutes for steel? Is that really necessary? Yes! Our "In the Loupe" blog post **Why Flute Count Matters** walks readers through the importance of the tool's core diameter size and why flute count plays a pivotal role in speeds and feeds calculations.

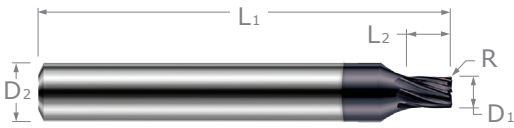
[Read more on harveyperformance.com/in-the-loupe/](http://harveyperformance.com/in-the-loupe/)



# END MILLS FOR HARDENED STEELS

Corner Radius – For Steels 45 - 68 Rc

HARDENED STEELS



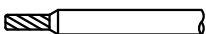
**7 Flute, Variable Helix Design**

- ⚡ **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

**mm & in**

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
					7 FL	PRICE
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.030	.005	.045 (1.5x)	1/4	2-1/2	903130-C6	67.30
.030	.005	.090 (3x)	1/4	2-1/2	910830-C6	67.30
.031 (1/32)	.005	.047 (1.5x)	1/4	2-1/2	903131-C6	65.20
.031 (1/32)	.005	.093 (3x)	1/4	2-1/2	910831-C6	65.20
.031 (1/32)	.005	.156 (5x)	1/4	2-1/2	845231-C6	70.50
.040	.005	.120 (3x)	1/4	2-1/2	910840-C6	67.30
.047 (3/64)	.005	.071 (1.5x)	1/4	2-1/2	903147-C6	65.20
.047 (3/64)	.005	.141 (3x)	1/4	2-1/2	910847-C6	65.20
.050	.005	.150 (3x)	1/4	2-1/2	910850-C6	67.30
.060	.005	.180 (3x)	1/4	2-1/2	910860-C6	67.30
.062 (1/16)	.005	.093 (1.5x)	1/4	2-1/2	903162-C6	65.20
.062 (1/16)	.005	.186 (3x)	1/4	2-1/2	910862-C6	65.20
.062 (1/16)	.005	.312 (5x)	1/4	2-1/2	845262-C6	70.50
.062 (1/16)	.010	.186 (3x)	1/4	2-1/2	850562-C6	65.20
.070	.005	.210 (3x)	1/4	2-1/2	910870-C6	67.30
.078 (5/64)	.005	.117 (1.5x)	1/4	2-1/2	903178-C6	68.40
.078 (5/64)	.005	.234 (3x)	1/4	2-1/2	910878-C6	68.40
.080	.005	.240 (3x)	1/4	2-1/2	910880-C6	70.60
.090	.005	.270 (3x)	1/4	2-1/2	910890-C6	70.60
.093 (3/32)	.005	.140 (1.5x)	1/4	2-1/2	903193-C6	69.00
.093 (3/32)	.005	.279 (3x)	1/4	2-1/2	910893-C6	69.00
.093 (3/32)	.005	.500 (5x)	1/4	2-1/2	845293-C6	74.30
.093 (3/32)	.010	.279 (3x)	1/4	2-1/2	850593-C6	69.00
.100	.005	.300 (3x)	1/4	2-1/2	910900-C6	70.60
.109 (7/64)	.005	.327 (3x)	1/4	2-1/2	910902-C6	70.60
.118	.005	.354 (3x)	1/4	2-1/2	910905-C6	70.60
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.125 (1/8)	.005	.187 (1.5x)	1/4	2-1/2	903208-C6	70.00
.125 (1/8)	.005	.375 (3x)	1/4	2-1/2	910908-C6	70.00
.125 (1/8)	.005	.625 (5x)	1/4	2-1/2	845308-C6	70.00
.125 (1/8)	.010	.375 (3x)	1/4	2-1/2	850608-C6	70.00
.125 (1/8)	.015	.187 (1.5x)	1/4	2-1/2	879108-C6	70.00
.125 (1/8)	.015	.375 (3x)	1/4	2-1/2	882308-C6	70.00
.125 (1/8)	.030	.375 (3x)	1/4	2-1/2	883508-C6	70.00

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# END MILLS FOR HARDENED STEELS

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

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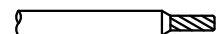
CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
					7 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	R <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>		
.140 (9/64)	.005	.425 (3x)	1/4	2-1/2	910909-C6	72.20
.156 (5/32)	.005	.235 (1.5x)	1/4	2-1/2	903210-C6	70.00
.156 (5/32)	.005	.468 (3x)	1/4	2-1/2	910910-C6	70.00
.187 (3/16)	.005	.285 (1.5x)	1/4	2-1/2	903212-C6	72.90
.187 (3/16)	.005	.562 (3x)	1/4	2-1/2	910912-C6	72.90
.187 (3/16)	.010	.562 (3x)	1/4	2-1/2	850612-C6	72.90
.187 (3/16)	.015	.285 (1.5x)	1/4	2-1/2	879112-C6	72.90
.187 (3/16)	.015	.562 (3x)	1/4	2-1/2	882312-C6	72.90
.250 (1/4)	.005	.375 (1.5x)	1/4	2-1/2	903216-C6	81.10
.250 (1/4)	.005	.750 (3x)	1/4	2-1/2	910916-C6	81.10
.250 (1/4)	.010	.750 (3x)	1/4	2-1/2	850616-C6	81.10
.250 (1/4)	.015	.375 (1.5x)	1/4	2-1/2	879116-C6	81.10
.250 (1/4)	.015	.750 (3x)	1/4	2-1/2	882316-C6	81.10
.250 (1/4)	.030	.750 (3x)	1/4	2-1/2	883516-C6	81.10
.312 (5/16)	.015	1.000 (3x)	5/16	2-1/2	882320-C6	84.30
.312 (5/16)	.030	1.000 (3x)	5/16	2-1/2	883520-C6	84.30
.375 (3/8)	.015	.570 (1.5x)	3/8	2-1/2	879124-C6	91.20
.375 (3/8)	.015	1.125 (3x)	3/8	2-1/2	882324-C6	91.20
.375 (3/8)	.030	.570 (1.5x)	3/8	2-1/2	868024-C6	91.20
.375 (3/8)	.030	1.125 (3x)	3/8	2-1/2	883524-C6	91.20
.500 (1/2)	.015	.750 (1.5x)	1/2	3	879132-C6	101.00
.500 (1/2)	.015	1.500 (3x)	1/2	3	882332-C6	101.00
.500 (1/2)	.030	.750 (1.5x)	1/2	3	868032-C6	101.00
.500 (1/2)	.030	1.500 (3x)	1/2	3	883532-C6	101.00

HARDENED STEELS

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

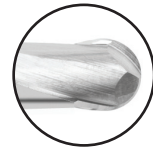
Material	Hardness	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter											Depth of Cut			
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	Radial	Axial	
Hardened Steels	45 - 55 Rc	60	Semi-Roughing	.00004	.00008	.00012	.00015	.00019	.00023	.00031	.00047	.00062	.00078	.00094	.00125	.15 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
			Finishing	.00003	.00007	.00010	.00014	.00017	.00020	.00027	.00041	.00055	.00069	.00082	.00110	.08 x Dia	.5 x Dia



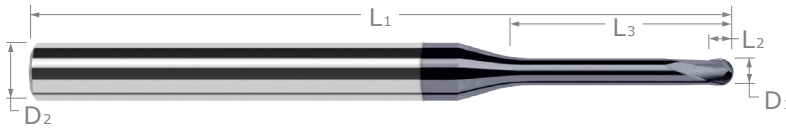
# END MILLS FOR HARDENED STEELS

## 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 (3 flutes to center)
- Reduced neck diameter to avoid heeling
- CNC ground in the USA

**mm & in**

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO 2 FLUTE		AITIN 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"	-0.014mm	equivalent	+0.000"	+0.000"						
			+0.125mm	+0.125mm						
			-0.000mm	-0.000mm						
.008		.0080	.006	<b>.012</b> (1.5x)	1/4	2-1/2	37808-C6	95.10		
.008		.0080	.006	<b>.025</b> (3x)	1/4	2-1/2	31408-C6	95.10		
.008		.0080	.006	<b>.040</b> (5x)	1/4	2-1/2	38708-C6	99.80		
.010		.0100	.008	<b>.015</b> (1.5x)	1/4	2-1/2	37810-C6	86.40		
.010		.0100	.008	<b>.031</b> (3x)	1/4	2-1/2	31410-C6	86.40		
.010		.0100	.008	<b>.050</b> (5x)	1/4	2-1/2	38710-C6	90.40		
.015 (1/64)		.0150	.012	-	1/4	2-1/2	958315-C6	73.60		
.015 (1/64)		.0150	.012	<b>.023</b> (1.5x)	1/4	2-1/2	37815-C6	69.70		
.015 (1/64)		.0150	.012	<b>.047</b> (3x)	1/4	2-1/2	31415-C6	69.70	813115-C6	74.20 NEW
.015 (1/64)		.0150	.012	<b>.062</b> (4x)	1/4	2-1/2	881515-C6	72.20		
.015 (1/64)		.0150	.012	<b>.078</b> (5x)	1/4	2-1/2	38715-C6	72.20	812915-C6	76.70 NEW
.015 (1/64)		.0150	.012	<b>.125</b> (8x)	1/4	2-1/2	32015-C6	76.40		
.015 (1/64)		.0150	.012	<b>.187</b> (12x)	1/4	2-1/2	33815-C6	93.10		
.020		.0200	.016	-	1/4	2-1/2	958320-C6	73.60		
.020		.0200	.016	<b>.031</b> (1.5x)	1/4	2-1/2	37820-C6	69.70		
.020		.0200	.016	<b>.062</b> (3x)	1/4	2-1/2	31420-C6	69.70		
.020		.0200	.016	<b>.080</b> (4x)	1/4	2-1/2	881520-C6	72.20		
.020		.0200	.016	<b>.100</b> (5x)	1/4	2-1/2	38720-C6	72.20		
.020		.0200	.016	<b>.160</b> (8x)	1/4	2-1/2	32020-C6	72.90		
.025		.0250	.020	<b>.038</b> (1.5x)	1/4	2-1/2	37825-C6	69.70		
.025		.0250	.020	<b>.075</b> (3x)	1/4	2-1/2	31425-C6	69.70		
.025		.0250	.020	<b>.125</b> (5x)	1/4	2-1/2	38725-C6	72.20		
.031 (1/32)		.0310	.025	-	1/4	2-1/2	958331-C6	63.30		
.031 (1/32)		.0310	.025	<b>.047</b> (1.5x)	1/4	2-1/2	37831-C6	59.60		
.031 (1/32)		.0310	.025	<b>.093</b> (3x)	1/4	2-1/2	31431-C6	59.60	813131-C6	64.10 NEW
.031 (1/32)		.0310	.025	<b>.125</b> (4x)	1/4	2-1/2	881531-C6	63.30		
.031 (1/32)		.0310	.025	<b>.156</b> (5x)	1/4	2-1/2	38731-C6	65.20	812931-C6	69.70 NEW
.031 (1/32)		.0310	.025	<b>.187</b> (6x)	1/4	2-1/2	858031-C6	66.50		
.031 (1/32)		.0310	.025	<b>.218</b> (7x)	1/4	2-1/2	863231-C6	67.60		
.031 (1/32)		.0310	.025	<b>.250</b> (8x)	1/4	2-1/2	32031-C6	68.70		
.031 (1/32)		.0310	.025	<b>.312</b> (10x)	1/4	2-1/2	919131-C6	79.90		
.031 (1/32)		.0310	.025	<b>.375</b> (12x)	1/4	2-1/2	33831-C6	79.90		
.031 (1/32)		.0310	.025	<b>.470</b> (15x)	1/4	2-1/2	973231-C6	91.70		

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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	
					2 FL	PRICE	3 FL	PRICE
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>				
.039	.031	-	1/4	2-1/2	958339-C6	63.30		
.039	.031	<b>.062</b> (1.5x)	1/4	2-1/2	37839-C6	59.60		
.039	.031	<b>.117</b> (3x)	1/4	2-1/2	31439-C6	59.60		
.039	.031	<b>.156</b> (4x)	1/4	2-1/2	881539-C6	65.20		
.039	.031	<b>.203</b> (5x)	1/4	2-1/2	38739-C6	65.20		
.039	.031	<b>.312</b> (8x)	1/4	2-1/2	32039-C6	68.70		
.039	.031	<b>.468</b> (12x)	1/4	2-1/2	33839-C6	79.90		
1.0 mm	.80 mm	<b>3.00 mm</b> (3x)	6 mm	63 mm	882922-C6	65.20		
1.0 mm	.80 mm	<b>5.00 mm</b> (5x)	6 mm	63 mm	881722-C6	70.60		
.040	.032	<b>.062</b> (1.5x)	1/4	2-1/2	37840-C6	59.60		
.040	.032	<b>.125</b> (3x)	1/4	2-1/2	31440-C6	59.60		
.047 (3/64)	.038	-	1/4	2-1/2	958347-C6	63.30		
.047 (3/64)	.038	<b>.071</b> (1.5x)	1/4	2-1/2	37847-C6	59.60		
<b>NEW</b> .047 (3/64)	.038	<b>.141</b> (3x)	1/4	2-1/2	31447-C6	59.60	813147-C6	64.10
.047 (3/64)	.038	<b>.187</b> (4x)	1/4	2-1/2	881547-C6	65.20		
<b>NEW</b> .047 (3/64)	.038	<b>.250</b> (5x)	1/4	2-1/2	38747-C6	65.20	812947-C6	69.70
.047 (3/64)	.038	<b>.375</b> (8x)	1/4	2-1/2	32047-C6	68.70		
.047 (3/64)	.038	<b>.470</b> (10x)	1/4	2-1/2	919147-C6	79.90		
.047 (3/64)	.038	<b>.564</b> (12x)	1/4	2-1/2	33847-C6	79.90		
.047 (3/64)	.038	<b>.710</b> (15x)	1/4	2-1/2	973247-C6	91.70		
.050	.040	<b>.078</b> (1.5x)	1/4	2-1/2	37850-C6	59.60		
.050	.040	<b>.150</b> (3x)	1/4	2-1/2	31450-C6	59.60		
.060	.048	<b>.093</b> (1.5x)	1/4	2-1/2	37860-C6	59.60		
.060	.048	<b>.180</b> (3x)	1/4	2-1/2	31460-C6	59.60		
.062 (1/16)	.050	-	1/4	2-1/2	958362-C6	63.30		
.062 (1/16)	.050	<b>.093</b> (1.5x)	1/4	2-1/2	37862-C6	59.60		
<b>NEW</b> .062 (1/16)	.050	<b>.187</b> (3x)	1/4	2-1/2	31462-C6	59.60	813162-C6	64.10
.062 (1/16)	.050	<b>.250</b> (4x)	1/4	2-1/2	881562-C6	63.30		
<b>NEW</b> .062 (1/16)	.050	<b>.312</b> (5x)	1/4	2-1/2	38762-C6	65.20	812962-C6	69.70
.062 (1/16)	.050	<b>.375</b> (6x)	1/4	2-1/2	858062-C6	66.50		
.062 (1/16)	.050	<b>.437</b> (7x)	1/4	2-1/2	863262-C6	67.60		
.062 (1/16)	.050	<b>.500</b> (8x)	1/4	2-1/2	32062-C6	68.70		
.062 (1/16)	.050	<b>.625</b> (10x)	1/4	2-1/2	919162-C6	86.90		
.062 (1/16)	.050	<b>.750</b> (12x)	1/4	4	33862-C6	86.90		
.062 (1/16)	.050	<b>.950</b> (15x)	1/4	4	973262-C6	99.10		
.078 (5/64)	.062	-	1/4	2-1/2	958378-C6	63.30		
.078 (5/64)	.062	<b>.117</b> (1.5x)	1/4	2-1/2	37878-C6	59.60		
<b>NEW</b> .078 (5/64)	.062	<b>.234</b> (3x)	1/4	2-1/2	31478-C6	59.60	813178-C6	64.10
.078 (5/64)	.062	<b>.312</b> (4x)	1/4	2-1/2	881578-C6	65.20		
<b>NEW</b> .078 (5/64)	.062	<b>.406</b> (5x)	1/4	2-1/2	38778-C6	65.20	812978-C6	69.70
.078 (5/64)	.062	<b>.625</b> (8x)	1/4	2-1/2	32078-C6	68.70		
.078 (5/64)	.062	<b>.781</b> (10x)	1/4	2-1/2	919178-C6	86.90		
.078 (5/64)	.062	<b>.937</b> (12x)	1/4	4	33878-C6	86.90		
.078 (5/64)	.062	<b>1.187</b> (15x)	1/4	4	973278-C6	99.10		

HARDENED STEELS

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# END MILLS FOR HARDENED STEELS

## Finishers – Ball (cont.)

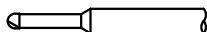


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HARDENED STEELS

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 FL
2.0 mm	.0787		1.60 mm	<b>6.00 mm (3x)</b>	6 mm	63 mm	882945-C6	65.20			
2.0 mm	.0787		1.60 mm	<b>10.00 mm (5x)</b>	6 mm	63 mm	881745-C6	70.60			
.093 (3/32)	.0930		.074	-	1/4	2-1/2	958393-C6	63.30			
.093 (3/32)	.0930		.074	<b>.140 (1.5x)</b>	1/4	2-1/2	37893-C6	59.60			
.093 (3/32)	.0930		.074	<b>.281 (3x)</b>	1/4	2-1/2	31493-C6	59.60	813193-C6	64.10 NEW	
.093 (3/32)	.0930		.074	<b>.375 (4x)</b>	1/4	2-1/2	881593-C6	63.30			
.093 (3/32)	.0930		.074	<b>.500 (5x)</b>	1/4	2-1/2	38793-C6	65.20	812993-C6	69.70 NEW	
.093 (3/32)	.0930		.074	<b>.585 (6x)</b>	1/4	2-1/2	858093-C6	66.50			
.093 (3/32)	.0930		.074	<b>.670 (7x)</b>	1/4	2-1/2	863293-C6	67.60			
.093 (3/32)	.0930		.074	<b>.750 (8x)</b>	1/4	2-1/2	32093-C6	68.70			
.093 (3/32)	.0930		.074	<b>.937 (10x)</b>	1/4	4	919193-C6	86.90			
.093 (3/32)	.0930		.074	<b>1.125 (12x)</b>	1/4	4	33893-C6	86.90			
.093 (3/32)	.0930		.074	<b>1.400 (15x)</b>	1/4	4	973293-C6	99.10			
.118	.1180		.094	<b>.177 (1.5x)</b>	1/4	2-1/2	37905-C6	66.80			
.118	.1180		.094	<b>.354 (3x)</b>	1/4	2-1/2	31505-C6	66.80			
.118	.1180		.094	<b>.625 (5x)</b>	1/4	2-1/2	38805-C6	75.90			
3.0 mm	.1181		2.40 mm	<b>9.00 mm (3x)</b>	6 mm	63 mm	882957-C6	72.20			
3.0 mm	.1181		2.40 mm	<b>15.00 mm (5x)</b>	6 mm	63 mm	881757-C6	81.50			
.125 (1/8)	.1250		.100	-	1/4	2-1/2	958408-C6	70.60			
.125 (1/8)	.1250		.100	<b>.187 (1.5x)</b>	1/4	2-1/2	37908-C6	66.80			
.125 (1/8)	.1250		.100	<b>.375 (3x)</b>	1/4	2-1/2	31508-C6	66.80	813208-C6	71.30 NEW	
.125 (1/8)	.1250		.100	<b>.500 (4x)</b>	1/4	2-1/2	881608-C6	74.00			
.125 (1/8)	.1250		.100	<b>.625 (5x)</b>	1/4	2-1/2	38808-C6	75.90	813008-C6	80.40 NEW	
.125 (1/8)	.1250		.100	<b>.750 (6x)</b>	1/4	2-1/2	858108-C6	77.40			
.125 (1/8)	.1250		.100	<b>.875 (7x)</b>	1/4	2-1/2	863308-C6	78.90			
.125 (1/8)	.1250		.100	<b>1.000 (8x)</b>	1/4	2-1/2	32108-C6	80.40			
.125 (1/8)	.1250		.100	<b>1.250 (10x)</b>	1/4	4	919208-C6	94.00			
.125 (1/8)	.1250		.100	<b>1.500 (12x)</b>	1/4	4	33908-C6	94.00			
.125 (1/8)	.1250		.100	<b>1.875 (15x)</b>	1/4	4	973308-C6	106.10			
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	
.156 (5/32)	.1560		.125	<b>.235 (1.5x)</b>	1/4	2-1/2	37910-C6	66.80			
.156 (5/32)	.1560		.125	<b>.470 (3x)</b>	1/4	2-1/2	31510-C6	66.80			
.156 (5/32)	.1560		.125	<b>.750 (5x)</b>	1/4	2-1/2	38810-C6	75.90			
.187 (3/16)	.1870		.150	-	1/4	2-1/2	958412-C6	70.60			
.187 (3/16)	.1870		.150	<b>.285 (1.5x)</b>	1/4	2-1/2	37912-C6	66.80			
.187 (3/16)	.1870		.150	<b>.570 (3x)</b>	1/4	2-1/2	31512-C6	66.80	813212-C6	71.30 NEW	
.187 (3/16)	.1870		.150	<b>1.000 (5x)</b>	1/4	2-1/2	38812-C6	75.90	813012-C6	80.40 NEW	
.187 (3/16)	.1870		.150	<b>1.500 (8x)</b>	1/4	4	32112-C6	88.80			
.187 (3/16)	.1870		.150	<b>2.250 (12x)</b>	1/4	4	33912-C6	106.10			

continued on next page



# END MILLS FOR HARDENED STEELS

Finishers – Ball (cont.)

HARDENED STEELS

**mm & in** continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO 2 FLUTE		AITIN NANO 3 FLUTE	
					2 FL	PRICE	3 FL	PRICE
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>				
6.0 mm	.2362	4.80 mm	<b>18.00 mm (3x)</b>	6 mm	63 mm	882966-C6	72.20	
6.0 mm	.2362	4.80 mm	<b>30.00 mm (5x)</b>	6 mm	63 mm	881766-C6	81.50	
.250 (1/4)	.2500	.200	-	1/4	2-1/2	958416-C6	70.60	
.250 (1/4)	.2500	.200	<b>.375 (1.5x)</b>	1/4	2-1/2	37916-C6	66.80	
<b>NEW</b> .250 (1/4)	.2500	.200	<b>.750 (3x)</b>	1/4	2-1/2	31516-C6	75.90	<b>813216-C6</b> 80.40
<b>NEW</b> .250 (1/4)	.2500	.200	<b>1.000 (4x)</b>	1/4	2-1/2	881616-C6	75.90	
.250 (1/4)	.2500	.200	<b>1.250 (5x)</b>	1/4	2-1/2	38816-C6	75.90	<b>813016-C6</b> 80.40
.250 (1/4)	.2500	.200	<b>1.500 (6x)</b>	1/4	3	858116-C6	82.30	
.250 (1/4)	.2500	.200	<b>1.750 (7x)</b>	1/4	3	863316-C6	82.30	
.250 (1/4)	.2500	.200	<b>2.000 (8x)</b>	1/4	4	32116-C6	88.80	
.312 (5/16)	.3120	.250	<b>.470 (1.5x)</b>	5/16	2-1/2	37920-C6	87.50	
.312 (5/16)	.3120	.250	<b>1.000 (3x)</b>	5/16	2-1/2	31520-C6	92.50	
.375 (3/8)	.3750	.300	<b>.570 (1.5x)</b>	3/8	2-1/2	37924-C6	94.10	
.375 (3/8)	.3750	.300	<b>1.125 (3x)</b>	3/8	2-1/2	31524-C6	99.30	

## GUIDELINES FOR MILLING HARDENED STEELS

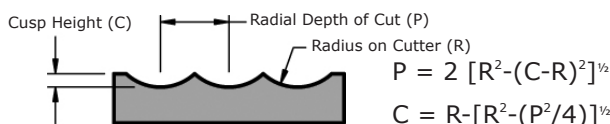
- Rigid machining enhances tool life by centering and balancing tool holders, which minimizes vibration.
- Mist or air coolant is recommended for material hardness of 45Rc or more.
- Enter workpiece slowly by ramping or helical interpolation to avoid potential chipping or breakage.
- Climb Milling will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



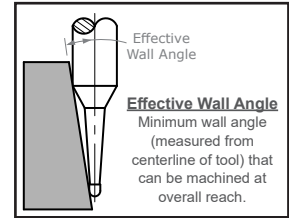
# END MILLS FOR HARDENED STEELS

## Finishers – Ball – Tapered Reach

HARDENED STEELS

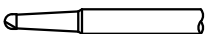
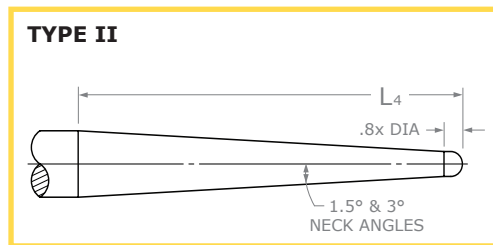
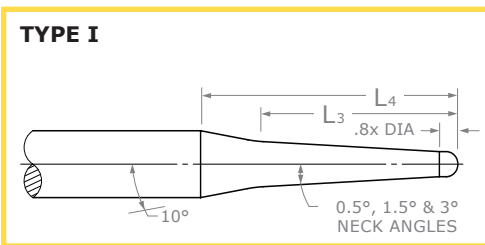


- **Designed to profile and finish hardened tool, die, and mold steels 46Rc to 68Rc**
- Solid tapered neck for increased rigidity and strength
- Select carbide grade for improved edge retention
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Geometry includes stub 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	AlTiN 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	62.80
	.031 (1/32)	.025	I	<b>.156</b>	<b>.817</b>	7.8°	1/4	2-1/2	998706-C6	68.10
	.031 (1/32)	.025	I	<b>.250</b>	<b>.906</b>	7.0°	1/4	2-1/2	998709-C6	70.80
	.047 (3/64)	.038	I	<b>.156</b>	<b>.772</b>	7.7°	1/4	2-1/2	998712-C6	62.80
	.047 (3/64)	.038	I	<b>.250</b>	<b>.862</b>	6.9°	1/4	2-1/2	998715-C6	68.10
	.047 (3/64)	.038	I	<b>.375</b>	<b>.981</b>	6.1°	1/4	2-1/2	998718-C6	70.80
	.062 (1/16)	.050	I	<b>.312</b>	<b>.879</b>	6.4°	1/4	2-1/2	998721-C6	62.80
	.062 (1/16)	.050	I	<b>.500</b>	<b>1.057</b>	5.3°	1/4	2-1/2	998724-C6	68.10
	.062 (1/16)	.050	I	<b>.750</b>	<b>1.295</b>	4.3°	1/4	2-1/2	998727-C6	70.80
	.078 (5/64)	.062	I	<b>.437</b>	<b>.953</b>	5.4°	1/4	2-1/2	998730-C6	62.80
	.078 (5/64)	.062	I	<b>.625</b>	<b>1.131</b>	4.5°	1/4	2-1/2	998733-C6	68.10
	.078 (5/64)	.062	I	<b>1.000</b>	<b>1.488</b>	3.4°	1/4	3	998736-C6	78.30
	.093 (3/32)	.074	I	<b>.500</b>	<b>.971</b>	4.9°	1/4	2-1/2	998739-C6	62.80
	.093 (3/32)	.074	I	<b>.750</b>	<b>1.208</b>	3.9°	1/4	2-1/2	998742-C6	68.10
	.093 (3/32)	.074	I	<b>1.125</b>	<b>1.565</b>	3.0°	1/4	3	998745-C6	78.30
	.125 (1/8)	.100	I	<b>.625</b>	<b>1.000</b>	3.9°	1/4	2-1/2	998748-C6	66.60
.125 (1/8)	.100	I	<b>1.000</b>	<b>1.357</b>	2.8°	1/4	2-1/2	998751-C6	68.60	
.125 (1/8)	.100	I	<b>1.500</b>	<b>1.832</b>	2.1°	1/4	3	998754-C6	78.70	

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# END MILLS FOR HARDENED STEELS

Finishers – Ball – Tapered Reach (cont.)

continued from previous page

NECK ANGLE	CUTTER DIAMETER	LENGTH OF CUT	TYPE	TAPERED REACH	OVERALL REACH	EFFECTIVE WALL ANGLE	SHANK DIAMETER	OVERALL LENGTH	AISI 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	68.10
	.031 (1/32)	.025	I	.500	1.088	5.9°	1/4	2-1/2	997414-C6	70.80
	.047 (3/64)	.038	I	.375	.938	6.4°	1/4	2-1/2	997421-C6	68.10
	.062 (1/16)	.050	I	.500	1.004	5.6°	1/4	2-1/2	997428-C6	68.10
	.062 (1/16)	.050	I	1.000	1.429	3.9°	1/4	3	997435-C6	78.30
	.078 (5/64)	.062	I	.625	1.066	4.8°	1/4	2-1/2	997442-C6	68.10
	.078 (5/64)	.062	I	1.250	1.599	3.2°	1/4	3	997449-C6	78.30
	.093 (3/32)	.074	I	.750	1.132	4.2°	1/4	2-1/2	997456-C6	68.10
	.093 (3/32)	.074	I	1.500	1.771	2.7°	1/4	3	997463-C6	78.30
	.125 (1/8)	.100	I	1.000	1.258	3.0°	1/4	2-1/2	997470-C6	68.60
.125 (1/8)	.100	II	2.487	2.487	1.5°	1/4	4	997477-C6	78.70	
3.0°	.031 (1/32)	.025	I	.312	.714	8.9°	1/4	2-1/2	994907-C6	70.40
	.031 (1/32)	.025	I	.750	1.067	6.0°	1/4	2-1/2	994914-C6	72.40
	.047 (3/64)	.038	I	.875	1.140	5.2°	1/4	2-1/2	994921-C6	70.40
	.047 (3/64)	.038	I	1.250	1.442	4.1°	1/4	3	994928-C6	78.30
	.062 (1/16)	.050	I	.875	1.114	5.0°	1/4	2-1/2	994935-C6	70.40
	.062 (1/16)	.050	II	1.844	1.844	3.0°	1/4	3	994942-C6	78.30
	.078 (5/64)	.062	I	1.125	1.288	4.0°	1/4	2-1/2	994949-C6	70.40
	.078 (5/64)	.062	II	1.703	1.703	3.0°	1/4	3	994956-C6	78.30
	.093 (3/32)	.074	I	1.000	1.162	4.1°	1/4	2-1/2	994963-C6	70.40
	.093 (3/32)	.074	II	1.572	1.572	3.0°	1/4	3	994970-C6	78.30
	.125 (1/8)	.100	II	1.293	1.293	2.9°	1/4	2-1/2	994977-C6	77.30
	.125 (1/8)	.100	II	2.485	2.485	3.0°	3/8	4	994984-C6	112.10

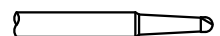
HARDENED STEELS



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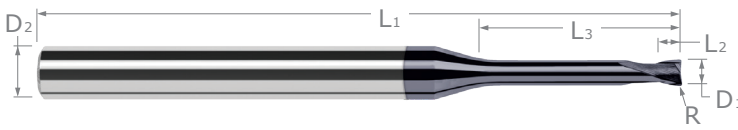
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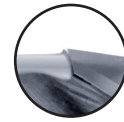
# END MILLS FOR HARDENED STEELS

## Finishers – Corner Radius

HARDENED STEELS



- **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



Reduced Neck Diameter to Avoid Heeling

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>				
.010	.002	.008	.015 (1.5x)	1/4	2-1/2	40210-C6	85.30		
.010	.002	.008	.031 (3x)	1/4	2-1/2	30610-C6	85.30		
.015 (1/64)	.002	.012	.023 (1.5x)	1/4	2-1/2	40215-C6	66.80	951415-C6	67.90
.015 (1/64)	.002	.012	.047 (3x)	1/4	2-1/2	30615-C6	66.80		
.015 (1/64)	.002	.012	.078 (5x)	1/4	2-1/2	40615-C6	75.40		
.015 (1/64)	.002	.012	.125 (8x)	1/4	2-1/2	31015-C6	75.90		
.015 (1/64)	.002	.012	.187 (12x)	1/4	2-1/2	33015-C6	88.40		
.020	.004	.016	.031 (1.5x)	1/4	2-1/2	40220-C6	66.80	951420-C6	67.90
.020	.004	.016	.062 (3x)	1/4	2-1/2	30620-C6	66.80		
.020	.004	.016	.100 (5x)	1/4	2-1/2	40620-C6	72.20		
.025	.004	.020	.038 (1.5x)	1/4	2-1/2	40225-C6	66.80		
.025	.004	.020	.075 (3x)	1/4	2-1/2	30625-C6	66.80		
.025	.004	.020	.125 (5x)	1/4	2-1/2	40625-C6	72.20		
.031 (1/32)	.005	.025	.047 (1.5x)	1/4	2-1/2	40231-C6	59.00	951431-C6	60.10
.031 (1/32)	.005	.025	.093 (3x)	1/4	2-1/2	30631-C6	59.00	938731-C6	60.10
.031 (1/32)	.005	.025	.156 (5x)	1/4	2-1/2	40631-C6	63.90	996331-C6	65.20
.031 (1/32)	.005	.025	.250 (8x)	1/4	2-1/2	31031-C6	67.60	999031-C6	68.70
.031 (1/32)	.005	.025	.375 (12x)	1/4	2-1/2	33031-C6	75.70		
.031 (1/32)	.005	.025	.470 (15x)	1/4	2-1/2	942431-C6	88.60		
.031 (1/32)	.010	.025	.093 (3x)	1/4	2-1/2	982631-C6	61.10		
.031 (1/32)	.010	.025	.156 (5x)	1/4	2-1/2	957431-C6	66.10		
.039 (1 mm)	.005	.031	.062 (1.5x)	1/4	2-1/2	40239-C6	59.00		
.039 (1 mm)	.005	.031	.117 (3x)	1/4	2-1/2	30639-C6	59.00	938739-C6	60.10
.039 (1 mm)	.005	.031	.203 (5x)	1/4	2-1/2	40639-C6	63.90	996339-C6	65.20
.039 (1 mm)	.005	.031	.312 (8x)	1/4	2-1/2	31039-C6	67.60		
.039 (1 mm)	.005	.031	.468 (12x)	1/4	2-1/2	33039-C6	75.70		
.047 (3/64)	.008	.038	.071 (1.5x)	1/4	2-1/2	40247-C6	59.00		
.047 (3/64)	.008	.038	.141 (3x)	1/4	2-1/2	30647-C6	59.00	938747-C6	60.10
.047 (3/64)	.008	.038	.250 (5x)	1/4	2-1/2	40647-C6	63.90	996347-C6	65.20
.047 (3/64)	.008	.038	.375 (8x)	1/4	2-1/2	31047-C6	67.60	999047-C6	68.70
.047 (3/64)	.008	.038	.564 (12x)	1/4	2-1/2	33047-C6	75.70		
.047 (3/64)	.008	.038	.710 (15x)	1/4	2-1/2	942447-C6	88.60		

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## END MILLS FOR HARDENED STEELS

Finishers – Corner Radius (cont.)

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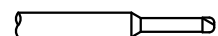
CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO 2 FLUTE		AITIN NANO 4 FLUTE	
						2 FL	PRICE	4 FL	PRICE
D <sub>1</sub> $\begin{matrix} +.0000'' \\ -.0006'' \end{matrix}$	R $\begin{matrix} +.0002'' \\ -.0002'' \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.010'' \\ -.000'' \end{matrix}$	L <sub>3</sub> $\begin{matrix} +.010'' \\ -.000'' \end{matrix}$	D <sub>2</sub> (h6)	L <sub>1</sub>				
.062 (1/16)	<b>.005</b>	.050	<b>.187</b> (3x)	1/4	2-1/2	893162-C6	59.00		
.062 (1/16)	<b>.010</b>	.050	-	1/4	2-1/2	870362-C6	57.60	862262-C6	58.60
.062 (1/16)	<b>.010</b>	.050	<b>.093</b> (1.5x)	1/4	2-1/2	40262-C6	59.00	951462-C6	60.10
.062 (1/16)	<b>.010</b>	.050	<b>.187</b> (3x)	1/4	2-1/2	30662-C6	59.00	938762-C6	60.10
.062 (1/16)	<b>.010</b>	.050	<b>.312</b> (5x)	1/4	2-1/2	40662-C6	63.90	996362-C6	65.20
.062 (1/16)	<b>.010</b>	.050	<b>.500</b> (8x)	1/4	2-1/2	31062-C6	67.60	999062-C6	68.70
.062 (1/16)	<b>.010</b>	.050	<b>.750</b> (12x)	1/4	4	33062-C6	85.00	924162-C6	86.20
.062 (1/16)	<b>.010</b>	.050	<b>.950</b> (15x)	1/4	4	942462-C6	97.60		
.062 (1/16)	<b>.020</b>	.050	<b>.187</b> (3x)	1/4	2-1/2	991562-C6	61.10		
.062 (1/16)	<b>.020</b>	.050	<b>.312</b> (5x)	1/4	2-1/2	953162-C6	66.10		
.078 (5/64)	<b>.010</b>	.062	<b>.117</b> (1.5x)	1/4	2-1/2	40278-C6	59.00		
.078 (5/64)	<b>.010</b>	.062	<b>.234</b> (3x)	1/4	2-1/2	30678-C6	59.00	938778-C6	60.10
.078 (5/64)	<b>.010</b>	.062	<b>.406</b> (5x)	1/4	2-1/2	40678-C6	63.90	996378-C6	65.20
.078 (5/64)	<b>.010</b>	.062	<b>.625</b> (8x)	1/4	2-1/2	31078-C6	67.60	999078-C6	68.70
.078 (5/64)	<b>.010</b>	.062	<b>.937</b> (12x)	1/4	4	33078-C6	85.00		
.093 (3/32)	<b>.005</b>	.074	<b>.281</b> (3x)	1/4	2-1/2	893193-C6	59.00		
.093 (3/32)	<b>.010</b>	.074	<b>.281</b> (3x)	1/4	2-1/2	982693-C6	59.00		
.093 (3/32)	<b>.015</b>	.074	-	1/4	2-1/2	850893-C6	57.60		
.093 (3/32)	<b>.015</b>	.074	<b>.140</b> (1.5x)	1/4	2-1/2	40293-C6	59.00	951493-C6	60.10
.093 (3/32)	<b>.015</b>	.074	<b>.281</b> (3x)	1/4	2-1/2	30693-C6	59.00	938793-C6	60.10
.093 (3/32)	<b>.015</b>	.074	<b>.500</b> (5x)	1/4	2-1/2	40693-C6	63.90	996393-C6	65.20
.093 (3/32)	<b>.015</b>	.074	<b>.750</b> (8x)	1/4	2-1/2	31093-C6	67.60	999093-C6	68.70
.093 (3/32)	<b>.015</b>	.074	<b>1.125</b> (12x)	1/4	4	33093-C6	85.00	924193-C6	86.20
.093 (3/32)	<b>.030</b>	.074	<b>.281</b> (3x)	1/4	2-1/2	963393-C6	61.10		
.093 (3/32)	<b>.030</b>	.074	<b>.500</b> (5x)	1/4	2-1/2	946393-C6	66.10		
.118 (3 mm)	<b>.015</b>	.094	<b>.177</b> (1.5x)	1/4	2-1/2	40305-C6	63.30		
.118 (3 mm)	<b>.015</b>	.094	<b>.354</b> (3x)	1/4	2-1/2	30705-C6	63.30		
.125 (1/8)	<b>.005</b>	.100	<b>.375</b> (3x)	1/4	2-1/2	893208-C6	63.30		
.125 (1/8)	<b>.010</b>	.100	<b>.375</b> (3x)	1/4	2-1/2	982708-C6	63.30		
.125 (1/8)	<b>.015</b>	.100	-	1/4	2-1/2	850908-C6	61.80		
.125 (1/8)	<b>.015</b>	.100	<b>.187</b> (1.5x)	1/4	2-1/2	40308-C6	63.30	951508-C6	64.30
.125 (1/8)	<b>.015</b>	.100	<b>.375</b> (3x)	1/4	2-1/2	30708-C6	63.30	938808-C6	64.30
.125 (1/8)	<b>.015</b>	.100	<b>.625</b> (5x)	1/4	2-1/2	40708-C6	69.40	996408-C6	75.90
.125 (1/8)	<b>.015</b>	.100	<b>1.000</b> (8x)	1/4	2-1/2	31108-C6	73.60	999108-C6	79.90
.125 (1/8)	<b>.015</b>	.100	<b>1.500</b> (12x)	1/4	4	33108-C6	91.10	924208-C6	98.10
.125 (1/8)	<b>.030</b>	.100	<b>.375</b> (3x)	1/4	2-1/2	963408-C6	65.40		
.125 (1/8)	<b>.030</b>	.100	<b>.625</b> (5x)	1/4	2-1/2	946408-C6	71.80		

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View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](https://www.harveytool.com).

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# END MILLS FOR HARDENED STEELS

## Finishers – Corner Radius (cont.)

continued from previous page

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
D <sub>1</sub> $\begin{smallmatrix} +.000" \\ -.001" \end{smallmatrix}$	R $\begin{smallmatrix} +.0005" \\ -.0005" \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.020" \\ -.000" \end{smallmatrix}$	L <sub>3</sub> $\begin{smallmatrix} +.020" \\ -.000" \end{smallmatrix}$	D <sub>2</sub> (h6)	L <sub>1</sub>				
.156 (5/32)	<b>.015</b>	.125	<b>.235 (1.5x)</b>	1/4	2-1/2	40310-C6	63.30		
.156 (5/32)	<b>.015</b>	.125	<b>.470 (3x)</b>	1/4	2-1/2	30710-C6	63.30		
.187 (3/16)	<b>.015</b>	.150	<b>.285 (1.5x)</b>	1/4	2-1/2	40312-C6	63.30	951512-C6	64.30
.187 (3/16)	<b>.015</b>	.150	<b>.570 (3x)</b>	1/4	2-1/2	30712-C6	63.30	938812-C6	64.30
.187 (3/16)	<b>.015</b>	.150	<b>1.000 (5x)</b>	1/4	2-1/2	40712-C6	69.40	996412-C6	75.90
.187 (3/16)	<b>.015</b>	.150	<b>1.500 (8x)</b>	1/4	4	31112-C6	82.90		
.187 (3/16)	<b>.015</b>	.150	<b>2.250 (12x)</b>	1/4	4	33112-C6	97.60		
.187 (3/16)	<b>.060</b>	.150	<b>.570 (3x)</b>	1/4	2-1/2	939212-C6	72.60	934412-C6	78.90
.250 (1/4)	<b>.015</b>	.200	<b>.375 (1.5x)</b>	1/4	2-1/2	40316-C6	63.30	951516-C6	64.30
.250 (1/4)	<b>.015</b>	.200	<b>.750 (3x)</b>	1/4	2-1/2	30716-C6	66.30	938816-C6	72.40
.250 (1/4)	<b>.015</b>	.200	<b>1.250 (5x)</b>	1/4	2-1/2	40716-C6	69.40		
.250 (1/4)	<b>.015</b>	.200	<b>2.000 (8x)</b>	1/4	4	31116-C6	82.90		
.250 (1/4)	<b>.060</b>	.200	<b>.750 (3x)</b>	1/4	2-1/2	939216-C6	72.60	934416-C6	78.90
.312 (5/16)	<b>.030</b>	.250	<b>1.000 (3x)</b>	5/16	2-1/2			938820-C6	79.90
.375 (3/8)	<b>.030</b>	.300	<b>1.125 (3x)</b>	3/8	2-1/2			938824-C6	92.20

### 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.

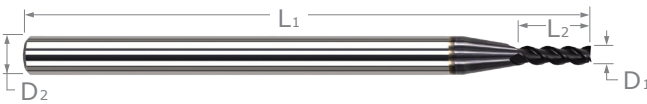
### SPEEDS & FEEDS (End Mills for Hardened Steels – Corner Radius)

**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.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	
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 (5x Reach)	.00012	.00024	.00037	.00048	.00061	.00073	.00098	.00146	.00195	.00243	.00293	.00390	.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 (5x Reach)	.00009	.00019	.00029	.00039	.00049	.00058	.00078	.00117	.00156	.00195	.00234	.00312	.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 EXOTIC ALLOYS

Square



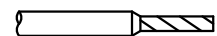
- Optimized for titanium alloys, inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Variable helix design (approx. 34°) reduces chatter and harmonics and increases material removal rates
- Latest 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

EXOTIC ALLOYS

**mm & in**

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	942804-C6	55.80
.010		.0100	<b>.015</b> (1.5x)	3	1/8	1-1/2	973710-C6	52.60
.010		.0100	<b>.030</b> (3x)	3	1/8	1-1/2	967010-C6	52.10
.010		.0100	<b>.050</b> (5x)	3	1/8	2-1/2	990710-C6	60.20
.015 (1/64)		.0150	<b>.012</b> (0.8x)	3	1/8	1-1/2	888015-C6	43.80
.015 (1/64)		.0150	<b>.023</b> (1.5x)	3	1/8	1-1/2	973715-C6	43.20
.015 (1/64)		.0150	<b>.045</b> (3x)	3	1/8	1-1/2	967015-C6	42.70
.015 (1/64)		.0150	<b>.045</b> (3x)	4	1/8	1-1/2	875415-C6	44.50
.015 (1/64)		.0150	<b>.062</b> (4x)	3	1/8	2-1/2	886215-C6	50.40
.015 (1/64)		.0150	<b>.078</b> (5x)	3	1/8	2-1/2	990715-C6	52.40
.4 mm	.0157		<b>1.20 mm</b> (3x)	3	4 mm	50 mm	942809-C6	41.20
.5 mm	.0196		<b>.40 mm</b> (0.8x)	3	4 mm	50 mm	848011-C6	42.00
.5 mm	.0196		<b>.75 mm</b> (1.5x)	3	4 mm	50 mm	954511-C6	41.20
.5 mm	.0196		<b>1.50 mm</b> (3x)	3	4 mm	50 mm	942811-C6	41.20
.020		.0200	<b>.016</b> (0.8x)	3	1/8	1-1/2	888020-C6	38.40
.020		.0200	<b>.030</b> (1.5x)	3	1/8	1-1/2	973720-C6	37.90
.020		.0200	<b>.060</b> (3x)	3	1/8	1-1/2	967020-C6	37.50
.020		.0200	<b>.060</b> (3x)	4	1/8	1-1/2	875420-C6	39.30
.020		.0200	<b>.100</b> (5x)	3	1/8	2-1/2	990720-C6	44.50
.6 mm	.0236		<b>1.80 mm</b> (3x)	3	4 mm	50 mm	942813-C6	40.00
.025		.0250	<b>.038</b> (1.5x)	3	1/8	1-1/2	973725-C6	36.50
.025		.0250	<b>.075</b> (3x)	3	1/8	1-1/2	967025-C6	36.10
.025		.0250	<b>.125</b> (5x)	3	1/8	2-1/2	990725-C6	43.00
.030		.0300	<b>.045</b> (1.5x)	3	1/8	1-1/2	973730-C6	36.50
.030		.0300	<b>.090</b> (3x)	3	1/8	1-1/2	967030-C6	36.10
.030		.0300	<b>.125</b> (4x)	3	1/8	2-1/2	886230-C6	43.00
.030		.0300	<b>.156</b> (5x)	3	1/8	2-1/2	990730-C6	43.00
.031 (1/32)		.0310	<b>.025</b> (0.8x)	3	1/8	1-1/2	888031-C6	32.50
.031 (1/32)		.0310	<b>.047</b> (1.5x)	3	1/8	1-1/2	973731-C6	31.20
.031 (1/32)		.0310	<b>.047</b> (1.5x)	4	1/8	1-1/2	841631-C6	32.60
.031 (1/32)		.0310	<b>.093</b> (3x)	3	1/8	1-1/2	967031-C6	30.80
.031 (1/32)		.0310	<b>.093</b> (3x)	4	1/8	1-1/2	875431-C6	32.60
.031 (1/32)		.0310	<b>.125</b> (4x)	3	1/8	2-1/2	886231-C6	37.00
.031 (1/32)		.0310	<b>.156</b> (5x)	3	1/8	2-1/2	990731-C6	39.10
.031 (1/32)		.0310	<b>.156</b> (5x)	4	1/8	2-1/2	852931-C6	40.80
.8 mm	.0314		<b>2.40 mm</b> (3x)	3	4 mm	50 mm	942818-C6	34.70
.035		.0350	<b>.028</b> (0.8x)	3	1/8	1-1/2	888035-C6	31.40
.035		.0350	<b>.053</b> (1.5x)	3	1/8	1-1/2	973735-C6	31.20
.035		.0350	<b>.105</b> (3x)	3	1/8	1-1/2	967035-C6	30.80
.035		.0350	<b>.187</b> (5x)	3	1/8	2-1/2	990735-C6	39.10

continued on next page



# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Square (cont.)



continued from previous page

EXOTIC 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 equivalent	+ .010"					
- .0005"	- .02mm		- .000"					
			+ .25mm					
			- .00mm					
1.0 mm	.0393		<b>.80 mm</b> (0.8x)	3	4 mm	50 mm	848022-C6	35.10
1.0 mm	.0393		<b>1.50 mm</b> (1.5x)	3	4 mm	50 mm	954522-C6	35.00
1.0 mm	.0393		<b>3.00 mm</b> (3x)	3	4 mm	50 mm	942822-C6	34.70
1.0 mm	.0393		<b>5.00 mm</b> (5x)	3	4 mm	50 mm	910522-C6	42.90
.040	.0400		<b>.032</b> (0.8x)	3	1/8	1-1/2	888040-C6	31.40
.040	.0400		<b>.060</b> (1.5x)	3	1/8	1-1/2	973740-C6	31.20
.040	.0400		<b>.120</b> (3x)	3	1/8	1-1/2	967040-C6	30.80
.040	.0400		<b>.120</b> (3x)	4	1/8	1-1/2	875440-C6	32.60
.040	.0400		<b>.160</b> (4x)	3	1/8	2-1/2	886240-C6	37.20
.040	.0400		<b>.203</b> (5x)	3	1/8	2-1/2	990740-C6	39.10
.045	.0450		<b>.068</b> (1.5x)	3	1/8	1-1/2	973745-C6	31.20
.045	.0450		<b>.135</b> (3x)	3	1/8	1-1/2	967045-C6	30.80
.045	.0450		<b>.225</b> (5x)	3	1/8	2-1/2	990745-C6	39.10
.047 (3/64)	.0470		<b>.038</b> (0.8x)	3	1/8	1-1/2	888047-C6	34.00
.047 (3/64)	.0470		<b>.071</b> (1.5x)	3	1/8	1-1/2	973747-C6	31.20
.047 (3/64)	.0470		<b>.071</b> (1.5x)	4	1/8	1-1/2	841647-C6	32.80
.047 (3/64)	.0470		<b>.141</b> (3x)	3	1/8	1-1/2	967047-C6	30.80
.047 (3/64)	.0470		<b>.141</b> (3x)	4	1/8	1-1/2	875447-C6	32.60
.047 (3/64)	.0470		<b>.187</b> (4x)	3	1/8	2-1/2	886247-C6	37.00
.047 (3/64)	.0470		<b>.250</b> (5x)	3	1/8	2-1/2	990747-C6	39.10
.047 (3/64)	.0470		<b>.250</b> (5x)	4	1/8	2-1/2	852947-C6	40.80
1.2 mm	.0472		<b>3.50 mm</b> (3x)	3	4 mm	50 mm	942827-C6	34.70
.050	.0500		<b>.075</b> (1.5x)	3	1/8	1-1/2	973750-C6	31.20
.050	.0500		<b>.150</b> (3x)	3	1/8	1-1/2	967050-C6	30.80
.050	.0500		<b>.250</b> (5x)	3	1/8	2-1/2	990750-C6	39.10
.055	.0550		<b>.083</b> (1.5x)	3	1/8	1-1/2	973755-C6	31.20
.055	.0550		<b>.165</b> (3x)	3	1/8	1-1/2	967055-C6	30.80
.055	.0550		<b>.275</b> (5x)	3	1/8	2-1/2	990755-C6	39.10
1.4 mm	.0551		<b>4.00 mm</b> (3x)	3	4 mm	50 mm	942831-C6	32.60
1.5 mm	.0590		<b>2.20 mm</b> (1.5x)	3	4 mm	50 mm	954533-C6	32.90
1.5 mm	.0590		<b>4.50 mm</b> (3x)	3	4 mm	50 mm	942833-C6	32.60
1.5 mm	.0590		<b>7.50 mm</b> (5x)	3	4 mm	50 mm	910533-C6	41.10
.060	.0600		<b>.090</b> (1.5x)	3	1/8	1-1/2	973760-C6	31.20
.060	.0600		<b>.180</b> (3x)	3	1/8	1-1/2	967060-C6	30.80
.060	.0600		<b>.312</b> (5x)	3	1/8	2-1/2	990760-C6	39.10
.062 (1/16)	.0620		<b>.050</b> (0.8x)	3	1/8	1-1/2	888062-C6	32.00
.062 (1/16)	.0620		<b>.093</b> (1.5x)	3	1/8	1-1/2	973762-C6	29.10
.062 (1/16)	.0620		<b>.093</b> (1.5x)	4	1/8	1-1/2	841662-C6	30.70
.062 (1/16)	.0620		<b>.186</b> (3x)	3	1/8	1-1/2	967062-C6	28.80
.062 (1/16)	.0620		<b>.186</b> (3x)	4	1/8	1-1/2	875462-C6	30.60
.062 (1/16)	.0620		<b>.250</b> (4x)	3	1/8	2-1/2	886262-C6	35.50
.062 (1/16)	.0620		<b>.312</b> (5x)	3	1/8	2-1/2	990762-C6	37.50
.062 (1/16)	.0620		<b>.312</b> (5x)	4	1/8	2-1/2	852962-C6	39.30
1.6 mm	.0629		<b>5.00 mm</b> (3x)	3	4 mm	50 mm	942836-C6	33.30
.065	.0650		<b>.195</b> (3x)	3	1/8	1-1/2	967065-C6	33.20

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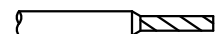
## VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

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
+ .0005"	+ .00mm	decimal	+ .010"					
- .0005"	- .02mm	equivalent	- .000"					
			+ .25mm					
			- .00mm					
.070		.0700	.105 (1.5x)	3	1/8	1-1/2	973770-C6	29.10
.070		.0700	.210 (3x)	3	1/8	1-1/2	967070-C6	28.80
.070		.0700	.375 (5x)	3	1/8	2-1/2	990770-C6	37.50
	1.8 mm	.0708	5.50 mm (3x)	3	4 mm	50 mm	942840-C6	33.30
.075		.0750	.225 (3x)	3	1/8	1-1/2	967075-C6	33.20
.078 (5/64)		.0780	.062 (0.8x)	3	1/8	1-1/2	888078-C6	32.00
.078 (5/64)		.0780	.118 (1.5x)	3	1/8	1-1/2	973778-C6	29.10
.078 (5/64)		.0780	.118 (1.5x)	4	1/8	1-1/2	841678-C6	30.70
.078 (5/64)		.0780	.234 (3x)	3	1/8	1-1/2	967078-C6	28.80
.078 (5/64)		.0780	.234 (3x)	4	1/8	1-1/2	875478-C6	30.60
.078 (5/64)		.0780	.312 (4x)	3	1/8	2-1/2	886278-C6	35.50
.078 (5/64)		.0780	.406 (5x)	3	1/8	2-1/2	990778-C6	37.50
.078 (5/64)		.0780	.406 (5x)	4	1/8	2-1/2	852978-C6	39.30
	2.0 mm	.0787	3.00 mm (1.5x)	3	4 mm	50 mm	954545-C6	32.90
	2.0 mm	.0787	6.00 mm (3x)	3	4 mm	50 mm	942845-C6	32.60
	2.0 mm	.0787	10.00 mm (5x)	3	4 mm	50 mm	910545-C6	41.10
.080		.0800	.120 (1.5x)	3	1/8	1-1/2	973780-C6	29.10
.080		.0800	.240 (3x)	3	1/8	1-1/2	967080-C6	28.80
.080		.0800	.406 (5x)	3	1/8	2-1/2	990780-C6	37.50
.085		.0850	.255 (3x)	3	1/8	1-1/2	967085-C6	33.20
.090		.0900	.135 (1.5x)	3	1/8	1-1/2	973790-C6	29.10
.090		.0900	.270 (3x)	3	1/8	1-1/2	967090-C6	28.80
.090		.0900	.450 (5x)	3	1/8	2-1/2	990790-C6	37.50
.093 (3/32)		.0930	.074 (0.8x)	3	1/8	1-1/2	888093-C6	32.00
.093 (3/32)		.0930	.140 (1.5x)	3	1/8	1-1/2	973793-C6	29.10
.093 (3/32)		.0930	.140 (1.5x)	4	1/8	1-1/2	841693-C6	30.70
.093 (3/32)		.0930	.279 (3x)	3	1/8	1-1/2	967093-C6	28.80
.093 (3/32)		.0930	.279 (3x)	4	1/8	1-1/2	875493-C6	30.60
.093 (3/32)		.0930	.375 (4x)	3	1/8	2-1/2	886293-C6	35.50
.093 (3/32)		.0930	.500 (5x)	3	1/8	2-1/2	990793-C6	37.50
.093 (3/32)		.0930	.500 (5x)	4	1/8	2-1/2	852993-C6	39.30
.095		.0950	.285 (3x)	3	1/8	1-1/2	967095-C6	32.40
	2.5 mm	.0984	3.70 mm (1.5x)	3	4 mm	50 mm	954551-C6	32.90
	2.5 mm	.0984	7.50 mm (3x)	3	4 mm	50 mm	942851-C6	32.60
	2.5 mm	.0984	12.00 mm (5x)	3	4 mm	50 mm	910551-C6	41.10
.100		.1000	.150 (1.5x)	3	1/8	1-1/2	973800-C6	29.10
.100		.1000	.300 (3x)	3	1/8	1-1/2	967100-C6	28.80
.100		.1000	.500 (5x)	3	1/8	2-1/2	990800-C6	37.50
.109 (7/64)		.1090	.164 (1.5x)	3	1/8	1-1/2	973802-C6	29.10
.109 (7/64)		.1090	.327 (3x)	3	1/8	1-1/2	967102-C6	28.80
.109 (7/64)		.1090	.570 (5x)	3	1/8	2-1/2	990802-C6	37.50
	3.0 mm	.1181	2.40 mm (0.8x)	3	4 mm	50 mm	848057-C6	33.10
	3.0 mm	.1181	4.50 mm (1.5x)	3	4 mm	50 mm	954557-C6	32.90
	3.0 mm	.1181	9.00 mm (3x)	3	4 mm	50 mm	942857-C6	32.60
	3.0 mm	.1181	15.00 mm (5x)	3	4 mm	50 mm	910557-C6	41.10

continued on next page



# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Square (cont.)

**mm & in** continued from previous page

EXOTIC 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
+ .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	888108-C6	32.00
.125 (1/8)		.1250	<b>.187</b> (1.5x)	4	1/8	1-1/2	973808-C6	27.80
.125 (1/8)		.1250	<b>.375</b> (3x)	4	1/8	1-1/2	967108-C6	27.70
.125 (1/8)		.1250	<b>.500</b> (4x)	4	1/8	2-1/2	886308-C6	35.50
.125 (1/8)		.1250	<b>.625</b> (5x)	4	1/8	2-1/2	990808-C6	37.50
.140 (9/64)		.1406	<b>.220</b> (1.5x)	4	3/16	2	973809-C6	31.40
.140 (9/64)		.1406	<b>.425</b> (3x)	4	3/16	2	967109-C6	31.30
.140 (9/64)		.1406	<b>.750</b> (5x)	4	3/16	3	990809-C6	39.80
.156 (5/32)		.1562	<b>.125</b> (0.8x)	4	3/16	2	888110-C6	30.80
.156 (5/32)		.1562	<b>.235</b> (1.5x)	4	3/16	2	973810-C6	31.40
.156 (5/32)		.1562	<b>.470</b> (3x)	4	3/16	2	967110-C6	31.30
.156 (5/32)		.1562	<b>.750</b> (5x)	4	3/16	3	990810-C6	39.80
	4.0 mm	.1574	<b>12.00 mm</b> (3x)	4	6 mm	63 mm	942861-C6	41.20
.187 (3/16)		.1875	<b>.150</b> (0.8x)	4	3/16	2	888112-C6	34.50
.187 (3/16)		.1875	<b>.285</b> (1.5x)	4	3/16	2	973812-C6	30.20
.187 (3/16)		.1875	<b>.562</b> (3x)	4	3/16	2	967112-C6	30.10
.187 (3/16)		.1875	<b>.750</b> (4x)	4	3/16	3	886312-C6	38.00
.187 (3/16)		.1875	<b>1.000</b> (5x)	4	3/16	3	990812-C6	39.80
.218 (7/32)		.2187	<b>.660</b> (3x)	4	1/4	2-1/2	967114-C6	41.00
	6.0 mm	.2362	<b>18.00 mm</b> (3x)	4	6 mm	63 mm	942866-C6	41.20
.250 (1/4)		.2500	<b>.200</b> (0.8x)	4	1/4	2-1/2	888116-C6	42.30
.250 (1/4)		.2500	<b>.375</b> (1.5x)	4	1/4	2-1/2	973816-C6	37.80
.250 (1/4)		.2500	<b>.750</b> (3x)	4	1/4	2-1/2	967116-C6	37.60
.250 (1/4)		.2500	<b>1.000</b> (4x)	4	1/4	4	886316-C6	45.80
.250 (1/4)		.2500	<b>1.250</b> (5x)	4	1/4	4	990816-C6	47.60
.312 (5/16)		.3125	<b>1.000</b> (3x)	4	5/16	2-1/2	967120-C6	52.70
.375 (3/8)		.3750	<b>1.125</b> (3x)	4	3/8	2-1/2	967124-C6	61.00
.500 (1/2)		.5000	<b>.750</b> (1.5x)	4	1/2	3	973832-C6	78.80

**PLEASE SEE SPEEDS & FEEDS ON PAGE 119**



View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

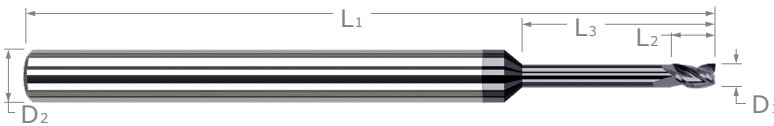
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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Square – Long Reach, Stub Flute



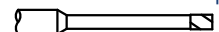
- ↻ Optimized for titanium alloys, inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- ↻ Long reach design for deep cavities    ↻ Reduced neck diameter to avoid heeling
- ↻ Variable helix design (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

EXOTIC ALLOYS

**mm & in**

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
+ .0005" / - .0005"	+ .00mm / - .02mm	decimal equivalent	+ .010" / - .000" / + .25mm / - .00mm	+ .010" / - .000" / + .25mm / - .00mm					
.010		.0100	.015	<b>.050</b> (5x)	3	1/8	2-1/2	985310-C6	64.10
.010		.0100	.015	<b>.080</b> (8x)	3	1/8	2-1/2	978210-C6	65.40
.015 (1/64)		.0150	.023	<b>.078</b> (5x)	3	1/8	2-1/2	985315-C6	55.40
.015 (1/64)		.0150	.023	<b>.125</b> (8x)	3	1/8	2-1/2	978215-C6	56.40
.020		.0200	.030	<b>.100</b> (5x)	3	1/8	2-1/2	985320-C6	53.00
.020		.0200	.030	<b>.160</b> (8x)	3	1/8	2-1/2	978220-C6	54.00
.020		.0200	.030	<b>.200</b> (10x)	3	1/8	2-1/2	935720-C6	58.50
.025		.0250	.038	<b>.125</b> (5x)	3	1/8	2-1/2	985325-C6	53.00
.025		.0250	.038	<b>.203</b> (8x)	3	1/8	2-1/2	978225-C6	54.00
.030		.0300	.045	<b>.156</b> (5x)	3	1/8	2-1/2	985330-C6	53.00
.030		.0300	.045	<b>.250</b> (8x)	3	1/8	2-1/2	978230-C6	54.00
.031 (1/32)		.0310	.047	<b>.093</b> (3x)	3	1/8	1-1/2	940531-C6	48.00
.031 (1/32)		.0310	.047	<b>.156</b> (5x)	3	1/8	2-1/2	985331-C6	49.10
.031 (1/32)		.0310	.047	<b>.187</b> (6x)	3	1/8	2-1/2	895531-C6	49.10
.031 (1/32)		.0310	.047	<b>.218</b> (7x)	3	1/8	2-1/2	880731-C6	50.20
.031 (1/32)		.0310	.047	<b>.250</b> (8x)	3	1/8	2-1/2	978231-C6	50.20
<b>NEW</b> .031 (1/32)		.0310	.047	<b>.250</b> (8x)	4	1/8	2-1/2	<b>812331-C6</b>	52.10
.031 (1/32)		.0310	.047	<b>.312</b> (10x)	3	1/8	2-1/2	935731-C6	54.60
.031 (1/32)		.0310	.047	<b>.375</b> (12x)	3	1/8	2-1/2	901331-C6	56.30
.031 (1/32)		.0310	.047	<b>.470</b> (15x)	3	1/8	2-1/2	851531-C6	57.40
.035		.0350	.053	<b>.187</b> (5x)	3	1/8	2-1/2	985335-C6	48.00
	1.0 mm	.0393	1.50 mm	<b>5.0 mm</b> (5x)	3	4 mm	50 mm	905022-C6	53.50
	1.0 mm	.0393	1.50 mm	<b>8.0 mm</b> (8x)	3	4 mm	50 mm	911422-C6	53.80
.040		.0400	.060	<b>.203</b> (5x)	3	1/8	2-1/2	985340-C6	48.00
.040		.0400	.060	<b>.325</b> (8x)	3	1/8	2-1/2	978240-C6	49.10
.045		.0450	.068	<b>.225</b> (5x)	3	1/8	2-1/2	985345-C6	48.00
.047 (3/64)		.0470	.071	<b>.250</b> (5x)	3	1/8	2-1/2	985347-C6	48.00
.047 (3/64)		.0470	.071	<b>.375</b> (8x)	3	1/8	2-1/2	978247-C6	49.10
<b>NEW</b> .047 (3/64)		.0470	.071	<b>.480</b> (10x)	4	1/8	2-1/2	<b>812347-C6</b>	51.00
.047 (3/64)		.0470	.071	<b>.375</b> (8x)	3	1/8	2-1/2	935747-C6	53.10
.050		.0500	.075	<b>.250</b> (5x)	3	1/8	2-1/2	985350-C6	48.00
.055		.0550	.083	<b>.275</b> (5x)	3	1/8	2-1/2	985355-C6	48.00
.060		.0600	.090	<b>.312</b> (5x)	3	1/8	2-1/2	985360-C6	48.00
.060		.0600	.090	<b>.500</b> (8x)	3	1/8	2-1/2	978260-C6	49.10
.062 (1/16)		.0620	.093	<b>.186</b> (3x)	3	1/8	1-1/2	940562-C6	48.00
.062 (1/16)		.0620	.093	<b>.312</b> (5x)	3	1/8	2-1/2	985362-C6	49.10
.062 (1/16)		.0620	.093	<b>.375</b> (6x)	3	1/8	2-1/2	895562-C6	49.10

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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Square – Long Reach, Stub Flute (cont.)



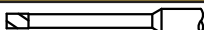
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EXOTIC ALLOYS

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					
.062 (1/16)		.0620	.093	<b>.437</b> (7x)	3	1/8	2-1/2	880762-C6	50.20
.062 (1/16)		.0620	.093	<b>.500</b> (8x)	3	1/8	2-1/2	978262-C6	50.20
.062 (1/16)		.0620	.093	<b>.500</b> (8x)	4	1/8	2-1/2	812362-C6	52.10 <span style="color:red">NEW</span>
.062 (1/16)		.0620	.093	<b>.625</b> (10x)	3	1/8	2-1/2	935762-C6	54.60
.062 (1/16)		.0620	.093	<b>.750</b> (12x)	3	1/8	2-1/2	901362-C6	56.30
.062 (1/16)		.0620	.093	<b>.950</b> (15x)	3	1/8	2-1/2	851562-C6	57.40
.070		.0700	.105	<b>.375</b> (5x)	3	1/8	2-1/2	985370-C6	51.60
.078 (5/64)		.0780	.118	<b>.406</b> (5x)	3	1/8	2-1/2	985378-C6	48.00
.078 (5/64)		.0780	.118	<b>.625</b> (8x)	3	1/8	2-1/2	978278-C6	49.10
.078 (5/64)		.0780	.118	<b>.625</b> (8x)	4	1/8	2-1/2	812378-C6	51.00 <span style="color:red">NEW</span>
.078 (5/64)		.0780	.118	<b>.800</b> (10x)	3	1/8	2-1/2	935778-C6	53.10
2.0 mm	.0787	3.00 mm	<b>10.0 mm</b> (5x)	3	4 mm	50 mm	905045-C6	54.30	
2.0 mm	.0787	3.00 mm	<b>16.0 mm</b> (8x)	3	4 mm	50 mm	911445-C6	54.90	
.080		.0800	.120	<b>.406</b> (5x)	3	1/8	2-1/2	985380-C6	51.60
.090		.0900	.135	<b>.450</b> (5x)	3	1/8	2-1/2	985390-C6	51.60
.093 (3/32)		.0930	.140	<b>.279</b> (3x)	3	1/8	1-1/2	940593-C6	48.00
.093 (3/32)		.0930	.140	<b>.500</b> (5x)	3	1/8	2-1/2	985393-C6	49.10
.093 (3/32)		.0930	.140	<b>.585</b> (6x)	3	1/8	2-1/2	895593-C6	49.10
.093 (3/32)		.0930	.140	<b>.670</b> (7x)	3	1/8	2-1/2	880793-C6	50.20
.093 (3/32)		.0930	.140	<b>.750</b> (8x)	3	1/8	2-1/2	978293-C6	50.20
.093 (3/32)		.0930	.140	<b>.750</b> (8x)	4	1/8	2-1/2	812393-C6	52.10 <span style="color:red">NEW</span>
.093 (3/32)		.0930	.140	<b>.950</b> (10x)	3	1/8	2-1/2	935793-C6	54.60
.093 (3/32)		.0930	.140	<b>1.125</b> (12x)	3	1/8	2-1/2	901393-C6	56.30
.093 (3/32)		.0930	.140	<b>1.400</b> (15x)	3	1/8	3	851593-C6	57.40
.100		.1000	.150	<b>.500</b> (5x)	3	1/8	2-1/2	985400-C6	48.00
.100		.1000	.150	<b>.800</b> (8x)	3	1/8	2-1/2	978300-C6	49.10
.109 (7/64)		.1090	.164	<b>.570</b> (5x)	3	1/8	2-1/2	985402-C6	48.00
.109 (7/64)		.1090	.164	<b>.900</b> (8x)	3	1/8	2-1/2	978302-C6	49.10
3.0 mm	.1181	4.50 mm	<b>15.0 mm</b> (5x)	3	4 mm	50 mm	905057-C6	49.40	
3.0 mm	.1181	4.50 mm	<b>24.0 mm</b> (8x)	3	4 mm	50 mm	911457-C6	49.60	

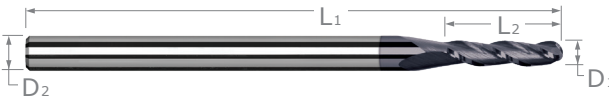
D <sub>1</sub>			L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .000" / - .002"	+ .00mm / - .04mm	decimal equivalent	+ .030" / - .000" / + .75mm / - .00mm	+ .030" / - .000" / + .75mm / - .00mm					
.125 (1/8)		.1250	.187	<b>.375</b> (3x)	4	1/8	1-1/2	940608-C6	48.00
.125 (1/8)		.1250	.187	<b>.625</b> (5x)	4	1/8	2-1/2	985408-C6	49.10
.125 (1/8)		.1250	.187	<b>.750</b> (6x)	4	1/8	2-1/2	895608-C6	49.10
.125 (1/8)		.1250	.187	<b>.875</b> (7x)	4	1/8	2-1/2	880808-C6	50.20
.125 (1/8)		.1250	.187	<b>1.000</b> (8x)	4	1/8	2-1/2	978308-C6	50.20
.125 (1/8)		.1250	.187	<b>1.250</b> (10x)	4	1/8	2-1/2	935808-C6	54.60
.140 (9/64)		.1406	.220	<b>.750</b> (5x)	4	3/16	3	985409-C6	55.60
.156 (5/32)		.1562	.235	<b>.750</b> (5x)	4	3/16	3	985410-C6	53.00
.156 (5/32)		.1562	.235	<b>1.250</b> (8x)	4	3/16	3	978310-C6	54.00
.187 (3/16)		.1875	.285	<b>1.000</b> (5x)	4	3/16	3	985412-C6	53.00
.187 (3/16)		.1875	.285	<b>1.500</b> (8x)	4	3/16	3	978312-C6	54.00
6.0 mm	.2362	9.00mm	<b>30.0mm</b> (5x)	4	6 mm	63 mm	905066-C6	62.10	
.250 (1/4)		.2500	.375	<b>1.250</b> (5x)	4	1/4	4	985416-C6	59.10
.250 (1/4)		.2500	.375	<b>2.000</b> (8x)	4	1/4	4	978316-C6	60.40

PLEASE SEE SPEEDS & FEEDS ON PAGE 112



# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Ball



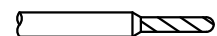
- Optimized for titanium alloys, inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Variable helix design (approx. 34°) reduces chatter and harmonics and increases material removal rates
- Latest generation AITIN 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

EXOTIC ALLOYS

**mm & in**

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 mm	.0078	<b>.60 mm</b> (3x)	3	4 mm	50 mm	975304-C6	62.40
.010	.0100		<b>.015</b> (1.5x)	3	1/8	1-1/2	944210-C6	59.10
.010	.0100		<b>.030</b> (3x)	3	1/8	1-1/2	970510-C6	59.10
.010	.0100		<b>.050</b> (5x)	3	1/8	2-1/2	930610-C6	68.40
.015 (1/64)	.0150		<b>.023</b> (1.5x)	3	1/8	1-1/2	944215-C6	50.20
.015 (1/64)	.0150		<b>.045</b> (3x)	3	1/8	1-1/2	970515-C6	50.20
.015 (1/64)	.0150		<b>.078</b> (5x)	3	1/8	2-1/2	930615-C6	59.30
.4 mm	.0157		<b>1.20 mm</b> (3x)	3	4 mm	50 mm	975309-C6	51.60
.5 mm	.0196		<b>1.50 mm</b> (3x)	3	4 mm	50 mm	975311-C6	46.80
.020	.0200		<b>.030</b> (1.5x)	3	1/8	1-1/2	944220-C6	44.90
.020	.0200		<b>.060</b> (3x)	3	1/8	1-1/2	970520-C6	44.90
.020	.0200		<b>.100</b> (5x)	3	1/8	2-1/2	930620-C6	49.40
.6 mm	.0236		<b>1.80 mm</b> (3x)	3	4 mm	50 mm	975313-C6	45.40
.025	.0250		<b>.038</b> (1.5x)	3	1/8	1-1/2	944225-C6	43.50
.025	.0250		<b>.075</b> (3x)	3	1/8	1-1/2	970525-C6	43.50
.025	.0250		<b>.125</b> (5x)	3	1/8	2-1/2	930625-C6	48.00
.030	.0300		<b>.045</b> (1.5x)	3	1/8	1-1/2	944230-C6	38.40
.030	.0300		<b>.090</b> (3x)	3	1/8	1-1/2	970530-C6	38.40
<b>NEW</b> .030	.0300		<b>.156</b> (5x)	3	1/8	2-1/2	<b>930630-C6</b>	42.90
.031 (1/32)	.0310		<b>.025</b> (0.8x)	3	1/8	1-1/2	848131-C6	38.90
.031 (1/32)	.0310		<b>.047</b> (1.5x)	3	1/8	1-1/2	944231-C6	38.20
<b>NEW</b> .031 (1/32)	.0310		<b>.047</b> (1.5x)	4	1/8	1-1/2	<b>814531-C6</b>	40.40
.031 (1/32)	.0310		<b>.093</b> (3x)	3	1/8	1-1/2	970531-C6	38.20
.031 (1/32)	.0310		<b>.093</b> (3x)	4	1/8	1-1/2	893031-C6	40.40
<b>NEW</b> .031 (1/32)	.0310		<b>.125</b> (4x)	3	1/8	2-1/2	<b>811231-C6</b>	46.20
.031 (1/32)	.0310		<b>.156</b> (5x)	3	1/8	2-1/2	930631-C6	46.20
.8 mm	.0314		<b>1.20 mm</b> (1.5x)	3	4 mm	50 mm	968018-C6	39.90
.8 mm	.0314		<b>2.40 mm</b> (3x)	3	4 mm	50 mm	975318-C6	39.90
.035	.0350		<b>.105</b> (3x)	3	1/8	1-1/2	970535-C6	38.40
1.0 mm	.0393		<b>.80 mm</b> (0.8x)	3	4 mm	50 mm	872422-C6	40.40
1.0 mm	.0393		<b>1.50 mm</b> (1.5x)	3	4 mm	50 mm	968022-C6	39.90
1.0 mm	.0393		<b>3.00 mm</b> (3x)	3	4 mm	50 mm	975322-C6	39.90
1.0 mm	.0393		<b>5.00 mm</b> (5x)	3	4 mm	50 mm	911322-C6	47.80

continued on next page



# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Ball (cont.)

mm & in

continued from previous page

EXOTIC 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					
.040		.0400	<b>.060</b> (1.5x)	3	1/8	1-1/2	944240-C6	38.20
.040		.0400	<b>.120</b> (3x)	3	1/8	1-1/2	970540-C6	38.20
.040		.0400	<b>.203</b> (5x)	3	1/8	2-1/2	930640-C6	46.40
.045		.0450	<b>.135</b> (3x)	3	1/8	1-1/2	970545-C6	38.40
.047 (3/64)		.0470	<b>.038</b> (0.8x)	3	1/8	1-1/2	848147-C6	38.50
.047 (3/64)		.0470	<b>.071</b> (1.5x)	3	1/8	1-1/2	944247-C6	38.20
.047 (3/64)		.0470	<b>.141</b> (3x)	3	1/8	1-1/2	970547-C6	38.20
.047 (3/64)		.0470	<b>.141</b> (3x)	4	1/8	1-1/2	893047-C6	40.40
.047 (3/64)		.0470	<b>.250</b> (5x)	3	1/8	2-1/2	930647-C6	46.40
1.2 mm		.0472	<b>1.80 mm</b> (1.5x)	3	4 mm	50 mm	968027-C6	39.90
1.2 mm		.0472	<b>3.50 mm</b> (3x)	3	4 mm	50 mm	975327-C6	39.90
.050		.0500	<b>.075</b> (1.5x)	3	1/8	1-1/2	944250-C6	38.20
.050		.0500	<b>.150</b> (3x)	3	1/8	1-1/2	970550-C6	38.20
.050		.0500	<b>.250</b> (5x)	3	1/8	2-1/2	930650-C6	46.40
.055		.0550	<b>.165</b> (3x)	3	1/8	1-1/2	970555-C6	38.40
1.4 mm		.0551	<b>2.10 mm</b> (1.5x)	3	4 mm	50 mm	968031-C6	39.90
1.4 mm		.0551	<b>4.00 mm</b> (3x)	3	4 mm	50 mm	975331-C6	39.90
1.5 mm		.0590	<b>2.20 mm</b> (1.5x)	3	4 mm	50 mm	968033-C6	39.90
1.5 mm		.0590	<b>4.50 mm</b> (3x)	3	4 mm	50 mm	975333-C6	39.90
1.5 mm		.0590	<b>7.50 mm</b> (5x)	3	4 mm	50 mm	911333-C6	47.80
.060		.0600	<b>.090</b> (1.5x)	3	1/8	1-1/2	944260-C6	38.20
.060		.0600	<b>.180</b> (3x)	3	1/8	1-1/2	970560-C6	38.20
.060		.0600	<b>.312</b> (5x)	3	1/8	2-1/2	930660-C6	46.40
.062 (1/16)		.0620	<b>.050</b> (0.8x)	3	1/8	1-1/2	848162-C6	36.70
.062 (1/16)		.0620	<b>.093</b> (1.5x)	3	1/8	1-1/2	944262-C6	36.00
.062 (1/16)		.0620	<b>.093</b> (1.5x)	4	1/8	1-1/2	814562-C6	38.20
.062 (1/16)		.0620	<b>.186</b> (3x)	3	1/8	1-1/2	970562-C6	36.00
.062 (1/16)		.0620	<b>.186</b> (3x)	4	1/8	1-1/2	893062-C6	38.20
.062 (1/16)		.0620	<b>.250</b> (4x)	3	1/8	2-1/2	811262-C6	44.30
.062 (1/16)		.0620	<b>.312</b> (5x)	3	1/8	2-1/2	930662-C6	44.30
1.6 mm		.0629	<b>2.40 mm</b> (1.5x)	3	4 mm	50 mm	968036-C6	37.50
1.6 mm		.0629	<b>5.00 mm</b> (3x)	3	4 mm	50 mm	975336-C6	37.50
.070		.0700	<b>.105</b> (1.5x)	3	1/8	1-1/2	944270-C6	36.50
.070		.0700	<b>.210</b> (3x)	3	1/8	1-1/2	970570-C6	36.50
.070		.0700	<b>.375</b> (5x)	3	1/8	2-1/2	930670-C6	43.40
1.8 mm		.0708	<b>2.70 mm</b> (1.5x)	3	4 mm	50 mm	968040-C6	37.50
1.8 mm		.0708	<b>5.50 mm</b> (3x)	3	4 mm	50 mm	975340-C6	37.50
.078 (5/64)		.0780	<b>.062</b> (0.8x)	3	1/8	1-1/2	848178-C6	36.70
.078 (5/64)		.0780	<b>.118</b> (1.5x)	3	1/8	1-1/2	944278-C6	36.00
.078 (5/64)		.0780	<b>.234</b> (3x)	3	1/8	1-1/2	970578-C6	36.00
.078 (5/64)		.0780	<b>.234</b> (3x)	4	1/8	1-1/2	893078-C6	38.20
.078 (5/64)		.0780	<b>.406</b> (5x)	3	1/8	2-1/2	930678-C6	43.90
2.0 mm		.0787	<b>3.00 mm</b> (1.5x)	3	4 mm	50 mm	968045-C6	37.50
2.0 mm		.0787	<b>6.00 mm</b> (3x)	3	4 mm	50 mm	975345-C6	37.50
2.0 mm		.0787	<b>10.00 mm</b> (5x)	3	4 mm	50 mm	911345-C6	45.40

NEW

NEW

NEW

continued on next page



# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

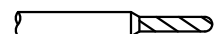
Ball (cont.)

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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
+ .0005" - .0005"	+ .00mm - .02mm	decimal equivalent	+ .010" - .000" + .25mm - .00mm					
.080		.0800	<b>.120</b> (1.5x)	3	1/8	1-1/2	944280-C6	36.50
.080		.0800	<b>.240</b> (3x)	3	1/8	1-1/2	970580-C6	36.50
.090		.0900	<b>.135</b> (1.5x)	3	1/8	1-1/2	944290-C6	36.50
.090		.0900	<b>.270</b> (3x)	3	1/8	1-1/2	970590-C6	36.50
.093 (3/32)		.0930	<b>.074</b> (0.8x)	3	1/8	1-1/2	848193-C6	36.70
.093 (3/32)		.0930	<b>.140</b> (1.5x)	3	1/8	1-1/2	944293-C6	36.00
<b>NEW</b> .093 (3/32)		.0930	<b>.140</b> (1.5x)	4	1/8	1-1/2	<b>814593-C6</b>	38.20
.093 (3/32)		.0930	<b>.279</b> (3x)	3	1/8	1-1/2	970593-C6	36.00
.093 (3/32)		.0930	<b>.279</b> (3x)	4	1/8	1-1/2	893093-C6	38.20
<b>NEW</b> .093 (3/32)		.0930	<b>.375</b> (4x)	3	1/8	2-1/2	<b>811293-C6</b>	44.30
.093 (3/32)		.0930	<b>.500</b> (5x)	3	1/8	2-1/2	930693-C6	44.30
	2.5 mm	.0984	<b>3.70 mm</b> (1.5x)	3	4 mm	50 mm	968051-C6	39.50
	2.5 mm	.0984	<b>7.50 mm</b> (3x)	3	4 mm	50 mm	975351-C6	39.50
.100		.1000	<b>.150</b> (1.5x)	3	1/8	1-1/2	944300-C6	36.20
.100		.1000	<b>.300</b> (3x)	3	1/8	1-1/2	970600-C6	36.20
.100		.1000	<b>.500</b> (5x)	3	1/8	2-1/2	930700-C6	44.40
.109 (7/64)		.1090	<b>.327</b> (3x)	3	1/8	1-1/2	970602-C6	38.40
	3.0 mm	.1181	<b>4.50 mm</b> (1.5x)	3	4 mm	50 mm	968057-C6	37.50
	3.0 mm	.1181	<b>9.00 mm</b> (3x)	3	4 mm	50 mm	975357-C6	37.50
	3.0 mm	.1181	<b>15.00 mm</b> (5x)	3	4 mm	50 mm	911357-C6	45.40
<hr/>								
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	36.70
.125 (1/8)		.1250	<b>.187</b> (1.5x)	4	1/8	1-1/2	944308-C6	34.50
.125 (1/8)		.1250	<b>.375</b> (3x)	4	1/8	1-1/2	970608-C6	34.50
<b>NEW</b> .125 (1/8)		.1250	<b>.500</b> (4x)	4	1/8	2-1/2	<b>811308-C6</b>	44.30
.125 (1/8)		.1250	<b>.625</b> (5x)	4	1/8	2-1/2	930708-C6	44.30
.140 (9/64)		.1406	<b>.425</b> (3x)	4	3/16	2	970609-C6	46.40
.156 (5/32)		.1562	<b>.235</b> (1.5x)	4	3/16	2	944310-C6	38.40
.156 (5/32)		.1562	<b>.470</b> (3x)	4	3/16	2	970610-C6	38.40
.156 (5/32)		.1562	<b>.750</b> (5x)	4	3/16	3	930710-C6	46.80
.187 (3/16)		.1875	<b>.150</b> (0.8x)	4	3/16	2	848212-C6	39.10
.187 (3/16)		.1875	<b>.285</b> (1.5x)	4	3/16	2	944312-C6	36.70
.187 (3/16)		.1875	<b>.562</b> (3x)	4	3/16	2	970612-C6	36.70
.187 (3/16)		.1875	<b>1.000</b> (5x)	4	3/16	3	930712-C6	46.80
	6.0 mm	.2362	<b>18.00 mm</b> (3x)	4	6 mm	63 mm	975372-C6	49.70
.250 (1/4)		.2500	<b>.200</b> (0.8x)	4	1/4	2-1/2	848216-C6	47.20
.250 (1/4)		.2500	<b>.375</b> (1.5x)	4	1/4	2-1/2	944316-C6	44.40
.250 (1/4)		.2500	<b>.750</b> (3x)	4	1/4	2-1/2	970616-C6	44.40
.250 (1/4)		.2500	<b>1.250</b> (5x)	4	1/4	4	930716-C6	54.80

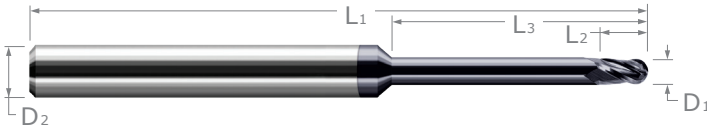
EXOTIC ALLOYS

**PLEASE SEE SPEEDS & FEEDS ON PAGE 119**



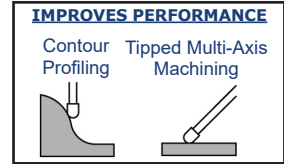
# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

## Ball – Long Reach, Stub Flute



EXOTIC ALLOYS

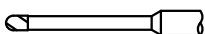
- Optimized for titanium alloys, inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Long reach design for deep cavities
- Reduced neck diameter to avoid heeling
- Variable helix design (approx. 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



mm & in

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITiN NANO COATED	
						4 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>		
.015 (1/64)	.0150	.022	<b>.078</b> (5x)	4	1/8	2-1/2	63615-C6   62.70
.015 (1/64)	.0150	.022	<b>.125</b> (8x)	4	1/8	2-1/2	56115-C6   63.90
.015 (1/64)	.0150	.022	<b>.187</b> (12x)	4	1/8	2-1/2	64815-C6   68.00
.4 mm	.0157	.60 mm	<b>2.0 mm</b> (5x)	4	4 mm	50 mm	988709-C6   67.70
.4 mm	.0157	.60 mm	<b>3.2 mm</b> (8x)	4	4 mm	50 mm	974009-C6   68.70
.4 mm	.0157	.60 mm	<b>4.8 mm</b> (12x)	4	4 mm	50 mm	981309-C6   73.70
.5 mm	.0196	.75 mm	<b>2.5 mm</b> (5x)	4	4 mm	50 mm	988711-C6   65.50
.5 mm	.0196	.75 mm	<b>4.0 mm</b> (8x)	4	4 mm	50 mm	974011-C6   66.50
.5 mm	.0196	.75 mm	<b>6.0 mm</b> (12x)	4	4 mm	50 mm	981311-C6   71.20
.5 mm	.0196	.75 mm	<b>8.0 mm</b> (16x)	4	4 mm	50 mm	976511-C6   74.40
.020	.0200	.030	<b>.100</b> (5x)	4	1/8	2-1/2	63620-C6   59.90
.020	.0200	.030	<b>.160</b> (8x)	4	1/8	2-1/2	56120-C6   61.10
.020	.0200	.030	<b>.250</b> (12x)	4	1/8	2-1/2	64820-C6   65.50
.6 mm	.0236	.90 mm	<b>3.0 mm</b> (5x)	4	4 mm	50 mm	988713-C6   63.80
.6 mm	.0236	.90 mm	<b>4.8 mm</b> (8x)	4	4 mm	50 mm	974013-C6   65.20
.6 mm	.0236	.90 mm	<b>7.2 mm</b> (12x)	4	4 mm	50 mm	981313-C6   69.60
.025	.0250	.037	<b>.125</b> (5x)	4	1/8	2-1/2	63625-C6   58.30
.025	.0250	.037	<b>.203</b> (8x)	4	1/8	2-1/2	56125-C6   59.60
.025	.0250	.037	<b>.312</b> (12x)	4	1/8	2-1/2	64825-C6   64.10
.031 (1/32)	.0310	.047	<b>.093</b> (3x)	4	1/8	1-1/2	929031-C6   53.40
.031 (1/32)	.0310	.047	<b>.156</b> (5x)	4	1/8	2-1/2	63631-C6   54.80
.031 (1/32)	.0310	.047	<b>.250</b> (8x)	4	1/8	2-1/2	56131-C6   56.10
.031 (1/32)	.0310	.047	<b>.312</b> (10x)	4	1/8	2-1/2	887231-C6   57.20
.031 (1/32)	.0310	.047	<b>.375</b> (12x)	4	1/8	2-1/2	64831-C6   57.90
.031 (1/32)	.0310	.047	<b>.470</b> (15x)	4	1/8	2-1/2	953331-C6   60.70
.8 mm	.0314	1.20 mm	<b>4.0 mm</b> (5x)	4	4 mm	50 mm	988718-C6   59.60
.8 mm	.0314	1.20 mm	<b>6.5 mm</b> (8x)	4	4 mm	50 mm	974018-C6   60.90
.8 mm	.0314	1.20 mm	<b>9.5 mm</b> (12x)	4	4 mm	50 mm	981318-C6   62.40
.035	.0350	.052	<b>.187</b> (5x)	4	1/8	2-1/2	63635-C6   54.80

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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Ball – Long Reach, Stub Flute (cont.)

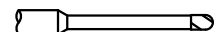
**mm & in**

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	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
	1.0 mm	.0393	1.50 mm	<b>5.0 mm</b> (5x)	4	4 mm	50 mm	988722-C6	59.60
	1.0 mm	.0393	1.50 mm	<b>8.0 mm</b> (8x)	4	4 mm	50 mm	974022-C6	60.90
	1.0 mm	.0393	1.50 mm	<b>12.0 mm</b> (12x)	4	4 mm	50 mm	981322-C6	62.40
	1.0 mm	.0393	1.50 mm	<b>16.0 mm</b> (16x)	4	4 mm	50 mm	976522-C6	65.50
NEW	.040	.0400	.060	<b>.203</b> (5x)	4	1/8	2-1/2	63640-C6	54.80
	.040	.0400	.060	<b>.325</b> (8x)	4	1/8	2-1/2	56140-C6	56.10
	.045	.0450	.067	<b>.225</b> (5x)	4	1/8	2-1/2	63645-C6	54.80
	.047 (3/64)	.0470	.070	<b>.250</b> (5x)	4	1/8	2-1/2	63647-C6	54.80
	.047 (3/64)	.0470	.070	<b>.375</b> (8x)	4	1/8	2-1/2	56147-C6	56.10
	.047 (3/64)	.0470	.070	<b>.480</b> (10x)	4	1/8	2-1/2	887247-C6	57.20
	.047 (3/64)	.0470	.070	<b>.570</b> (12x)	4	1/8	2-1/2	64847-C6	57.90
NEW	.050	.0500	.075	<b>.250</b> (5x)	4	1/8	2-1/2	63650-C6	54.80
	.050	.0500	.075	<b>.400</b> (8x)	4	1/8	2-1/2	56150-C6	56.10
	.055	.0550	.082	<b>.275</b> (5x)	4	1/8	2-1/2	63655-C6	54.80
NEW	1.5 mm	.0590	2.20 mm	<b>7.5 mm</b> (5x)	4	4 mm	50 mm	988733-C6	59.60
	1.5 mm	.0590	2.20 mm	<b>12.0 mm</b> (8x)	4	4 mm	50 mm	974033-C6	60.90
	1.5 mm	.0590	2.20 mm	<b>18.0 mm</b> (12x)	4	4 mm	50 mm	981333-C6	62.40
	1.5 mm	.0590	2.20 mm	<b>24.0 mm</b> (16x)	4	4 mm	63 mm	976533-C6	65.50
	.060	.0600	.090	<b>.312</b> (5x)	4	1/8	2-1/2	63660-C6	54.80
	.060	.0600	.090	<b>.500</b> (8x)	4	1/8	2-1/2	56160-C6	56.10
	.062 (1/16)	.0620	.093	<b>.186</b> (3x)	4	1/8	1-1/2	929062-C6	53.40
NEW	.062 (1/16)	.0620	.093	<b>.312</b> (5x)	4	1/8	2-1/2	63662-C6	54.80
	.062 (1/16)	.0620	.093	<b>.500</b> (8x)	4	1/8	2-1/2	56162-C6	56.10
	.062 (1/16)	.0620	.093	<b>.625</b> (10x)	4	1/8	2-1/2	887262-C6	57.20
	.062 (1/16)	.0620	.093	<b>.750</b> (12x)	4	1/8	2-1/2	64862-C6	57.90
	.062 (1/16)	.0620	.093	<b>.950</b> (15x)	4	1/8	2-1/2	953362-C6	60.70
	.070	.0700	.105	<b>.375</b> (5x)	4	1/8	2-1/2	63670-C6	54.80
	.070	.0700	.105	<b>.570</b> (8x)	4	1/8	2-1/2	56170-C6	56.10
NEW	.078 (5/64)	.0780	.117	<b>.406</b> (5x)	4	1/8	2-1/2	63678-C6	54.80
	.078 (5/64)	.0780	.117	<b>.625</b> (8x)	4	1/8	2-1/2	56178-C6	56.10
	.078 (5/64)	.0780	.117	<b>.940</b> (12x)	4	1/8	2-1/2	64878-C6	57.90
NEW	2.0 mm	.0787	3.00 mm	<b>10.0 mm</b> (5x)	4	4 mm	50 mm	988745-C6	59.40
	2.0 mm	.0787	3.00 mm	<b>16.0 mm</b> (8x)	4	4 mm	50 mm	974045-C6	60.70
	2.0 mm	.0787	3.00 mm	<b>24.0 mm</b> (12x)	4	4 mm	63 mm	981345-C6	62.40
	2.0 mm	.0787	3.00 mm	<b>32.0 mm</b> (16x)	4	4 mm	63 mm	976545-C6	65.50
NEW	.093 (3/32)	.0930	.139	<b>.279</b> (3x)	4	1/8	1-1/2	929093-C6	53.40
	.093 (3/32)	.0930	.139	<b>.500</b> (5x)	4	1/8	2-1/2	63693-C6	54.80
	.093 (3/32)	.0930	.139	<b>.750</b> (8x)	4	1/8	2-1/2	56193-C6	56.10
	.093 (3/32)	.0930	.139	<b>.950</b> (10x)	4	1/8	2-1/2	887293-C6	57.20
	.093 (3/32)	.0930	.139	<b>1.125</b> (12x)	4	1/8	2-1/2	64893-C6	57.90
	.093 (3/32)	.0930	.139	<b>1.400</b> (15x)	4	1/8	3	953393-C6	60.70
NEW	.100	.1000	.150	<b>.500</b> (5x)	4	1/8	2-1/2	63700-C6	54.20
	.100	.1000	.150	<b>.800</b> (8x)	4	1/8	2-1/2	56200-C6	55.40
NEW	3.0 mm	.1181	4.50 mm	<b>15.0 mm</b> (5x)	4	4 mm	50 mm	988757-C6	56.40
	3.0 mm	.1181	4.50 mm	<b>24.0 mm</b> (8x)	4	4 mm	50 mm	974057-C6	57.70

EXOTIC ALLOYS

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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

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



continued from previous page

EXOTIC ALLOYS

CUTTER DIAMETER		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	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)	.1250	.187	.375	(3x)	4	1/8	1-1/2	929108-C6 53.40
.125 (1/8)	.1250	.187	.625	(5x)	4	1/8	2-1/2	63708-C6 54.40
.125 (1/8)	.1250	.187	1.000	(8x)	4	1/8	2-1/2	56208-C6 55.60
.125 (1/8)	.1250	.187	1.250	(10x)	4	1/8	3	887308-C6 57.20
.125 (1/8)	.1250	.187	1.500	(12x)	4	1/8	3	64908-C6 57.90
.156 (5/32)	.1562	.234	.750	(5x)	4	3/16	3	63710-C6 59.00
.156 (5/32)	.1562	.234	1.250	(8x)	4	3/16	3	56210-C6 60.10
.156 (5/32)	.1562	.234	1.570	(10x)	4	3/16	4	887310-C6 62.90
.187 (3/16)	.1875	.281	1.000	(5x)	4	3/16	3	63712-C6 59.90
.187 (3/16)	.1875	.281	1.500	(8x)	4	3/16	3	56212-C6 61.20
.187 (3/16)	.1875	.281	1.875	(10x)	4	3/16	4	887312-C6 64.00
.250 (1/4)	.2500	.375	1.250	(5x)	4	1/4	4	63716-C6 66.30
.250 (1/4)	.2500	.375	2.000	(8x)	4	1/4	4	56216-C6 67.60
.250 (1/4)	.2500	.375	2.500	(10x)	4	1/4	6	887316-C6 78.60

### SPEEDS & FEEDS (Variable Helix – Long Reach, Stub Flute for Exotic 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									
Stainless Steels: 40x, 41x, 42x, 43x, 44x, 13-8, 15-5, 15-7, 17-4, 17-7	275 - 300	160																		
	300 - 350	140																		
	350 - 400	100																		
Tool Steels: D, H, M, T, S series	400 - 425	80																		
	275 - 300	200																		
	300 - 350	125																		
Titanium: All alloys	350 - 400	75																		
	400 - 425	75																		
	275 - 300	80																		
Nickel Alloys: Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discoloy, Incoloy	300 - 350	60																		
	350 - 400	50																		
	400 - 425	40																		

Radial Depth of Cut*:		Axial Depth of Cut*:	
Slotting: 1x Dia	Roughing: .28x Dia	Slotting: .28x Dia	Roughing: .5x - .7x Dia
Finishing: .1x Dia		Finishing: .5x - 1x Dia	

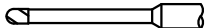
\* If less than minimum Axial or Radial DOC values are used, increased feed rates are possible. If greater than maximum Axial and Radial DOC values are used, decreased feed rates may be needed.



"Shout out to #HarveyTool on another great product. When I started cutting composites, I knew exactly where to turn. Their Tech support answered all my questions (even the dumb ones) and the tool performed flawlessly. The improvement in surface finish with this 10 flute finisher is amazing. Thanks again @harveytool"

— @venomdefense

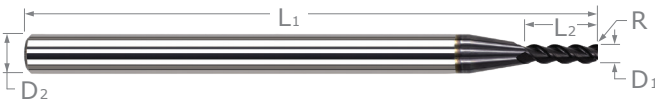
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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

## Corner Radius



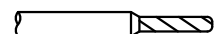
- Optimized for titanium alloys, inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Variable helix design (approx. 34°) reduces chatter and harmonics and increases material removal rates
- Latest 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

EXOTIC ALLOYS

**mm & in**

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					
.2 mm	.0078		<b>.05 mm</b>	.30 mm (1.5x)	3	4 mm	50 mm	984104-C6	55.90
.2 mm	.0078		<b>.05 mm</b>	.60 mm (3x)	3	4 mm	50 mm	979304-C6	55.90
.010	.0100		<b>.003</b>	.015 (1.5x)	3	1/8	1-1/2	52210-C6	52.60
.010	.0100		<b>.003</b>	.030 (3x)	3	1/8	1-1/2	46810-C6	53.00
.3 mm	.0118		<b>.08 mm</b>	.45 mm (1.5x)	3	4 mm	50 mm	984106-C6	54.40
.3 mm	.0118		<b>.08 mm</b>	.90 mm (3x)	3	4 mm	50 mm	979306-C6	54.40
.015 (1/64)	.0150		<b>.003</b>	.012 (0.8x)	3	1/8	1-1/2	954215-C6	46.20
.015 (1/64)	.0150		<b>.003</b>	.022 (1.5x)	3	1/8	1-1/2	52215-C6	43.70
.015 (1/64)	.0150		<b>.003</b>	.045 (3x)	3	1/8	1-1/2	46815-C6	43.70
.015 (1/64)	.0150		<b>.003</b>	.078 (5x)	3	1/8	2-1/2	53615-C6	52.90
.015 (1/64)	.0150		<b>.005</b>	.045 (3x)	3	1/8	1-1/2	936415-C6	49.70
.4 mm	.0157		<b>.08 mm</b>	.60 mm (1.5x)	3	4 mm	50 mm	984109-C6	46.80
.4 mm	.0157		<b>.08 mm</b>	1.20 mm (3x)	3	4 mm	50 mm	979309-C6	46.80
.5 mm	.0196		<b>.10 mm</b>	.75 mm (1.5x)	3	4 mm	50 mm	984111-C6	41.90
.5 mm	.0196		<b>.10 mm</b>	1.50 mm (3x)	3	4 mm	50 mm	979311-C6	41.90
.5 mm	.0196		<b>.10 mm</b>	2.50 mm (5x)	3	4 mm	50 mm	965811-C6	52.60
.020	.0200		<b>.004</b>	.016 (0.8x)	3	1/8	1-1/2	954220-C6	40.80
.020	.0200		<b>.004</b>	.030 (1.5x)	3	1/8	1-1/2	52220-C6	38.40
.020	.0200		<b>.004</b>	.060 (3x)	3	1/8	1-1/2	46820-C6	38.40
.020	.0200		<b>.004</b>	.100 (5x)	3	1/8	2-1/2	53620-C6	47.00
.6 mm	.0236		<b>.10 mm</b>	.90 mm (1.5x)	3	4 mm	50 mm	984113-C6	40.50
.6 mm	.0236		<b>.10 mm</b>	1.80 mm (3x)	3	4 mm	50 mm	979313-C6	40.50
.025	.0250		<b>.004</b>	.020 (0.8x)	3	1/8	1-1/2	954225-C6	39.80
.025	.0250		<b>.004</b>	.038 (1.5x)	3	1/8	1-1/2	52225-C6	37.30
.025	.0250		<b>.004</b>	.075 (3x)	3	1/8	1-1/2	46825-C6	37.30
.025	.0250		<b>.004</b>	.125 (5x)	3	1/8	2-1/2	53625-C6	45.50
.7 mm	.0275		<b>.10 mm</b>	2.10 mm (3x)	3	4 mm	50 mm	979315-C6	40.50
.030	.0300		<b>.005</b>	.045 (1.5x)	3	1/8	1-1/2	52230-C6	37.30
.030	.0300		<b>.005</b>	.090 (3x)	3	1/8	1-1/2	46830-C6	37.30

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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

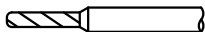
Corner Radius (cont.)

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EXOTIC ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	A1TiN NANO COATED	
D <sub>1</sub>			R	L <sub>2</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					
.031 (1/32)		.0310	.003	.047 (1.5x)	3	1/8	1-1/2	853631-C6	34.20
.031 (1/32)		.0310	.003	.093 (3x)	3	1/8	1-1/2	923631-C6	31.50
.031 (1/32)		.0310	.005	.025 (0.8x)	3	1/8	1-1/2	954231-C6	32.70
.031 (1/32)		.0310	.005	.047 (1.5x)	3	1/8	1-1/2	52231-C6	31.80
.031 (1/32)		.0310	.005	.093 (3x)	3	1/8	1-1/2	46831-C6	31.80
.031 (1/32)		.0310	.005	.093 (3x)	4	1/8	1-1/2	850731-C6	33.60
.031 (1/32)		.0310	.005	.156 (5x)	3	1/8	2-1/2	53631-C6	39.50
.031 (1/32)		.0310	.008	.047 (1.5x)	3	1/8	1-1/2	847831-C6	34.40
.031 (1/32)		.0310	.008	.093 (3x)	3	1/8	1-1/2	848431-C6	34.40
.031 (1/32)		.0310	.010	.047 (1.5x)	3	1/8	1-1/2	912931-C6	34.20
.031 (1/32)		.0310	.010	.093 (3x)	3	1/8	1-1/2	950731-C6	34.40
.031 (1/32)		.0310	.010	.156 (5x)	3	1/8	2-1/2	869831-C6	42.20
.8 mm		.0314	.10 mm	1.20 mm (1.5x)	3	4 mm	50 mm	984118-C6	35.20
.8 mm		.0314	.10 mm	2.40 mm (3x)	3	4 mm	50 mm	979318-C6	35.20
.035		.0350	.005	.053 (1.5x)	3	1/8	1-1/2	52235-C6	31.80
.035		.0350	.005	.105 (3x)	3	1/8	1-1/2	46835-C6	31.80
.035		.0350	.005	.187 (5x)	3	1/8	2-1/2	53635-C6	39.50
.035		.0350	.010	.105 (3x)	3	1/8	1-1/2	950735-C6	34.40
.9 mm		.0354	.10 mm	2.70 mm (3x)	3	4 mm	50 mm	979320-C6	35.20
1.0 mm		.0393	.10 mm	1.50 mm (1.5x)	3	4 mm	50 mm	984122-C6	35.20
1.0 mm		.0393	.10 mm	3.00 mm (3x)	3	4 mm	50 mm	979322-C6	35.20
1.0 mm		.0393	.10 mm	5.00 mm (5x)	3	4 mm	50 mm	965822-C6	43.10
1.0 mm		.0393	.30 mm	3.00 mm (3x)	3	4 mm	50 mm	843322-C6	35.20
.040		.0400	.003	.120 (3x)	3	1/8	1-1/2	923640-C6	31.80
.040		.0400	.005	.032 (0.8x)	3	1/8	1-1/2	954240-C6	34.20
.040		.0400	.005	.060 (1.5x)	3	1/8	1-1/2	52240-C6	31.80
.040		.0400	.005	.120 (3x)	3	1/8	1-1/2	46840-C6	31.80
.040		.0400	.005	.203 (5x)	3	1/8	2-1/2	53640-C6	39.50
.040		.0400	.010	.120 (3x)	3	1/8	1-1/2	950740-C6	34.40
1.1 mm		.0433	.10 mm	3.00 mm (3x)	3	4 mm	50 mm	979324-C6	35.20
.045		.0450	.005	.068 (1.5x)	3	1/8	1-1/2	52245-C6	31.80
.045		.0450	.005	.135 (3x)	3	1/8	1-1/2	46845-C6	31.80
.045		.0450	.005	.225 (5x)	3	1/8	2-1/2	53645-C6	39.50
.047 (3/64)		.0470	.003	.141 (3x)	3	1/8	1-1/2	923647-C6	31.50
.047 (3/64)		.0470	.005	.038 (0.8x)	3	1/8	1-1/2	954247-C6	32.70
.047 (3/64)		.0470	.005	.071 (1.5x)	3	1/8	1-1/2	52247-C6	31.80
.047 (3/64)		.0470	.005	.141 (3x)	3	1/8	1-1/2	46847-C6	31.80
.047 (3/64)		.0470	.005	.141 (3x)	4	1/8	1-1/2	850747-C6	33.60
.047 (3/64)		.0470	.005	.250 (5x)	3	1/8	2-1/2	53647-C6	39.50
.047 (3/64)		.0470	.010	.071 (1.5x)	3	1/8	1-1/2	912947-C6	34.20
.047 (3/64)		.0470	.010	.141 (3x)	3	1/8	1-1/2	950747-C6	34.40
.047 (3/64)		.0470	.015	.071 (1.5x)	3	1/8	1-1/2	975647-C6	31.80
.047 (3/64)		.0470	.015	.141 (3x)	3	1/8	1-1/2	964147-C6	34.40
1.2 mm		.0472	.10 mm	1.80 mm (1.5x)	3	4 mm	50 mm	984127-C6	35.20
1.2 mm		.0472	.10 mm	3.50 mm (3x)	3	4 mm	50 mm	979327-C6	35.20

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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Corner Radius (cont.)

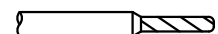


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CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm	decimal equivalent	+ .001" - .001"	+ .010" - .000"					
- .0005"	- .02mm		+ .025mm - .025mm	+ .25mm - .00mm					
.050		.0500	<b>.005</b>	.040 (0.8x)	3	1/8	1-1/2	954250-C6	34.20
.050		.0500	<b>.005</b>	.075 (1.5x)	3	1/8	1-1/2	52250-C6	31.50
.050		.0500	<b>.005</b>	.150 (3x)	3	1/8	1-1/2	46850-C6	31.50
.050		.0500	<b>.005</b>	.250 (5x)	3	1/8	2-1/2	53650-C6	39.50
.050		.0500	<b>.010</b>	.075 (1.5x)	3	1/8	1-1/2	912950-C6	34.20
.050		.0500	<b>.010</b>	.150 (3x)	3	1/8	1-1/2	950750-C6	34.40
.050		.0500	<b>.015</b>	.075 (1.5x)	3	1/8	1-1/2	975650-C6	34.40
.050		.0500	<b>.015</b>	.150 (3x)	3	1/8	1-1/2	964150-C6	32.70
	1.3 mm	.0511	<b>.10 mm</b>	4.00 mm (3x)	3	4 mm	50 mm	979329-C6	35.20
.055		.0550	<b>.005</b>	.083 (1.5x)	3	1/8	1-1/2	52255-C6	31.50
.055		.0550	<b>.005</b>	.165 (3x)	3	1/8	1-1/2	46855-C6	31.50
.055		.0550	<b>.005</b>	.275 (5x)	3	1/8	2-1/2	53655-C6	39.50
.055		.0550	<b>.010</b>	.083 (1.5x)	3	1/8	1-1/2	912955-C6	34.20
.055		.0550	<b>.010</b>	.165 (3x)	3	1/8	1-1/2	950755-C6	34.40
.055		.0550	<b>.015</b>	.083 (1.5x)	3	1/8	1-1/2	975655-C6	34.40
.055		.0550	<b>.015</b>	.165 (3x)	3	1/8	1-1/2	964155-C6	34.40
	1.4 mm	.0551	<b>.10 mm</b>	2.10 mm (1.5x)	3	4 mm	50 mm	984131-C6	35.20
	1.4 mm	.0551	<b>.10 mm</b>	4.00 mm (3x)	3	4 mm	50 mm	979331-C6	35.20
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm (1.5x)	3	4 mm	50 mm	984133-C6	33.00
	1.5 mm	.0590	<b>.20 mm</b>	4.50 mm (3x)	3	4 mm	50 mm	979333-C6	33.00
	1.5 mm	.0590	<b>.20 mm</b>	7.50 mm (5x)	3	4 mm	50 mm	965833-C6	40.30
.060		.0600	<b>.005</b>	.090 (1.5x)	3	1/8	1-1/2	908860-C6	31.50
.060		.0600	<b>.005</b>	.180 (3x)	3	1/8	1-1/2	936460-C6	31.50
.060		.0600	<b>.005</b>	.312 (5x)	3	1/8	2-1/2	869060-C6	39.50
.060		.0600	<b>.010</b>	.048 (0.8x)	3	1/8	1-1/2	954260-C6	34.20
.060		.0600	<b>.010</b>	.090 (1.5x)	3	1/8	1-1/2	52260-C6	31.50
.060		.0600	<b>.010</b>	.180 (3x)	3	1/8	1-1/2	46860-C6	31.50
.060		.0600	<b>.010</b>	.312 (5x)	3	1/8	2-1/2	53660-C6	39.50
.060		.0600	<b>.015</b>	.090 (1.5x)	3	1/8	1-1/2	975660-C6	31.80
.060		.0600	<b>.015</b>	.180 (3x)	3	1/8	1-1/2	964160-C6	31.80
.060		.0600	<b>.020</b>	.090 (1.5x)	3	1/8	1-1/2	931760-C6	32.10
.060		.0600	<b>.020</b>	.180 (3x)	3	1/8	1-1/2	959260-C6	32.40
.062 (1/16)		.0620	<b>.003</b>	.093 (1.5x)	3	1/8	1-1/2	853662-C6	29.60
.062 (1/16)		.0620	<b>.003</b>	.186 (3x)	3	1/8	1-1/2	923662-C6	29.60
.062 (1/16)		.0620	<b>.005</b>	.093 (1.5x)	3	1/8	1-1/2	908862-C6	29.60
.062 (1/16)		.0620	<b>.005</b>	.186 (3x)	3	1/8	1-1/2	936462-C6	29.60
.062 (1/16)		.0620	<b>.005</b>	.312 (5x)	3	1/8	2-1/2	869062-C6	37.70
.062 (1/16)		.0620	<b>.008</b>	.093 (1.5x)	3	1/8	1-1/2	847862-C6	29.60
.062 (1/16)		.0620	<b>.008</b>	.186 (3x)	3	1/8	1-1/2	848462-C6	29.60
.062 (1/16)		.0620	<b>.010</b>	.050 (0.8x)	3	1/8	1-1/2	954262-C6	29.60
.062 (1/16)		.0620	<b>.010</b>	.093 (1.5x)	3	1/8	1-1/2	52262-C6	29.60
.062 (1/16)		.0620	<b>.010</b>	.186 (3x)	3	1/8	1-1/2	46862-C6	29.60
.062 (1/16)		.0620	<b>.010</b>	.186 (3x)	4	1/8	1-1/2	856462-C6	33.60
.062 (1/16)		.0620	<b>.010</b>	.312 (5x)	3	1/8	2-1/2	53662-C6	37.90
.062 (1/16)		.0620	<b>.015</b>	.093 (1.5x)	3	1/8	1-1/2	975662-C6	29.60
.062 (1/16)		.0620	<b>.015</b>	.186 (3x)	3	1/8	1-1/2	964162-C6	29.60
.062 (1/16)		.0620	<b>.015</b>	.312 (5x)	3	1/8	2-1/2	860262-C6	37.90

EXOTIC ALLOYS

continued on next page



# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Corner Radius (cont.)

**mm & in** continued from previous page

EXOTIC ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO 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					
.062 (1/16)		.0620	.020	.093 (1.5x)	3	1/8	1-1/2	931762-C6	32.50
.062 (1/16)		.0620	.020	.186 (3x)	3	1/8	1-1/2	959262-C6	35.70
.062 (1/16)		.0620	.020	.312 (5x)	3	1/8	2-1/2	870662-C6	37.90
1.6 mm		.0629	.20 mm	2.40 mm (1.5x)	3	4 mm	50 mm	984136-C6	33.00
1.6 mm		.0629	.20 mm	5.00 mm (3x)	3	4 mm	50 mm	979336-C6	33.00
1.7 mm		.0669	.20 mm	5.00 mm (3x)	3	4 mm	50 mm	979338-C6	33.00
.070		.0700	.005	.210 (3x)	3	1/8	1-1/2	936470-C6	29.60
.070		.0700	.010	.105 (1.5x)	3	1/8	1-1/2	52270-C6	29.60
.070		.0700	.010	.210 (3x)	3	1/8	1-1/2	46870-C6	29.60
.070		.0700	.010	.375 (5x)	3	1/8	2-1/2	53670-C6	37.90
1.8 mm		.0708	.20 mm	2.70 mm (1.5x)	3	4 mm	50 mm	984140-C6	33.00
1.8 mm		.0708	.20 mm	5.50 mm (3x)	3	4 mm	50 mm	979340-C6	33.00
1.9 mm		.0748	.20 mm	5.50 mm (3x)	3	4 mm	50 mm	979342-C6	33.00
.078 (5/64)		.0780	.003	.234 (3x)	3	1/8	1-1/2	923678-C6	30.10
.078 (5/64)		.0780	.005	.117 (1.5x)	3	1/8	1-1/2	908878-C6	29.60
.078 (5/64)		.0780	.005	.234 (3x)	3	1/8	1-1/2	936478-C6	29.60
.078 (5/64)		.0780	.005	.406 (5x)	3	1/8	2-1/2	869078-C6	37.70
.078 (5/64)		.0780	.010	.062 (0.8x)	3	1/8	1-1/2	954278-C6	29.60
.078 (5/64)		.0780	.010	.117 (1.5x)	3	1/8	1-1/2	52278-C6	29.60
.078 (5/64)		.0780	.010	.234 (3x)	3	1/8	1-1/2	46878-C6	29.60
.078 (5/64)		.0780	.010	.234 (3x)	4	1/8	1-1/2	856478-C6	33.60
.078 (5/64)		.0780	.010	.406 (5x)	3	1/8	2-1/2	53678-C6	37.70
.078 (5/64)		.0780	.015	.117 (1.5x)	3	1/8	1-1/2	975678-C6	32.80
.078 (5/64)		.0780	.015	.234 (3x)	3	1/8	1-1/2	964178-C6	32.80
.078 (5/64)		.0780	.020	.117 (1.5x)	3	1/8	1-1/2	931778-C6	35.70
.078 (5/64)		.0780	.020	.234 (3x)	3	1/8	1-1/2	959278-C6	35.70
.078 (5/64)		.0780	.020	.406 (5x)	3	1/8	2-1/2	870678-C6	44.20
.078 (5/64)		.0780	.025	.234 (3x)	3	1/8	1-1/2	848878-C6	35.70
2.0 mm		.0787	.20 mm	3.00 mm (1.5x)	3	4 mm	50 mm	984145-C6	33.00
2.0 mm		.0787	.20 mm	6.00 mm (3x)	3	4 mm	50 mm	979345-C6	33.00
2.0 mm		.0787	.20 mm	10.00 mm (5x)	3	4 mm	50 mm	965845-C6	40.30
2.0 mm		.0787	.50 mm	6.00 mm (3x)	3	4 mm	50 mm	842545-C6	33.00
.080		.0800	.010	.120 (1.5x)	3	1/8	1-1/2	52280-C6	29.60
.080		.0800	.010	.240 (3x)	3	1/8	1-1/2	46880-C6	29.60
.090		.0900	.010	.135 (1.5x)	3	1/8	1-1/2	52290-C6	29.60
.090		.0900	.010	.270 (3x)	3	1/8	1-1/2	46890-C6	29.60
.093 (3/32)		.0930	.003	.279 (3x)	3	1/8	1-1/2	923693-C6	29.10
.093 (3/32)		.0930	.005	.140 (1.5x)	3	1/8	1-1/2	908893-C6	29.60
.093 (3/32)		.0930	.005	.279 (3x)	3	1/8	1-1/2	936493-C6	29.60
.093 (3/32)		.0930	.005	.500 (5x)	3	1/8	2-1/2	869093-C6	37.60
.093 (3/32)		.0930	.008	.140 (1.5x)	3	1/8	1-1/2	847893-C6	29.60
.093 (3/32)		.0930	.008	.279 (3x)	3	1/8	1-1/2	848493-C6	29.60
.093 (3/32)		.0930	.010	.074 (0.8x)	3	1/8	1-1/2	954293-C6	29.60
.093 (3/32)		.0930	.010	.140 (1.5x)	3	1/8	1-1/2	52293-C6	29.60
.093 (3/32)		.0930	.010	.279 (3x)	3	1/8	1-1/2	46893-C6	29.60
.093 (3/32)		.0930	.010	.279 (3x)	4	1/8	1-1/2	856493-C6	33.60
.093 (3/32)		.0930	.010	.500 (5x)	3	1/8	2-1/2	53693-C6	37.70

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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Corner Radius (cont.)



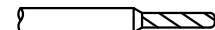
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CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005" / - .0005"	+ .00mm / - .02mm	decimal equivalent	+ .001" / - .001" / + .025mm / - .025mm	+ .010" / - .000" / + .25mm / - .00mm					
.093 (3/32)		.0930	<b>.015</b>	.140 (1.5x)	3	1/8	1-1/2	975693-C6	29.60
.093 (3/32)		.0930	<b>.015</b>	.279 (3x)	3	1/8	1-1/2	964193-C6	29.60
.093 (3/32)		.0930	<b>.020</b>	.140 (1.5x)	3	1/8	1-1/2	931793-C6	29.60
.093 (3/32)		.0930	<b>.020</b>	.279 (3x)	3	1/8	1-1/2	959293-C6	29.60
.093 (3/32)		.0930	<b>.025</b>	.279 (3x)	3	1/8	1-1/2	848893-C6	35.80
.093 (3/32)		.0930	<b>.030</b>	.140 (1.5x)	3	1/8	1-1/2	929393-C6	35.80
.093 (3/32)		.0930	<b>.030</b>	.279 (3x)	3	1/8	1-1/2	943893-C6	35.80
.093 (3/32)		.0930	<b>.030</b>	.500 (5x)	3	1/8	2-1/2	871493-C6	43.70
2.5 mm		.0984	<b>.20 mm</b>	3.70 mm (1.5x)	3	4 mm	50 mm	984151-C6	30.50
2.5 mm		.0984	<b>.20 mm</b>	7.50 mm (3x)	3	4 mm	50 mm	979351-C6	33.00
2.5 mm		.0984	<b>.20 mm</b>	12.00 mm (5x)	3	4 mm	50 mm	965851-C6	40.30
.100		.1000	<b>.005</b>	.150 (1.5x)	3	1/8	1-1/2	908800-C6	29.60
.100		.1000	<b>.005</b>	.300 (3x)	3	1/8	1-1/2	936500-C6	29.60
.100		.1000	<b>.010</b>	.150 (1.5x)	3	1/8	1-1/2	52300-C6	29.60
.100		.1000	<b>.010</b>	.300 (3x)	3	1/8	1-1/2	46900-C6	29.60
.100		.1000	<b>.010</b>	.500 (5x)	3	1/8	2-1/2	53700-C6	37.90
.100		.1000	<b>.015</b>	.150 (1.5x)	3	1/8	1-1/2	907700-C6	32.80
.100		.1000	<b>.015</b>	.300 (3x)	3	1/8	1-1/2	964200-C6	32.80
.100		.1000	<b>.020</b>	.150 (1.5x)	3	1/8	1-1/2	931800-C6	35.70
.100		.1000	<b>.020</b>	.300 (3x)	3	1/8	1-1/2	959300-C6	35.70
.100		.1000	<b>.030</b>	.150 (1.5x)	3	1/8	1-1/2	929400-C6	35.80
.100		.1000	<b>.030</b>	.300 (3x)	3	1/8	1-1/2	943900-C6	35.80
.109 (7/64)		.1090	<b>.005</b>	.327 (3x)	3	1/8	1-1/2	936502-C6	29.60
.109 (7/64)		.1090	<b>.010</b>	.327 (3x)	3	1/8	1-1/2	46902-C6	29.60
.109 (7/64)		.1090	<b>.015</b>	.327 (3x)	3	1/8	1-1/2	964202-C6	32.80
.118		.1180	<b>.010</b>	.177 (1.5x)	3	1/8	1-1/2	52305-C6	29.60
.118		.1180	<b>.010</b>	.354 (3x)	3	1/8	1-1/2	46905-C6	29.60
3.0 mm		.1181	<b>.20 mm</b>	4.50 mm (1.5x)	3	4 mm	50 mm	984157-C6	33.00
3.0 mm		.1181	<b>.20 mm</b>	9.00 mm (3x)	3	4 mm	50 mm	979357-C6	33.00
3.0 mm		.1181	<b>.20 mm</b>	15.00 mm (5x)	3	4 mm	50 mm	965857-C6	40.30
3.0 mm		.1181	<b>1.00 mm</b>	9.00 mm (3x)	3	4 mm	50 mm	842157-C6	38.70

EXOTIC ALLOYS

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					
.125 (1/8)		.1250	<b>.003</b>	.375 (3x)	4	1/8	1-1/2	923708-C6	29.40
.125 (1/8)		.1250	<b>.005</b>	.100 (0.8x)	4	1/8	1-1/2	840608-C6	29.40
.125 (1/8)		.1250	<b>.005</b>	.187 (1.5x)	4	1/8	1-1/2	908908-C6	29.40
.125 (1/8)		.1250	<b>.005</b>	.375 (3x)	4	1/8	1-1/2	936508-C6	29.40
.125 (1/8)		.1250	<b>.005</b>	.625 (5x)	4	1/8	2-1/2	869108-C6	37.90
.125 (1/8)		.1250	<b>.008</b>	.187 (1.5x)	4	1/8	1-1/2	847908-C6	29.40
.125 (1/8)		.1250	<b>.008</b>	.375 (3x)	4	1/8	1-1/2	848508-C6	29.40
.125 (1/8)		.1250	<b>.010</b>	.187 (1.5x)	4	1/8	1-1/2	913008-C6	28.30
.125 (1/8)		.1250	<b>.010</b>	.375 (3x)	4	1/8	1-1/2	950808-C6	28.30
.125 (1/8)		.1250	<b>.010</b>	.625 (5x)	4	1/8	2-1/2	869908-C6	37.90
.125 (1/8)		.1250	<b>.015</b>	.100 (0.8x)	4	1/8	1-1/2	954308-C6	29.60
.125 (1/8)		.1250	<b>.015</b>	.187 (1.5x)	4	1/8	1-1/2	52308-C6	28.30
.125 (1/8)		.1250	<b>.015</b>	.375 (3x)	4	1/8	1-1/2	46908-C6	28.30
.125 (1/8)		.1250	<b>.015</b>	.625 (5x)	4	1/8	2-1/2	53708-C6	37.90

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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Corner Radius (cont.)

**mm & in** continued from previous page

EXOTIC 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					
.125 (1/8)		.1250	.020	.187 (1.5x)	4	1/8	1-1/2	931808-C6	34.20
.125 (1/8)		.1250	.020	.375 (3x)	4	1/8	1-1/2	959308-C6	34.20
.125 (1/8)		.1250	.020	.625 (5x)	4	1/8	2-1/2	870708-C6	43.00
.125 (1/8)		.1250	.025	.375 (3x)	4	1/8	1-1/2	848908-C6	34.30
.125 (1/8)		.1250	.030	.187 (1.5x)	4	1/8	1-1/2	929408-C6	34.30
.125 (1/8)		.1250	.030	.375 (3x)	4	1/8	1-1/2	943908-C6	34.30
.125 (1/8)		.1250	.030	.625 (5x)	4	1/8	2-1/2	871508-C6	44.00
.125 (1/8)		.1250	.040	.375 (3x)	4	1/8	1-1/2	844008-C6	35.70
.140 (9/64)		.1406	.015	.220 (1.5x)	4	3/16	2	52309-C6	35.00
.140 (9/64)		.1406	.015	.425 (3x)	4	3/16	2	46909-C6	35.20
.140 (9/64)		.1406	.015	.750 (5x)	4	3/16	3	53709-C6	43.90
.156 (5/32)		.1562	.005	.235 (1.5x)	4	3/16	2	908956-C6	31.80
.156 (5/32)		.1562	.005	.470 (3x)	4	3/16	2	936510-C6	31.80
.156 (5/32)		.1562	.010	.235 (1.5x)	4	3/16	2	913010-C6	30.60
.156 (5/32)		.1562	.010	.470 (3x)	4	3/16	2	950810-C6	30.60
.156 (5/32)		.1562	.015	.125 (0.8x)	4	3/16	2	954310-C6	32.00
.156 (5/32)		.1562	.015	.235 (1.5x)	4	3/16	2	52310-C6	31.80
.156 (5/32)		.1562	.015	.470 (3x)	4	3/16	2	46910-C6	31.80
.156 (5/32)		.1562	.015	.750 (5x)	4	3/16	3	53710-C6	41.10
.156 (5/32)		.1562	.025	.470 (3x)	4	3/16	2	848910-C6	31.80
.156 (5/32)		.1562	.030	.235 (1.5x)	4	3/16	2	929410-C6	30.60
.156 (5/32)		.1562	.030	.470 (3x)	4	3/16	2	943910-C6	30.60
.156 (5/32)		.1562	.030	.750 (5x)	4	3/16	3	871510-C6	40.20
4.0 mm		.1574	.40 mm	6.00 mm (1.5x)	4	6 mm	63 mm	984161-C6	35.40
4.0 mm		.1574	.40 mm	12.00 mm (3x)	4	6 mm	63 mm	979361-C6	35.40
.187 (3/16)		.1875	.005	.285 (1.5x)	4	3/16	2	908910-C6	31.80
.187 (3/16)		.1875	.005	.562 (3x)	4	3/16	2	936512-C6	31.80
.187 (3/16)		.1875	.005	1.000 (5x)	4	3/16	3	869112-C6	40.70
.187 (3/16)		.1875	.008	.562 (3x)	4	3/16	2	848512-C6	31.80
.187 (3/16)		.1875	.010	.285 (1.5x)	4	3/16	2	913012-C6	30.60
.187 (3/16)		.1875	.010	.562 (3x)	4	3/16	2	950812-C6	30.60
.187 (3/16)		.1875	.010	1.000 (5x)	4	3/16	3	869912-C6	41.10
.187 (3/16)		.1875	.015	.150 (0.8x)	4	3/16	2	954312-C6	32.00
.187 (3/16)		.1875	.015	.285 (1.5x)	4	3/16	2	52312-C6	30.60
.187 (3/16)		.1875	.015	.562 (3x)	4	3/16	2	46912-C6	30.60
.187 (3/16)		.1875	.015	1.000 (5x)	4	3/16	3	53712-C6	41.10
.187 (3/16)		.1875	.020	.285 (1.5x)	4	3/16	2	931812-C6	36.20
.187 (3/16)		.1875	.020	.562 (3x)	4	3/16	2	959312-C6	36.20
.187 (3/16)		.1875	.020	1.000 (5x)	4	3/16	3	870712-C6	39.30
.187 (3/16)		.1875	.025	.562 (3x)	4	3/16	2	848912-C6	40.70
.187 (3/16)		.1875	.030	.285 (1.5x)	4	3/16	2	929412-C6	36.50
.187 (3/16)		.1875	.030	.562 (3x)	4	3/16	2	943912-C6	37.70
.187 (3/16)		.1875	.030	1.000 (5x)	4	3/16	3	871512-C6	40.70
.187 (3/16)		.1875	.045	.285 (1.5x)	4	3/16	2	857612-C6	37.90
.187 (3/16)		.1875	.045	.562 (3x)	4	3/16	2	864512-C6	37.90
.187 (3/16)		.1875	.060	.285 (1.5x)	4	3/16	2	845412-C6	36.20
.187 (3/16)		.1875	.060	.562 (3x)	4	3/16	2	885612-C6	36.20

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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Corner Radius (cont.)

**mm & in** continued from previous page

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	A1TiN 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 equivalent	+ .001" - .001"	+ .030" - .000"					
- .002"	- .04mm		+ .025mm - .025mm	+ .75mm - .00mm					
	5.0 mm	.1968	<b>.40 mm</b>	7.50 mm (1.5x)	4	6 mm	63 mm	984164-C6	35.40
	5.0 mm	.1968	<b>.40 mm</b>	15.00 mm (3x)	4	6 mm	63 mm	979364-C6	35.40
	6.0 mm	.2362	<b>.40 mm</b>	9.00 mm (1.5x)	4	6 mm	63 mm	984166-C6	35.40
	6.0 mm	.2362	<b>.40 mm</b>	18.00 mm (3x)	4	6 mm	63 mm	979366-C6	35.40
	.250 (1/4)	.2500	<b>.005</b>	.375 (1.5x)	4	1/4	2-1/2	908916-C6	39.80
	.250 (1/4)	.2500	<b>.005</b>	.750 (3x)	4	1/4	2-1/2	936516-C6	39.80
	.250 (1/4)	.2500	<b>.008</b>	.750 (3x)	4	1/4	2-1/2	848516-C6	39.80
	.250 (1/4)	.2500	<b>.010</b>	.375 (1.5x)	4	1/4	2-1/2	913016-C6	38.30
	.250 (1/4)	.2500	<b>.010</b>	.750 (3x)	4	1/4	2-1/2	950816-C6	38.30
	.250 (1/4)	.2500	<b>.015</b>	.200 (0.8x)	4	1/4	2-1/2	954316-C6	40.30
	.250 (1/4)	.2500	<b>.015</b>	.375 (1.5x)	4	1/4	2-1/2	52316-C6	38.60
	.250 (1/4)	.2500	<b>.015</b>	.750 (3x)	4	1/4	2-1/2	46916-C6	38.60
	.250 (1/4)	.2500	<b>.015</b>	1.250 (5x)	4	1/4	4	53716-C6	50.80
NEW	.250 (1/4)	.2500	<b>.020</b>	.200 (0.8x)	4	1/4	2-1/2	816416-C6	45.30
	.250 (1/4)	.2500	<b>.020</b>	.375 (1.5x)	4	1/4	2-1/2	931816-C6	43.90
	.250 (1/4)	.2500	<b>.020</b>	.750 (3x)	4	1/4	2-1/2	959316-C6	43.90
	.250 (1/4)	.2500	<b>.025</b>	.750 (3x)	4	1/4	2-1/2	848916-C6	43.90
	.250 (1/4)	.2500	<b>.030</b>	.375 (1.5x)	4	1/4	2-1/2	929416-C6	43.90
NEW	.250 (1/4)	.2500	<b>.030</b>	.750 (3x)	4	1/4	2-1/2	943916-C6	43.90
	.250 (1/4)	.2500	<b>.030</b>	1.250 (5x)	4	1/4	4	871516-C6	47.90
	.250 (1/4)	.2500	<b>.045</b>	.750 (3x)	4	1/4	2-1/2	864516-C6	45.90
	.250 (1/4)	.2500	<b>.060</b>	.750 (3x)	4	1/4	2-1/2	885616-C6	43.90
	.312 (5/16)	.3125	<b>.015</b>	.470 (1.5x)	4	5/16	2-1/2	52320-C6	55.70
	.312 (5/16)	.3125	<b>.015</b>	1.000 (3x)	4	5/16	2-1/2	46920-C6	55.70
	.375 (3/8)	.3750	<b>.015</b>	.570 (1.5x)	4	3/8	2-1/2	52324-C6	64.20
	.375 (3/8)	.3750	<b>.015</b>	1.125 (3x)	4	3/8	2-1/2	46924-C6	64.20
	.375 (3/8)	.3750	<b>.030</b>	.570 (1.5x)	4	3/8	2-1/2	929424-C6	69.50
	.375 (3/8)	.3750	<b>.030</b>	1.125 (3x)	4	3/8	2-1/2	943924-C6	69.50
NEW	.500 (1/2)	.5000	<b>.015</b>	.750 (1.5x)	4	1/2	3	816232-C6	82.90
	.500 (1/2)	.5000	<b>.030</b>	.750 (1.5x)	4	1/2	3	52332-C6	82.90

EXOTIC ALLOYS

## SPEEDS & FEEDS (Variable Helix for Exotic Alloys)

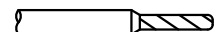
**Important Note:** Values in table are in inches and are based on 4 flute, standard (3x Dia) length of cut end mills. For 3 flutes, table values of IPT must be increased to 105% before adjustments for different lengths of cut. For shorter lengths of cut, table values of IPT must be increased (for 0.8x, 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.harveyttool.com](http://www.harveyttool.com).

Material	Hardness (HBN)	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter																	
			.015	.031	.047	.062	.078	.093	.125	.187	.250									
Stainless Steels: 40x, 41x, 42x, 43x, 44x, 13-8, 15-5, 15-7, 17-4, 17-7	275 - 300	160																		
	300 - 350	140																		
	350 - 400	100																		
Tool Steels: D, H, M, T, S series	400 - 425	80																		
	275 - 300	200																		
	300 - 350	125																		
	350 - 400	75																		
Titanium: All alloys	400 - 425	75																		
	275 - 300	80																		
	300 - 350	60																		
	350 - 400	50																		
Nickel Alloys: Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discoloy, Incoloy	400 - 425	40																		
	275 - 300	80																		
	300 - 350	60																		
	350 - 400	50																		
	400 - 425	40																		

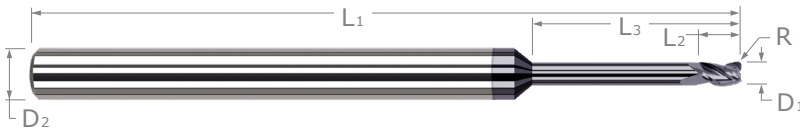
Radial Depth of Cut*:		Axial Depth of Cut*:	
Slotting: 1x Dia	Roughing: .4x Dia	Slotting: 4x Dia	Roughing: .5x - .7x Dia
Finishing: .1x Dia		Finishing: .1x Dia	Finishing: .5x - 1x Dia

\* 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.

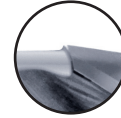


# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

## Corner Radius – Long Reach, Stub Flute



- 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 AITiN 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



Reduced Neck Diameter to Avoid Heeling

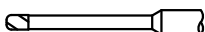
EXOTIC ALLOYS

mm & in

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
+ .0005"	+ .00mm	decimal	+ .010"	+ .010"	+ .010"					
- .0005"	- .02mm	equivalent	- .001"	- .025mm	- .000"					
			+ .025mm	+ .25mm	- .000"					
			- .025mm	- .00mm	- .000"					
.015 (1/64)	.0150	.0150	.003	.022	.045 (3x)	3	1/8	1-1/2	947615-C6	56.10
.015 (1/64)	.0150	.0150	.003	.022	.078 (5x)	3	1/8	2-1/2	64415-C6	56.10
.015 (1/64)	.0150	.0150	.003	.022	.125 (8x)	3	1/8	2-1/2	54815-C6	57.30
.015 (1/64)	.0150	.0150	.003	.022	.187 (12x)	3	1/8	2-1/2	63015-C6	62.70
.015 (1/64)	.0150	.0150	.003	.022	.225 (15x)	3	1/8	2-1/2	968915-C6	67.70
.4 mm	.0157	.0157	.08 mm	.60 mm	2.0 mm (5x)	3	4 mm	50 mm	980709-C6	62.10
.4 mm	.0157	.0157	.08 mm	.60 mm	3.2 mm (8x)	3	4 mm	50 mm	975009-C6	63.40
.4 mm	.0157	.0157	.08 mm	.60 mm	4.8 mm (12x)	3	4 mm	50 mm	987309-C6	67.70
.5 mm	.0196	.0196	.10 mm	.75 mm	2.5 mm (5x)	3	4 mm	50 mm	980711-C6	59.60
.5 mm	.0196	.0196	.10 mm	.75 mm	4.0 mm (8x)	3	4 mm	50 mm	975011-C6	60.90
.5 mm	.0196	.0196	.10 mm	.75 mm	6.0 mm (12x)	3	4 mm	50 mm	987311-C6	65.80
.5 mm	.0196	.0196	.10 mm	.75 mm	8.0 mm (16x)	3	4 mm	50 mm	971511-C6	68.70
.020	.0200	.0200	.004	.030	.060 (3x)	3	1/8	1-1/2	947620-C6	53.40
.020	.0200	.0200	.004	.030	.100 (5x)	3	1/8	2-1/2	64420-C6	53.60
.020	.0200	.0200	.004	.030	.160 (8x)	3	1/8	2-1/2	54820-C6	54.80
.020	.0200	.0200	.004	.030	.250 (12x)	3	1/8	2-1/2	63020-C6	60.40
.6 mm	.0236	.0236	.10 mm	.90 mm	3.0 mm (5x)	3	4 mm	50 mm	980713-C6	58.50
.6 mm	.0236	.0236	.10 mm	.90 mm	4.8 mm (8x)	3	4 mm	50 mm	975013-C6	59.60
.6 mm	.0236	.0236	.10 mm	.90 mm	7.2 mm (12x)	3	4 mm	50 mm	987313-C6	63.60
.025	.0250	.0250	.004	.038	.075 (3x)	3	1/8	1-1/2	947625-C6	51.80
.025	.0250	.0250	.004	.038	.125 (5x)	3	1/8	2-1/2	64425-C6	52.40
.025	.0250	.0250	.004	.038	.203 (8x)	3	1/8	2-1/2	54825-C6	53.40
.025	.0250	.0250	.004	.038	.312 (12x)	3	1/8	2-1/2	63025-C6	59.00
.031 (1/32)	.0310	.0310	.005	.047	.093 (3x)	3	1/8	1-1/2	947631-C6	49.40
.031 (1/32)	.0310	.0310	.005	.047	.156 (5x)	3	1/8	2-1/2	64431-C6	49.70
.031 (1/32)	.0310	.0310	.005	.047	.156 (5x)	4	1/8	2-1/2	812131-C6	51.60
.031 (1/32)	.0310	.0310	.005	.047	.250 (8x)	3	1/8	2-1/2	54831-C6	50.80
.031 (1/32)	.0310	.0310	.005	.047	.312 (10x)	3	1/8	2-1/2	932531-C6	52.00
.031 (1/32)	.0310	.0310	.005	.047	.375 (12x)	3	1/8	2-1/2	63031-C6	53.00
.031 (1/32)	.0310	.0310	.005	.047	.470 (15x)	3	1/8	2-1/2	968931-C6	57.50
.031 (1/32)	.0310	.0310	.010	.047	.156 (5x)	3	1/8	2-1/2	917331-C6	49.10
.031 (1/32)	.0310	.0310	.010	.047	.250 (8x)	3	1/8	2-1/2	908631-C6	50.80
.8 mm	.0314	.0314	.10 mm	1.20 mm	4.0 mm (5x)	3	4 mm	50 mm	980718-C6	53.80
.8 mm	.0314	.0314	.10 mm	1.20 mm	6.5 mm (8x)	3	4 mm	50 mm	975018-C6	55.20
.8 mm	.0314	.0314	.10 mm	1.20 mm	9.5 mm (12x)	3	4 mm	50 mm	987318-C6	56.70

NEW

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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

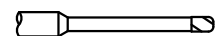
Corner Radius – Long Reach, Stub Flute (cont.)

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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	decimal equivalent	R	L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
			+.001" -.001" +.025mm -.025mm	+.010" -.000" +.25mm -.00mm	+.010" -.000" +.25mm -.00mm					
.035		.0350	<b>.005</b>	.053	.105 (3x)	3	1/8	1-1/2	947635-C6	49.40
.035		.0350	<b>.005</b>	.053	.187 (5x)	3	1/8	2-1/2	64435-C6	49.70
.035		.0350	<b>.005</b>	.053	.281 (8x)	3	1/8	2-1/2	54835-C6	50.80
.035		.0350	<b>.005</b>	.053	.350 (10x)	3	1/8	2-1/2	932535-C6	53.00
	1.0 mm	.0393	<b>.10 mm</b>	1.50 mm	5.0 mm (5x)	3	4 mm	50 mm	980722-C6	53.80
	1.0 mm	.0393	<b>.10 mm</b>	1.50 mm	8.0 mm (8x)	3	4 mm	50 mm	975022-C6	55.20
	1.0 mm	.0393	<b>.10 mm</b>	1.50 mm	12.0 mm (12x)	3	4 mm	50 mm	987322-C6	56.70
	1.0 mm	.0393	<b>.10 mm</b>	1.50 mm	16.0 mm (16x)	3	4 mm	50 mm	971522-C6	59.90
.040		.0400	<b>.005</b>	.060	.120 (3x)	3	1/8	2-1/2	947640-C6	49.40
.040		.0400	<b>.005</b>	.060	.203 (5x)	3	1/8	2-1/2	64440-C6	49.70
.040		.0400	<b>.005</b>	.060	.325 (8x)	3	1/8	2-1/2	54840-C6	50.80
.045		.0450	<b>.005</b>	.068	.135 (3x)	3	1/8	1-1/2	947645-C6	49.40
.045		.0450	<b>.005</b>	.068	.225 (5x)	3	1/8	2-1/2	64445-C6	49.70
.045		.0450	<b>.005</b>	.068	.375 (8x)	3	1/8	2-1/2	54845-C6	50.80
.047 (3/64)		.0470	<b>.005</b>	.070	.141 (3x)	3	1/8	1-1/2	947647-C6	49.40
.047 (3/64)		.0470	<b>.005</b>	.070	.250 (5x)	3	1/8	2-1/2	64447-C6	49.70
.047 (3/64)		.0470	<b>.005</b>	.070	.375 (8x)	3	1/8	2-1/2	54847-C6	50.80
.047 (3/64)		.0470	<b>.005</b>	.070	.570 (12x)	3	1/8	2-1/2	63047-C6	53.00
.047 (3/64)		.0470	<b>.005</b>	.070	.710 (15x)	3	1/8	2-1/2	968947-C6	57.50
.047 (3/64)		.0470	<b>.010</b>	.070	.250 (5x)	3	1/8	2-1/2	917347-C6	49.70
.047 (3/64)		.0470	<b>.010</b>	.070	.375 (8x)	3	1/8	2-1/2	908647-C6	50.80
.050		.0500	<b>.005</b>	.075	.150 (3x)	3	1/8	1-1/2	947650-C6	49.40
.050		.0500	<b>.005</b>	.075	.250 (5x)	3	1/8	2-1/2	64450-C6	49.70
.050		.0500	<b>.005</b>	.075	.400 (8x)	3	1/8	2-1/2	54850-C6	50.80
.055		.0550	<b>.005</b>	.083	.275 (5x)	3	1/8	2-1/2	64455-C6	49.70
.055		.0550	<b>.005</b>	.083	.450 (8x)	3	1/8	2-1/2	54855-C6	50.80
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm	7.5 mm (5x)	3	4 mm	50 mm	980733-C6	53.80
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm	12.0 mm (8x)	3	4 mm	50 mm	975033-C6	55.20
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm	18.0 mm (12x)	3	4 mm	50 mm	987333-C6	56.70
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm	24.0 mm (16x)	3	4 mm	63 mm	971533-C6	59.90
.060		.0600	<b>.010</b>	.090	.312 (5x)	3	1/8	2-1/2	64460-C6	49.70
.060		.0600	<b>.010</b>	.090	.500 (8x)	3	1/8	2-1/2	54860-C6	50.80
.060		.0600	<b>.010</b>	.090	.625 (10x)	3	1/8	2-1/2	932560-C6	53.00
.062 (1/16)		.0620	<b>.005</b>	.093	.312 (5x)	3	1/8	2-1/2	919862-C6	49.10
.062 (1/16)		.0620	<b>.005</b>	.093	.500 (8x)	3	1/8	2-1/2	915362-C6	50.80
.062 (1/16)		.0620	<b>.005</b>	.093	.625 (10x)	3	1/8	2-1/2	884462-C6	51.40
.062 (1/16)		.0620	<b>.010</b>	.093	.186 (3x)	3	1/8	1-1/2	947662-C6	49.10
.062 (1/16)		.0620	<b>.010</b>	.093	.312 (5x)	3	1/8	2-1/2	64462-C6	49.70
<b>NEW</b> .062 (1/16)		.0620	<b>.010</b>	.093	.312 (5x)	4	1/8	2-1/2	811862-C6	51.60
.062 (1/16)		.0620	<b>.010</b>	.093	.500 (8x)	3	1/8	2-1/2	54862-C6	50.80
.062 (1/16)		.0620	<b>.010</b>	.093	.625 (10x)	3	1/8	2-1/2	932562-C6	52.00
.062 (1/16)		.0620	<b>.010</b>	.093	.750 (12x)	3	1/8	2-1/2	63062-C6	53.00
.062 (1/16)		.0620	<b>.010</b>	.093	.950 (15x)	3	1/8	2-1/2	968962-C6	57.50
.062 (1/16)		.0620	<b>.015</b>	.093	.312 (5x)	3	1/8	2-1/2	902662-C6	49.10
.062 (1/16)		.0620	<b>.015</b>	.093	.500 (8x)	3	1/8	2-1/2	912062-C6	50.80

EXOTIC ALLOYS

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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

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



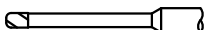
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EXOTIC ALLOYS

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
+ .0005" - .0005"	+ .00mm - .02mm	decimal equivalent	+ .001" - .001"	+ .010" - .000"	+ .010" - .000"					
			+ .025mm - .025mm	+ .25mm - .00mm	+ .25mm - .00mm					
.078 (5/64)		.0780	<b>.005</b>	.117	.406 (5x)	3	1/8	2-1/2	919878-C6	49.70
.078 (5/64)		.0780	<b>.005</b>	.117	.625 (8x)	3	1/8	2-1/2	915378-C6	50.80
.078 (5/64)		.0780	<b>.010</b>	.117	.234 (3x)	3	1/8	1-1/2	947678-C6	49.10
.078 (5/64)		.0780	<b>.010</b>	.117	.406 (5x)	3	1/8	2-1/2	64478-C6	49.70
.078 (5/64)		.0780	<b>.010</b>	.117	.406 (5x)	4	1/8	2-1/2	<b>811878-C6</b>	51.60 <b>NEW</b>
.078 (5/64)		.0780	<b>.010</b>	.117	.625 (8x)	3	1/8	2-1/2	54878-C6	50.80
.078 (5/64)		.0780	<b>.010</b>	.117	.940 (12x)	3	1/8	2-1/2	63078-C6	53.00
.078 (5/64)		.0780	<b>.010</b>	.117	1.187 (15x)	3	1/8	2-1/2	968978-C6	57.50
	2.0 mm	.0787	<b>.20 mm</b>	3.00 mm	10.0 mm (5x)	3	4 mm	50 mm	980745-C6	53.80
	2.0 mm	.0787	<b>.20 mm</b>	3.00 mm	16.0 mm (8x)	3	4 mm	50 mm	975045-C6	55.20
	2.0 mm	.0787	<b>.20 mm</b>	3.00 mm	24.0 mm (12x)	3	4 mm	63 mm	987345-C6	56.70
	2.0 mm	.0787	<b>.20 mm</b>	3.00 mm	32.0 mm (16x)	3	4 mm	63 mm	971545-C6	59.90
.093 (3/32)		.0930	<b>.005</b>	.139	.500 (5x)	3	1/8	2-1/2	919893-C6	49.10
.093 (3/32)		.0930	<b>.005</b>	.139	.750 (8x)	3	1/8	2-1/2	915393-C6	50.80
.093 (3/32)		.0930	<b>.010</b>	.139	.279 (3x)	3	1/8	1-1/2	947693-C6	49.10
.093 (3/32)		.0930	<b>.010</b>	.139	.500 (5x)	3	1/8	2-1/2	64493-C6	49.70
.093 (3/32)		.0930	<b>.010</b>	.139	.500 (5x)	4	1/8	2-1/2	<b>811893-C6</b>	51.60 <b>NEW</b>
.093 (3/32)		.0930	<b>.010</b>	.139	.750 (8x)	3	1/8	2-1/2	54893-C6	50.80
.093 (3/32)		.0930	<b>.010</b>	.139	.950 (10x)	3	1/8	2-1/2	932593-C6	52.00
.093 (3/32)		.0930	<b>.010</b>	.139	1.125 (12x)	3	1/8	2-1/2	63093-C6	53.00
.093 (3/32)		.0930	<b>.010</b>	.139	1.400 (15x)	3	1/8	3	968993-C6	57.50
.093 (3/32)		.0930	<b>.015</b>	.139	.500 (5x)	3	1/8	2-1/2	902693-C6	49.10
.093 (3/32)		.0930	<b>.015</b>	.139	.750 (8x)	3	1/8	2-1/2	912093-C6	50.80
.093 (3/32)		.0930	<b>.030</b>	.139	.500 (5x)	3	1/8	2-1/2	910193-C6	49.10
.093 (3/32)		.0930	<b>.030</b>	.139	.750 (8x)	3	1/8	2-1/2	906493-C6	50.80
.100		.1000	<b>.010</b>	.150	.500 (5x)	3	1/8	2-1/2	64500-C6	49.10
.100		.1000	<b>.010</b>	.150	.800 (8x)	3	1/8	2-1/2	54900-C6	50.40
	3.0 mm	.1181	<b>.20 mm</b>	4.50 mm	15.0 mm (5x)	3	4 mm	50 mm	980757-C6	51.10
	3.0 mm	.1181	<b>.20 mm</b>	4.50 mm	24.0 mm (8x)	3	4 mm	50 mm	975057-C6	51.20

D <sub>1</sub>			R	L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .000" - .002"	decimal equivalent		+ .001" - .001"	+ .030" - .000"	+ .030" - .000"					
.125 (1/8)		.1250	<b>.005</b>	.187	.625 (5x)	4	1/8	2-1/2	919908-C6	46.20
.125 (1/8)		.1250	<b>.005</b>	.187	1.000 (8x)	4	1/8	2-1/2	915408-C6	47.90
.125 (1/8)		.1250	<b>.010</b>	.187	.625 (5x)	4	1/8	2-1/2	917408-C6	48.70
.125 (1/8)		.1250	<b>.010</b>	.187	1.000 (8x)	4	1/8	2-1/2	908708-C6	50.40
.125 (1/8)		.1250	<b>.015</b>	.187	.375 (3x)	4	1/8	1-1/2	947708-C6	46.90
.125 (1/8)		.1250	<b>.015</b>	.187	.625 (5x)	4	1/8	2-1/2	64508-C6	49.10
.125 (1/8)		.1250	<b>.015</b>	.187	1.000 (8x)	4	1/8	2-1/2	54908-C6	50.40
.125 (1/8)		.1250	<b>.015</b>	.187	1.250 (10x)	4	1/8	2-1/2	932608-C6	52.00
.125 (1/8)		.1250	<b>.015</b>	.187	1.500 (12x)	4	1/8	3	63108-C6	53.00
.125 (1/8)		.1250	<b>.020</b>	.187	.625 (5x)	4	1/8	2-1/2	866908-C6	48.70
.125 (1/8)		.1250	<b>.020</b>	.187	1.000 (8x)	4	1/8	2-1/2	847608-C6	50.40
.125 (1/8)		.1250	<b>.030</b>	.187	.625 (5x)	4	1/8	2-1/2	910208-C6	48.70
.125 (1/8)		.1250	<b>.030</b>	.187	1.000 (8x)	4	1/8	2-1/2	906508-C6	50.40
.156 (5/32)		.1562	<b>.015</b>	.235	.750 (5x)	4	3/16	3	64510-C6	54.20
.156 (5/32)		.1562	<b>.015</b>	.235	1.250 (8x)	4	3/16	3	54910-C6	55.40
.156 (5/32)		.1562	<b>.015</b>	.235	1.875 (12x)	4	3/16	4	63110-C6	66.50

continued on next page



## VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

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 NANO COATED	
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>	TOOL #	PRICE
.187 (3/16)	.1875	<b>.005</b>	.281	1.000 (5x)	4	3/16	3	919912-C6	52.20
.187 (3/16)	.1875	<b>.005</b>	.281	1.500 (8x)	4	3/16	3	915412-C6	53.50
.187 (3/16)	.1875	<b>.015</b>	.281	1.000 (5x)	4	3/16	3	64512-C6	54.80
.187 (3/16)	.1875	<b>.015</b>	.281	1.500 (8x)	4	3/16	3	54912-C6	56.10
.187 (3/16)	.1875	<b>.015</b>	.281	2.250 (12x)	4	3/16	4	63112-C6	66.50
.187 (3/16)	.1875	<b>.030</b>	.281	1.000 (5x)	4	3/16	3	910212-C6	54.40
.187 (3/16)	.1875	<b>.030</b>	.281	1.500 (8x)	4	3/16	3	906512-C6	55.80
.250 (1/4)	.2500	<b>.015</b>	.375	1.250 (5x)	4	1/4	4	64516-C6	60.90
.250 (1/4)	.2500	<b>.015</b>	.375	2.000 (8x)	4	1/4	4	54916-C6	61.90
.250 (1/4)	.2500	<b>.015</b>	.375	3.000 (12x)	4	1/4	6	63116-C6	74.40
.250 (1/4)	.2500	<b>.030</b>	.375	1.250 (5x)	4	1/4	4	910216-C6	60.50
.250 (1/4)	.2500	<b>.030</b>	.375	2.000 (8x)	4	1/4	4	906516-C6	61.50

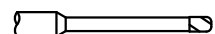
EXOTIC ALLOYS

**PLEASE SEE SPEEDS & FEEDS ON PAGE 112**



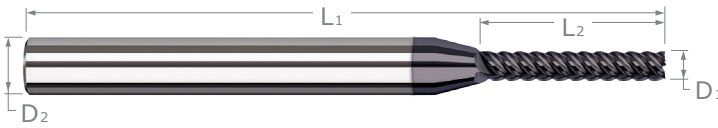
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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

## Finishers – Square



◀ **Up to 7 Flutes!**

EXOTIC 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. 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

**mm & in**

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)	4	4 mm	50 mm	967604-C6	53.80
.2 mm	.0078		<b>1.00 mm</b> (5x)	4	4 mm	50 mm	974504-C6	61.80
.2 mm	.0078		<b>1.60 mm</b> (8x)	4	4 mm	50 mm	976104-C6	63.40
.010	.0100		<b>.030</b> (3x)	4	1/8	1-1/2	57810-C6	53.60
.010	.0100		<b>.050</b> (5x)	4	1/8	2-1/2	62610-C6	61.50
.3 mm	.0118		<b>.90 mm</b> (3x)	4	4 mm	50 mm	967606-C6	49.70
.015 (1/64)	.0150		<b>.023</b> (1.5x)	4	1/8	1-1/2	946115-C6	42.70
.015 (1/64)	.0150		<b>.045</b> (3x)	4	1/8	1-1/2	57815-C6	42.70
.015 (1/64)	.0150		<b>.078</b> (5x)	4	1/8	2-1/2	62615-C6	53.00
.015 (1/64)	.0150		<b>.125</b> (8x)	4	1/8	2-1/2	59015-C6	54.40
.015 (1/64)	.0150		<b>.156</b> (10x)	4	1/8	2-1/2	941815-C6	63.00
.4 mm	.0157		<b>1.20 mm</b> (3x)	4	4 mm	50 mm	967609-C6	47.20
.4 mm	.0157		<b>2.00 mm</b> (5x)	4	4 mm	50 mm	974509-C6	55.30
.4 mm	.0157		<b>3.20 mm</b> (8x)	4	4 mm	50 mm	976109-C6	57.00
.5 mm	.0196		<b>1.50 mm</b> (3x)	4	4 mm	50 mm	967611-C6	47.20
.5 mm	.0196		<b>2.50 mm</b> (5x)	4	4 mm	50 mm	974511-C6	54.60
.5 mm	.0196		<b>4.00 mm</b> (8x)	4	4 mm	50 mm	976111-C6	56.00
.020	.0200		<b>.030</b> (1.5x)	4	1/8	1-1/2	946120-C6	41.90
.020	.0200		<b>.060</b> (3x)	4	1/8	1-1/2	57820-C6	41.90
.020	.0200		<b>.100</b> (5x)	4	1/8	2-1/2	62620-C6	52.70
.020	.0200		<b>.160</b> (8x)	4	1/8	2-1/2	59020-C6	54.20
.020	.0200		<b>.200</b> (10x)	4	1/8	2-1/2	941820-C6	62.40
.6 mm	.0236		<b>1.80 mm</b> (3x)	4	4 mm	50 mm	967613-C6	47.20
.6 mm	.0236		<b>3.00 mm</b> (5x)	4	4 mm	50 mm	974513-C6	54.60
.6 mm	.0236		<b>4.80 mm</b> (8x)	4	4 mm	50 mm	976113-C6	56.00
.025	.0250		<b>.075</b> (3x)	4	1/8	1-1/2	57825-C6	39.30
.025	.0250		<b>.125</b> (5x)	4	1/8	2-1/2	62625-C6	50.80
.025	.0250		<b>.203</b> (8x)	4	1/8	2-1/2	59025-C6	52.40
.025	.0250		<b>.250</b> (10x)	4	1/8	2-1/2	941825-C6	60.70
.7 mm	.0275		<b>2.10 mm</b> (3x)	4	4 mm	50 mm	967615-C6	47.00
.030	.0300		<b>.090</b> (3x)	6	1/8	1-1/2	57830-C6	39.30
.030	.0300		<b>.156</b> (5x)	6	1/8	2-1/2	62630-C6	50.80

continued on next page



## VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Finishers – Square (cont.)

mm &amp; in

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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
+ .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	35.20
.031 (1/32)		.0310	<b>.093</b> (3x)	6	1/8	1-1/2	57831-C6	35.20
.031 (1/32)		.0310	<b>.125</b> (4x)	6	1/8	2-1/2	890131-C6	48.60
.031 (1/32)		.0310	<b>.156</b> (5x)	6	1/8	2-1/2	62631-C6	48.60
.031 (1/32)		.0310	<b>.187</b> (6x)	6	1/8	2-1/2	868531-C6	49.20
.031 (1/32)		.0310	<b>.218</b> (7x)	6	1/8	2-1/2	881331-C6	49.20
.031 (1/32)		.0310	<b>.250</b> (8x)	6	1/8	2-1/2	59031-C6	50.00
.031 (1/32)		.0310	<b>.312</b> (10x)	6	1/8	2-1/2	941831-C6	58.20
.031 (1/31)		.0310	<b>.375</b> (12x)	6	1/8	2-1/2	69131-C6	62.40
	.8 mm	.0314	<b>2.40 mm</b> (3x)	6	4 mm	50 mm	967618-C6	42.40
	.8 mm	.0314	<b>4.00 mm</b> (5x)	6	4 mm	50 mm	974518-C6	49.70
	.8 mm	.0314	<b>6.50 mm</b> (8x)	6	4 mm	50 mm	976118-C6	51.20
.035		.0350	<b>.105</b> (3x)	6	1/8	1-1/2	57835-C6	37.90
.035		.0350	<b>.187</b> (5x)	6	1/8	2-1/2	62635-C6	39.30
	.9 mm	.0354	<b>2.70 mm</b> (3x)	6	4 mm	50 mm	967620-C6	41.30
	1.0 mm	.0393	<b>1.50 mm</b> (1.5x)	6	4 mm	50 mm	846722-C6	41.30
	1.0 mm	.0393	<b>3.00 mm</b> (3x)	6	4 mm	50 mm	967622-C6	41.30
	1.0 mm	.0393	<b>5.00 mm</b> (5x)	6	4 mm	50 mm	974522-C6	51.10
	1.0 mm	.0393	<b>8.00 mm</b> (8x)	6	4 mm	50 mm	976122-C6	53.50
	1.0 mm	.0393	<b>10.00 mm</b> (10x)	6	4 mm	50 mm	938322-C6	60.30
.040		.0400	<b>.060</b> (1.5x)	6	1/8	1-1/2	946140-C6	35.20
.040		.0400	<b>.120</b> (3x)	6	1/8	1-1/2	57840-C6	35.20
.040		.0400	<b>.203</b> (5x)	6	1/8	2-1/2	62640-C6	48.60
.040		.0400	<b>.325</b> (8x)	6	1/8	2-1/2	59040-C6	50.00
	1.1 mm	.0433	<b>3.00 mm</b> (3x)	6	4 mm	50 mm	967624-C6	40.10
.045		.0450	<b>.135</b> (3x)	6	1/8	1-1/2	57845-C6	37.90
.045		.0450	<b>.225</b> (5x)	6	1/8	2-1/2	62645-C6	39.30
.047 (3/64)		.0470	<b>.071</b> (1.5x)	6	1/8	1-1/2	946147-C6	36.00
.047 (3/64)		.0470	<b>.141</b> (3x)	6	1/8	1-1/2	57847-C6	35.20
.047 (3/64)		.0470	<b>.187</b> (4x)	6	1/8	2-1/2	890147-C6	48.60
.047 (3/64)		.0470	<b>.250</b> (5x)	6	1/8	2-1/2	62647-C6	48.60
.047 (3/64)		.0470	<b>.281</b> (6x)	6	1/8	2-1/2	868547-C6	49.20
.047 (3/64)		.0470	<b>.328</b> (7x)	6	1/8	2-1/2	881347-C6	49.20
.047 (3/64)		.0470	<b>.375</b> (8x)	6	1/8	2-1/2	59047-C6	50.00
.047 (3/64)		.0470	<b>.480</b> (10x)	6	1/8	2-1/2	941847-C6	58.20
.047 (3/64)		.0470	<b>.570</b> (12x)	6	1/8	2-1/2	69147-C6	62.40
	1.2 mm	.0472	<b>3.50 mm</b> (3x)	6	4 mm	50 mm	967627-C6	41.30
	1.2 mm	.0472	<b>6.00 mm</b> (5x)	6	4 mm	50 mm	974527-C6	51.10
	1.2 mm	.0472	<b>9.50 mm</b> (8x)	6	4 mm	50 mm	976127-C6	53.50
.050		.0500	<b>.075</b> (1.5x)	7	1/8	1-1/2	946150-C6	36.00
.050		.0500	<b>.150</b> (3x)	7	1/8	1-1/2	57850-C6	35.20
.050		.0500	<b>.250</b> (5x)	7	1/8	2-1/2	62650-C6	48.60
.050		.0500	<b>.400</b> (8x)	7	1/8	2-1/2	59050-C6	50.00
	1.3 mm	.0511	<b>4.00 mm</b> (3x)	7	4 mm	50 mm	967629-C6	41.30

continued on next page

EXOTIC ALLOYS



# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Finishers – Square (cont.)



continued from previous page

EXOTIC 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					
.055		.0550	<b>.165</b> (3x)	7	1/8	1-1/2	57855-C6	37.30
.055		.0550	<b>.275</b> (5x)	7	1/8	2-1/2	62655-C6	38.30
	1.4 mm	.0551	<b>4.00 mm</b> (3x)	7	4 mm	50 mm	967631-C6	41.30
	1.4 mm	.0551	<b>7.00 mm</b> (5x)	7	4 mm	50 mm	974531-C6	51.10
	1.4 mm	.0551	<b>11.00 mm</b> (8x)	7	4 mm	50 mm	976131-C6	53.50
	1.5 mm	.0590	<b>2.20 mm</b> (1.5x)	7	4 mm	50 mm	846733-C6	39.90
	1.5 mm	.0590	<b>4.50 mm</b> (3x)	7	4 mm	50 mm	967633-C6	39.90
	1.5 mm	.0590	<b>7.50 mm</b> (5x)	7	4 mm	50 mm	974533-C6	49.70
	1.5 mm	.0590	<b>12.00 mm</b> (8x)	7	4 mm	50 mm	976133-C6	52.00
	1.5 mm	.0590	<b>15.00 mm</b> (10x)	7	4 mm	50 mm	938333-C6	61.60
.060		.0600	<b>.090</b> (1.5x)	7	1/8	1-1/2	946160-C6	34.70
.060		.0600	<b>.180</b> (3x)	7	1/8	1-1/2	57860-C6	34.70
.060		.0600	<b>.312</b> (5x)	7	1/8	2-1/2	62660-C6	44.90
.060		.0600	<b>.500</b> (8x)	7	1/8	2-1/2	59060-C6	46.40
.062 (1/16)		.0620	<b>.093</b> (1.5x)	7	1/8	1-1/2	946162-C6	34.70
.062 (1/16)		.0620	<b>.186</b> (3x)	7	1/8	1-1/2	57862-C6	34.70
.062 (1/16)		.0620	<b>.250</b> (4x)	7	1/8	2-1/2	890162-C6	45.90
.062 (1/16)		.0620	<b>.312</b> (5x)	7	1/8	2-1/2	62662-C6	45.90
.062 (1/16)		.0620	<b>.375</b> (6x)	7	1/8	2-1/2	868562-C6	46.50
.062 (1/16)		.0620	<b>.437</b> (7x)	7	1/8	2-1/2	881362-C6	46.50
.062 (1/16)		.0620	<b>.500</b> (8x)	7	1/8	2-1/2	59062-C6	47.30
.062 (1/16)		.0620	<b>.625</b> (10x)	7	1/8	2-1/2	941862-C6	59.20
.062 (1/16)		.0620	<b>.750</b> (12x)	7	1/8	2-1/2	69162-C6	66.50
.062 (1/16)		.0620	<b>.950</b> (15x)	7	1/8	2-1/2	68762-C6	83.60
	1.6 mm	.0629	<b>5.00 mm</b> (3x)	7	4 mm	50 mm	967636-C6	39.90
	1.6 mm	.0629	<b>8.00 mm</b> (5x)	7	4 mm	50 mm	974536-C6	49.70
	1.6 mm	.0629	<b>13.00 mm</b> (8x)	7	4 mm	50 mm	976136-C6	52.00
	1.7 mm	.0669	<b>5.00 mm</b> (3x)	7	4 mm	50 mm	967638-C6	39.90
.070		.0700	<b>.210</b> (3x)	7	1/8	1-1/2	57870-C6	32.80
.070		.0700	<b>.375</b> (5x)	7	1/8	2-1/2	62670-C6	45.90
.070		.0700	<b>.570</b> (8x)	7	1/8	2-1/2	59070-C6	47.30
	1.8 mm	.0708	<b>5.50 mm</b> (3x)	7	4 mm	50 mm	967640-C6	39.90
	1.8 mm	.0708	<b>9.00 mm</b> (5x)	7	4 mm	50 mm	974540-C6	49.70
	1.8 mm	.0708	<b>14.00 mm</b> (8x)	7	4 mm	50 mm	976140-C6	52.00
	1.9 mm	.0748	<b>5.50 mm</b> (3x)	7	4 mm	50 mm	967642-C6	39.90
.078 (5/64)		.0780	<b>.117</b> (1.5x)	7	1/8	1-1/2	946178-C6	32.80
.078 (5/64)		.0780	<b>.234</b> (3x)	7	1/8	1-1/2	57878-C6	32.80
.078 (5/64)		.0780	<b>.312</b> (4x)	7	1/8	2-1/2	890178-C6	45.90
.078 (5/64)		.0780	<b>.406</b> (5x)	7	1/8	2-1/2	62678-C6	45.90
.078 (5/64)		.0780	<b>.475</b> (6x)	7	1/8	2-1/2	868578-C6	46.50
.078 (5/64)		.0780	<b>.550</b> (7x)	7	1/8	2-1/2	881378-C6	46.50
.078 (5/64)		.0780	<b>.625</b> (8x)	7	1/8	2-1/2	59078-C6	47.30
.078 (5/64)		.0780	<b>.800</b> (10x)	7	1/8	2-1/2	941878-C6	59.20

continued on next page



# VARIABLE HELIX END MILLS FOR EXOTIC 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" - .0005"	+ .00mm - .02mm	decimal equivalent	+ .010" - .000" + .25mm - .00mm					
.078 (5/64)		.0780	<b>.940</b> (12x)	7	1/8	2-1/2	69178-C6	66.50
.078 (5/64)		.0780	<b>1.187</b> (15x)	7	1/8	2-1/2	68778-C6	83.60
	2.0 mm	.0787	<b>3.00 mm</b> (1.5x)	7	4 mm	50 mm	846745-C6	39.90
	2.0 mm	.0787	<b>6.00 mm</b> (3x)	7	4 mm	50 mm	967645-C6	39.90
	2.0 mm	.0787	<b>10.00 mm</b> (5x)	7	4 mm	50 mm	974545-C6	49.40
	2.0 mm	.0787	<b>16.00 mm</b> (8x)	7	4 mm	50 mm	976145-C6	51.70
.080		.0800	<b>.120</b> (1.5x)	7	1/8	1-1/2	946180-C6	34.70
.080		.0800	<b>.240</b> (3x)	7	1/8	1-1/2	57880-C6	32.80
.080		.0800	<b>.406</b> (5x)	7	1/8	2-1/2	62680-C6	45.90
.080		.0800	<b>.650</b> (8x)	7	1/8	2-1/2	59080-C6	47.30
.090		.0900	<b>.270</b> (3x)	7	1/8	1-1/2	57890-C6	32.80
.090		.0900	<b>.450</b> (5x)	7	1/8	2-1/2	62690-C6	45.90
.090		.0900	<b>.750</b> (8x)	7	1/8	2-1/2	59090-C6	47.30
.093 (3/32)		.0930	<b>.074</b> (0.8x)	7	1/8	1-1/2	836593-C6	35.70
.093 (3/32)		.0930	<b>.140</b> (1.5x)	7	1/8	1-1/2	946193-C6	32.80
.093 (3/32)		.0930	<b>.279</b> (3x)	7	1/8	1-1/2	57893-C6	32.80
.093 (3/32)		.0930	<b>.375</b> (4x)	7	1/8	2-1/2	890193-C6	45.90
.093 (3/32)		.0930	<b>.500</b> (5x)	7	1/8	2-1/2	62693-C6	45.90
.093 (3/32)		.0930	<b>.585</b> (6x)	7	1/8	2-1/2	868593-C6	46.50
.093 (3/32)		.0930	<b>.670</b> (7x)	7	1/8	2-1/2	881393-C6	46.50
.093 (3/32)		.0930	<b>.750</b> (8x)	7	1/8	2-1/2	59093-C6	47.30
.093 (3/32)		.0930	<b>.950</b> (10x)	7	1/8	2-1/2	941893-C6	59.20
.093 (3/32)		.0930	<b>1.125</b> (12x)	7	1/8	2-1/2	69193-C6	66.50
.093 (3/32)		.0930	<b>1.400</b> (15x)	7	1/8	3	68793-C6	84.00
	2.5 mm	.0984	<b>7.50 mm</b> (3x)	7	4 mm	50 mm	967651-C6	39.90
.100		.1000	<b>.150</b> (1.5x)	7	1/8	1-1/2	960100-C6	33.00
.100		.1000	<b>.300</b> (3x)	7	1/8	1-1/2	57900-C6	32.80
.100		.1000	<b>.500</b> (5x)	7	1/8	2-1/2	62700-C6	45.90
.100		.1000	<b>.800</b> (8x)	7	1/8	2-1/2	59100-C6	47.30
.109 (7/64)		.1090	<b>.327</b> (3x)	7	1/8	1-1/2	57902-C6	32.80
.109 (7/64)		.1090	<b>.570</b> (5x)	7	1/8	2-1/2	62702-C6	45.90
.109 (7/64)		.1090	<b>.900</b> (8x)	7	1/8	2-1/2	59102-C6	48.70
	3.0 mm	.1181	<b>4.50 mm</b> (1.5x)	7	4 mm	50 mm	846757-C6	39.90
	3.0 mm	.1181	<b>9.00 mm</b> (3x)	7	4 mm	50 mm	967657-C6	39.90
	3.0 mm	.1181	<b>15.00 mm</b> (5x)	7	4 mm	50 mm	974557-C6	41.20
	3.0 mm	.1181	<b>24.00 mm</b> (8x)	7	4 mm	50 mm	976157-C6	44.70

EXOTIC ALLOYS

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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Finishers – Square (cont.)



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EXOTIC 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
+ .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	34.40
.125 (1/8)		.1250	<b>.187</b> (1.5x)	7	1/8	1-1/2	960108-C6	31.50
.125 (1/8)		.1250	<b>.375</b> (3x)	7	1/8	1-1/2	57908-C6	30.90
.125 (1/8)		.1250	<b>.500</b> (4x)	7	1/8	2-1/2	890208-C6	45.10
.125 (1/8)		.1250	<b>.625</b> (5x)	7	1/8	2-1/2	62708-C6	45.10
.125 (1/8)		.1250	<b>.750</b> (6x)	7	1/8	2-1/2	868608-C6	45.80
.125 (1/8)		.1250	<b>.875</b> (7x)	7	1/8	2-1/2	881408-C6	45.80
.125 (1/8)		.1250	<b>1.000</b> (8x)	7	1/8	2-1/2	59108-C6	46.50
.125 (1/8)		.1250	<b>1.250</b> (10x)	7	1/8	2-1/2	941908-C6	58.50
.125 (1/8)		.1250	<b>1.500</b> (12x)	7	1/8	3	69208-C6	66.00
.125 (1/8)		.1250	<b>1.875</b> (15x)	7	1/8	3	68808-C6	85.20
.140 (9/64)		.1406	<b>.425</b> (3x)	7	3/16	2	57909-C6	43.20
.140 (9/64)		.1406	<b>.750</b> (5x)	7	3/16	3	62709-C6	45.10
.140 (9/64)		.1406	<b>1.125</b> (8x)	7	3/16	3	59109-C6	47.60
.156 (5/32)		.1562	<b>.235</b> (1.5x)	7	3/16	2	960110-C6	35.70
.156 (5/32)		.1562	<b>.470</b> (3x)	7	3/16	2	57910-C6	35.20
.156 (5/32)		.1562	<b>.750</b> (5x)	7	3/16	3	62710-C6	47.50
.156 (5/32)		.1562	<b>1.250</b> (8x)	7	3/16	3	59110-C6	50.40
.187 (3/16)		.1875	<b>.150</b> (0.8x)	7	3/16	2	836612-C6	38.60
.187 (3/16)		.1875	<b>.285</b> (1.5x)	7	3/16	2	960112-C6	35.70
.187 (3/16)		.1875	<b>.570</b> (3x)	7	3/16	2	57912-C6	35.20
.187 (3/16)		.1875	<b>.750</b> (4x)	7	3/16	3	890212-C6	47.50
.187 (3/16)		.1875	<b>1.000</b> (5x)	7	3/16	3	62712-C6	47.50
.187 (3/16)		.1875	<b>1.156</b> (6x)	7	3/16	3	868612-C6	49.80
.187 (3/16)		.1875	<b>1.312</b> (7x)	7	3/16	3	881412-C6	49.80
.187 (3/16)		.1875	<b>1.500</b> (8x)	7	3/16	3	59112-C6	50.60
	6.0 mm	.2362	<b>18.00 mm</b> (3x)	7	6 mm	63 mm	967666-C6	44.90
	6.0 mm	.2362	<b>30.00 mm</b> (5x)	7	6 mm	63 mm	974566-C6	47.60
.250 (1/4)		.2500	<b>.200</b> (0.8x)	7	1/4	2-1/2	836616-C6	49.40
.250 (1/4)		.2500	<b>.375</b> (1.5x)	7	1/4	2-1/2	960116-C6	46.40
.250 (1/4)		.2500	<b>.750</b> (3x)	7	1/4	2-1/2	57916-C6	45.70
.250 (1/4)		.2500	<b>1.000</b> (4x)	7	1/4	4	890216-C6	58.20
.250 (1/4)		.2500	<b>1.250</b> (5x)	7	1/4	4	62716-C6	58.20
.250 (1/4)		.2500	<b>1.500</b> (6x)	7	1/4	4	868616-C6	60.90
.250 (1/4)		.2500	<b>1.750</b> (7x)	7	1/4	4	881416-C6	60.90
.250 (1/4)		.2500	<b>2.000</b> (8x)	7	1/4	4	59116-C6	61.60
.312 (5/16)		.3125	<b>.470</b> (1.5x)	7	5/16	2-1/2	960120-C6	62.70
.312 (5/16)		.3125	<b>1.000</b> (3x)	7	5/16	2-1/2	57920-C6	61.90
.375 (3/8)		.3750	<b>.570</b> (1.5x)	7	3/8	2-1/2	960124-C6	71.20
.375 (3/8)		.3750	<b>1.125</b> (3x)	7	3/8	2-1/2	57924-C6	70.60
.375 (3/8)		.3750	<b>2.000</b> (5x)	7	3/8	4	62724-C6	89.60
.500 (1/2)		.5000	<b>.750</b> (1.5x)	7	1/2	3	960132-C6	91.50
.500 (1/2)		.5000	<b>1.500</b> (3x)	7	1/2	3	57932-C6	91.50

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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Finishers – Square (cont.)

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SPEEDS & FEEDS (Finishers for Exotic 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)	.0013	.0026	.0040	.0053	.0066	.0079	.0106	.0158	.0212	< .10x Dia	.5x - 1.5x Dia
			Finishing (1.5x LOC)	.0012	.0024	.0036	.0048	.0060	.0072	.0096	.0144	.0193	< .10x Dia	.5x - 1.5x Dia
			Finishing (3x LOC)	.0011	.0022	.0033	.0043	.0055	.0065	.0088	.0131	.0175	< .10x Dia	.5x - 3x Dia
			Finishing (4x LOC)	.0010	.0021	.0031	.0042	.0052	.0062	.0084	.0125	.0167	< .10x Dia	.5x - 4x Dia
			Finishing (5x LOC)	.0008	.0016	.0025	.0033	.0041	.0049	.0066	.0098	.0131	< .07x Dia	.5x - 5x Dia
			Finishing (6x LOC)	.0007	.0015	.0022	.0030	.0037	.0044	.0060	.0089	.0119	< .07x Dia	.5x - 6x Dia
			Finishing (7x LOC)	.0006	.0013	.0020	.0026	.0032	.0039	.0052	.0078	.0104	< .05x Dia	.5x - 7x Dia
			Finishing (8x LOC)	.0006	.0012	.0018	.0024	.0030	.0036	.0048	.0072	.0096	< .05x Dia	.5x - 8x Dia
			Finishing (10x LOC)	-	.0011	.0017	.0023	.0028	.0034	.0046	.0068	.0091	< .04x Dia	.5x - 10x Dia
			Finishing (12x LOC)	-	.0011	.0016	.0022	.0027	.0033	.0044	.0065	.0088	< .04x Dia	.5x - 12x Dia
Finishing (15x LOC)	-	-	-	.0020	.0025	.0029	.0039	.0059	.0079	< .02x Dia	.5x - 15x Dia			
Tool Steels: D, H, M, T, S series	300 - 350	500	Finishing (0.8x LOC)	.0013	.0026	.0040	.0053	.0066	.0079	.0106	.0158	.0212	< .10x Dia	.5x - 1.5x Dia
			Finishing (1.5x LOC)	.0012	.0024	.0036	.0048	.0060	.0072	.0096	.0144	.0193	< .10x Dia	.5x - 1.5x Dia
			Finishing (3x LOC)	.0011	.0022	.0033	.0043	.0055	.0065	.0088	.0131	.0175	< .10x Dia	.5x - 3x Dia
			Finishing (4x LOC)	.0010	.0021	.0031	.0042	.0052	.0062	.0084	.0125	.0167	< .10x Dia	.5x - 4x Dia
			Finishing (5x LOC)	.0008	.0016	.0025	.0033	.0041	.0049	.0066	.0098	.0131	< .07x Dia	.5x - 5x Dia
			Finishing (6x LOC)	.0007	.0015	.0022	.0030	.0037	.0044	.0060	.0089	.0119	< .07x Dia	.5x - 6x Dia
			Finishing (7x LOC)	.0006	.0013	.0020	.0026	.0032	.0039	.0052	.0078	.0104	< .05x Dia	.5x - 7x Dia
			Finishing (8x LOC)	.0006	.0012	.0018	.0024	.0030	.0036	.0048	.0072	.0096	< .05x Dia	.5x - 8x Dia
			Finishing (10x LOC)	-	.0011	.0017	.0023	.0028	.0034	.0046	.0068	.0091	< .04x Dia	.5x - 10x Dia
			Finishing (12x LOC)	-	.0011	.0016	.0022	.0027	.0033	.0044	.0065	.0088	< .04x Dia	.5x - 12x Dia
	Finishing (15x LOC)	-	-	-	.0020	.0025	.0029	.0039	.0059	.0079	< .02x Dia	.5x - 15x Dia		
	350 - 400	250	Finishing (0.8x LOC)	.0010	.0021	.0032	.0042	.0053	.0063	.0085	.0127	.0169	< .10x Dia	.5x - 1.5x Dia
			Finishing (1.5x LOC)	.0009	.0019	.0029	.0038	.0048	.0057	.0077	.0115	.0154	< .10x Dia	.5x - 1.5x Dia
			Finishing (3x LOC)	.0008	.0017	.0026	.0035	.0044	.0052	.0070	.0105	.0140	< .10x Dia	.5x - 3x Dia
			Finishing (4x LOC)	.0008	.0017	.0025	.0033	.0042	.0050	.0067	.0100	.0134	< .10x Dia	.5x - 4x Dia
			Finishing (5x LOC)	.0006	.0013	.0020	.0026	.0033	.0039	.0053	.0079	.0105	< .07x Dia	.5x - 5x Dia
			Finishing (6x LOC)	.0006	.0012	.0018	.0024	.0030	.0035	.0048	.0071	.0095	< .07x Dia	.5x - 6x Dia
			Finishing (7x LOC)	.0005	.0010	.0016	.0021	.0026	.0031	.0042	.0062	.0083	< .05x Dia	.5x - 7x Dia
			Finishing (8x LOC)	.0005	.0010	.0014	.0019	.0024	.0029	.0039	.0058	.0077	< .05x Dia	.5x - 8x Dia
			Finishing (10x LOC)	-	.0009	.0014	.0018	.0023	.0027	.0036	.0054	.0073	< .04x Dia	.5x - 10x Dia
			Finishing (12x LOC)	-	.0009	.0013	.0017	.0022	.0026	.0035	.0052	.0070	< .04x Dia	.5x - 12x Dia
	Finishing (15x LOC)	-	-	-	.0016	.0020	.0023	.0032	.0047	.0063	< .02x Dia	.5x - 15x Dia		
	400 - 540	200	Finishing (0.8x LOC)	.0008	.0017	.0026	.0034	.0043	.0051	.0069	.0103	.0138	< .10x Dia	.5x - 1.5x Dia
			Finishing (1.5x LOC)	.0008	.0016	.0024	.0031	.0039	.0047	.0063	.0094	.0125	< .10x Dia	.5x - 1.5x Dia
			Finishing (3x LOC)	.0007	.0014	.0021	.0028	.0035	.0042	.0057	.0085	.0114	< .10x Dia	.5x - 3x Dia
			Finishing (4x LOC)	.0007	.0013	.0020	.0027	.0034	.0040	.0054	.0081	.0109	< .10x Dia	.5x - 5x Dia
			Finishing (5x LOC)	.0005	.0011	.0016	.0021	.0027	.0032	.0043	.0064	.0085	< .07x Dia	.5x - 5x Dia
			Finishing (6x LOC)	.0005	.0010	.0015	.0019	.0024	.0029	.0039	.0058	.0077	< .07x Dia	.5x - 6x Dia
			Finishing (7x LOC)	.0004	.0008	.0013	.0017	.0021	.0025	.0034	.0050	.0067	< .05x Dia	.5x - 7x Dia
			Finishing (8x LOC)	.0004	.0008	.0012	.0016	.0020	.0023	.0031	.0047	.0063	< .05x Dia	.5x - 8x Dia
Finishing (10x LOC)			-	.0007	.0011	.0015	.0018	.0022	.0030	.0044	.0059	< .04x Dia	.5x - 10x Dia	
Finishing (12x LOC)			-	.0007	.0011	.0014	.0018	.0021	.0028	.0043	.0057	< .04x Dia	.5x - 12x Dia	
Finishing (15x LOC)	-	-	-	.0013	.0016	.0019	.0026	.0038	.0051	< .02x Dia	.5x - 15x Dia			

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EXOTIC ALLOYS



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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Finishers – Square (cont.)

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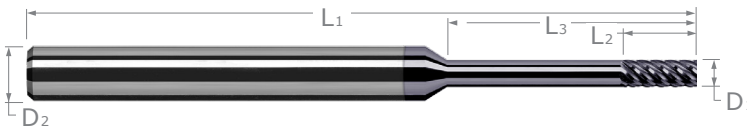
EXOTIC ALLOYS

SPEEDS & FEEDS (Finishers for Exotic 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	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 (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		
		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 (6x LOC)	.00003	.00006	.00009	.00012	.00015	.00017	.00023	.00035	.00047	< .07x Dia	.5x - 5x Dia			
	Finishing (8x LOC)	.00002	.00005	.00007	.00009	.00011	.00014	.00018	.00028	.00037	< .05x Dia	.5x - 7x Dia			
	Finishing (10x LOC)	.00002	.00004	.00006	.00008	.00011	.00013	.00017	.00026	.00034	< .05x Dia	.5x - 8x Dia			
	Finishing (12x LOC)	-	.00004	.00006	.00008	.00010	.00012	.00016	.00024	.00032	< .04x Dia	.5x - 10x Dia			
	Finishing (15x 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	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		
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	.00006	.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	.00006	.00008	.00010	< .02x Dia	.5x - 12x Dia			
Finishing (15x LOC)		-	-	-	.00002	.00003	.00003	.00005	.00007	.00009	< .01x Dia	.5x - 15x Dia			



# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Finishers – Square – Long Reach



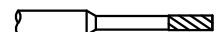
- ↻ Optimized for titanium alloys, inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- ↻ Long reach design for deep cavities and increased rigidity    ↻ Reduced neck diameter to avoid heeling
- ↻ 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

EXOTIC ALLOYS

**mm & in**

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
+ .0005" / - .0005"	+ .00mm / - .02mm	decimal equivalent	+ .010" / - .000" / + .25mm / - .00mm	+ .010" / - .000" / + .25mm / - .00mm					
.015 (1/64)		.0150	.045	<b>.078</b> (5x)	4	1/8	2-1/2	940715-C6	56.40
.015 (1/64)		.0150	.045	<b>.125</b> (8x)	4	1/8	2-1/2	962115-C6	58.30
.015 (1/64)		.0150	.045	<b>.187</b> (12x)	4	1/8	2-1/2	951815-C6	61.50
.020		.0200	.060	<b>.160</b> (8x)	4	1/8	2-1/2	962120-C6	51.00
.025		.0250	.075	<b>.203</b> (8x)	4	1/8	2-1/2	962125-C6	51.00
.031 (1/32)		.0310	.093	<b>.156</b> (5x)	6	1/8	2-1/2	940731-C6	49.70
.031 (1/32)		.0310	.093	<b>.250</b> (8x)	6	1/8	2-1/2	962131-C6	51.00
.031 (1/32)		.0310	.093	<b>.312</b> (10x)	6	1/8	2-1/2	862831-C6	52.70
.031 (1/32)		.0310	.093	<b>.375</b> (12x)	6	1/8	2-1/2	951831-C6	54.20
1.0 mm	.0393	3.00 mm	<b>8.0 mm</b> (8x)	6	4 mm	50 mm	924722-C6	51.50	
.040		.0400	.120	<b>.325</b> (8x)	6	1/8	2-1/2	962140-C6	51.00
.047 (3/64)		.0470	.141	<b>.250</b> (5x)	6	1/8	2-1/2	940747-C6	49.70
.047 (3/64)		.0470	.141	<b>.375</b> (8x)	6	1/8	2-1/2	962147-C6	51.00
.047 (3/64)		.0470	.141	<b>.570</b> (12x)	6	1/8	2-1/2	951847-C6	54.20
.050		.0500	.150	<b>.400</b> (8x)	7	1/8	2-1/2	962150-C6	51.00
1.5 mm	.0590	4.50 mm	<b>12.0 mm</b> (8x)	7	4 mm	50 mm	924733-C6	51.50	
.060		.0600	.180	<b>.500</b> (8x)	7	1/8	2-1/2	962160-C6	51.00
.062 (1/16)		.0620	.186	<b>.312</b> (5x)	7	1/8	2-1/2	940762-C6	47.50
.062 (1/16)		.0620	.186	<b>.500</b> (8x)	7	1/8	2-1/2	962162-C6	48.90
.062 (1/16)		.0620	.186	<b>.625</b> (10x)	7	1/8	2-1/2	862862-C6	50.60
.062 (1/16)		.0620	.186	<b>.750</b> (12x)	7	1/8	2-1/2	951862-C6	52.20
.070		.0700	.210	<b>.570</b> (8x)	7	1/8	2-1/2	962170-C6	48.90
.078 (5/64)		.0780	.234	<b>.406</b> (5x)	7	1/8	2-1/2	940778-C6	47.50
.078 (5/64)		.0780	.234	<b>.625</b> (8x)	7	1/8	2-1/2	962178-C6	48.90
.078 (5/64)		.0780	.234	<b>.940</b> (12x)	7	1/8	2-1/2	951878-C6	52.20
2.0 mm	.0787	6.00 mm	<b>16.0 mm</b> (8x)	7	4 mm	50 mm	924745-C6	49.40	
.080		.0800	.240	<b>.650</b> (8x)	7	1/8	2-1/2	962180-C6	48.90
.090		.0900	.270	<b>.750</b> (8x)	7	1/8	2-1/2	962190-C6	48.90
.093 (3/32)		.0930	.279	<b>.500</b> (5x)	7	1/8	2-1/2	940793-C6	47.50
.093 (3/32)		.0930	.279	<b>.750</b> (8x)	7	1/8	2-1/2	962193-C6	48.90
.093 (3/32)		.0930	.279	<b>.950</b> (10x)	7	1/8	2-1/2	862893-C6	50.60
.093 (3/32)		.0930	.279	<b>1.125</b> (12x)	7	1/8	2-1/2	951893-C6	52.20
.100		.1000	.300	<b>.800</b> (8x)	7	1/8	2-1/2	962200-C6	48.90
.109 (7/64)		0.1094	.327	<b>.570</b> (5x)	7	1/8	2-1/2	940802-C6	47.50
.109 (7/64)		0.1094	.327	<b>.900</b> (8x)	7	1/8	2-1/2	962202-C6	48.90
3.0 mm	.1181	9.00 mm	<b>24.0 mm</b> (8x)	7	4 mm	50 mm	924757-C6	49.40	

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# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

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

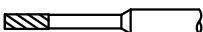
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EXOTIC ALLOYS

CUTTER DIAMETER		LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
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> (h6)	L <sub>1</sub>	TOOL #	PRICE
.125 (1/8)	.1250	.375	<b>.625</b> (5x)	7	1/8	2-1/2	940808-C6	45.90
.125 (1/8)	.1250	.375	<b>1.000</b> (8x)	7	1/8	2-1/2	962208-C6	47.20
.125 (1/8)	.1250	.375	<b>1.250</b> (10x)	7	1/8	3	862908-C6	48.70
.125 (1/8)	.1250	.375	<b>1.500</b> (12x)	7	1/8	3	951908-C6	50.20
.156 (5/32)	.1562	.470	<b>.750</b> (5x)	7	3/16	3	940810-C6	45.90
.156 (5/32)	.1562	.470	<b>1.250</b> (8x)	7	3/16	3	962210-C6	47.20
.187 (3/16)	.1875	.570	<b>1.000</b> (5x)	7	3/16	3	940812-C6	48.60
.250 (1/4)	.2500	.750	<b>1.250</b> (5x)	7	1/4	4	940816-C6	58.70
.250 (1/4)	.2500	.750	<b>2.000</b> (8x)	7	1/4	4	962216-C6	60.60

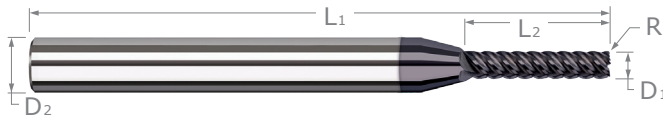
### SPEEDS & FEEDS (Finishers – Long Reach for Exotic Alloys)

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)	.00009	.00020	.00030	.00039	.00049	.00059	.00079	.00118	.00158	< .10x Dia	.5x - 3x Dia	
			Finishing (8x Reach)	.00008	.00016	.00025	.00032	.00041	.00049	.00065	.00098	.00131	< .07x Dia	.5x - 3x Dia	
	300 - 350	350	Finishing (10x Reach)	.00007	0.00015	0.00023	0.00030	0.00038	0.00046	0.00061	0.00092	0.00123	< .06x Dia	.5x - 3x Dia	
			Finishing (12x Reach)	.00007	.00015	.00022	.00029	.00037	.00044	.00059	.00088	.00118	< .05x Dia	.5x - 3x Dia	
<b>Tool Steels:</b> D, H, M, T, S series	300 - 350	500	Finishing (5x Reach)	.00009	.00020	.00030	.00039	.00049	.00059	.00079	.00118	.00158	< .10x Dia	.5x - 3x Dia	
			Finishing (8x Reach)	.00008	.00016	.00025	.00032	.00041	.00049	.00065	.00098	.00131	< .07x Dia	.5x - 3x Dia	
			Finishing (10x Reach)	.00007	0.00015	0.00023	0.00030	0.00038	0.00046	0.00061	0.00092	0.00123	< .06x Dia	.5x - 3x Dia	
			Finishing (12x Reach)	.00007	.00015	.00022	.00029	.00037	.00044	.00059	.00088	.00118	< .05x Dia	.5x - 3x Dia	
	350 - 400	250	Finishing (5x Reach)	.00008	.00016	.00024	.00031	.00039	.00047	.00063	.00094	.00126	< .10x Dia	.5x - 3x Dia	
			Finishing (8x Reach)	.00006	.00013	.00020	.00026	.00033	.00039	.00052	.00078	.00105	< .07x Dia	.5x - 3x Dia	
			Finishing (10x Reach)	.00006	0.00012	0.00018	0.00024	0.00031	0.00037	0.00049	0.00074	0.00098	< .06x Dia	.5x - 3x Dia	
			Finishing (12x Reach)	.00006	.00012	.00018	.00023	.00029	.00035	.00047	.00071	.00095	< .05x Dia	.5x - 3x Dia	
	400 - 540	200	Finishing (5x Reach)	.00006	.00013	.00019	.00025	.00032	.00038	.00051	.00077	.00102	< .10x Dia	.5x - 3x Dia	
			Finishing (8x Reach)	.00005	.00011	.00016	.00021	.00027	.00032	.00042	.00064	.00085	< .07x Dia	.5x - 3x Dia	
			Finishing (10x Reach)	.00005	0.00010	0.00015	0.00020	0.00025	0.00030	0.00040	0.00060	0.00080	< .06x Dia	.5x - 3x Dia	
			Finishing (12x Reach)	.00005	.00010	.00014	.00019	.00024	.00029	.00038	.00057	.00077	< .05x Dia	.5x - 3x Dia	
<b>Titanium:</b> All alloys	275 - 300	300	Finishing (5x Reach)	.00004	.00009	.00013	.00017	.00022	.00026	.00035	.00052	.00070	< .10x Dia	.5x - 3x Dia	
			Finishing (8x Reach)	.00003	.00007	.00011	.00014	.00018	.00022	.00029	.00043	.00058	< .07x Dia	.5x - 3x Dia	
		300 - 350	200	Finishing (10x Reach)	.00003	0.00007	0.00010	0.00013	0.00017	0.00020	0.00027	0.00041	0.00054	< .06x Dia	.5x - 3x Dia
				Finishing (12x Reach)	.00003	.00006	.00010	.00013	.00016	.00019	.00026	.00039	.00052	< .05x Dia	.5x - 3x Dia
	350 - 400	150	Finishing (5x Reach)	.00003	.00007	.00010	.00014	.00017	.00021	.00028	.00042	.00056	< .10x Dia	.5x - 3x Dia	
			Finishing (8x Reach)	.00003	.00006	.00009	.00011	.00014	.00017	.00023	.00035	.00046	< .07x Dia	.5x - 3x Dia	
		400 - 425	100	Finishing (10x Reach)	.00003	0.00005	0.00008	0.00011	0.00014	0.00016	0.00022	0.00033	0.00044	< .06x Dia	.5x - 3x Dia
				Finishing (12x Reach)	.00003	.00005	.00008	.00010	.00013	.00016	.00021	.00031	.00042	< .05x Dia	.5x - 3x Dia
<b>Nickel Alloys:</b> Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discoloy, Incoloy	275 - 300	150	Finishing (5x Reach)	.00002	.00004	.00005	.00007	.00009	.00011	.00015	.00022	.00029	< .10x Dia	.5x - 3x Dia	
			Finishing (8x Reach)	.00001	.00002	.00003	.00004	.00005	.00007	.00009	.00013	.00018	< .05x Dia	.5x - 3x Dia	
		300 - 350	100	Finishing (10x Reach)	.00001	0.00002	0.00003	0.00004	0.00005	0.00005	0.00007	0.00011	0.00015	< .04x Dia	.5x - 3x Dia
				Finishing (12x Reach)	.00001	.00002	.00003	.00003	.00004	.00005	.00007	.00010	.00014	< .03x Dia	.5x - 3x Dia
	350 - 400	80	Finishing (5x Reach)	.00001	.00003	.00004	.00006	.00007	.00009	.00012	.00018	.00023	< .10x Dia	.5x - 3x Dia	
			Finishing (8x Reach)	.00001	.00002	.00003	.00003	.00004	.00005	.00007	.00011	.00014	< .05x Dia	.5x - 3x Dia	
		400 - 425	60	Finishing (10x Reach)	.00001	0.00001	0.00002	0.00003	0.00004	0.00004	0.00006	0.00009	0.00012	< .04x Dia	.5x - 3x Dia
				Finishing (12x Reach)	.00001	.00001	.00002	.00003	.00003	.00004	.00005	.00008	.00011	< .03x Dia	.5x - 3x Dia



# VARIABLE HELIX END MILLS FOR EXOTIC ALLOYS

Finishers – Corner Radius



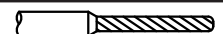
- Optimized for titanium alloys, inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Variable helix design (approx. 41°) reduces chatter and harmonics improving finish
- Latest generation AlTiN Nano 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

EXOTIC ALLOYS

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED	
D <sub>1</sub> <sup>+0.0005"</sup> / <sub>-0.0005"</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> (h6)	L <sub>1</sub>	TOOL #	PRICE
.031 (1/32)	.005	.093 (3x)	6	1/8	1-1/2	873031-C6	37.30
.031 (1/32)	.005	.156 (5x)	6	1/8	2-1/2	874631-C6	50.80
.047 (3/64)	.005	.141 (3x)	6	1/8	1-1/2	873047-C6	37.30
.047 (3/64)	.005	.250 (5x)	6	1/8	2-1/2	874647-C6	50.80
.047 (3/64)	.010	.141 (3x)	6	1/8	1-1/2	882647-C6	37.30
.047 (3/64)	.010	.250 (5x)	6	1/8	2-1/2	885447-C6	50.80
.062 (1/16)	.005	.186 (3x)	7	1/8	1-1/2	873062-C6	37.10
.062 (1/16)	.005	.312 (5x)	7	1/8	2-1/2	874662-C6	48.60
.062 (1/16)	.010	.186 (3x)	7	1/8	1-1/2	882662-C6	37.10
.062 (1/16)	.010	.312 (5x)	7	1/8	2-1/2	885462-C6	48.60
.078 (5/64)	.005	.234 (3x)	7	1/8	1-1/2	873078-C6	35.40
.078 (5/64)	.005	.406 (5x)	7	1/8	2-1/2	874678-C6	48.60
.078 (5/64)	.010	.234 (3x)	7	1/8	1-1/2	882678-C6	35.40
.078 (5/64)	.010	.406 (5x)	7	1/8	2-1/2	885478-C6	48.60
.093 (3/32)	.005	.279 (3x)	7	1/8	1-1/2	873093-C6	35.40
.093 (3/32)	.005	.500 (5x)	7	1/8	2-1/2	874693-C6	48.60
.093 (3/32)	.010	.279 (3x)	7	1/8	1-1/2	882693-C6	35.40
.093 (3/32)	.010	.500 (5x)	7	1/8	2-1/2	885493-C6	48.60

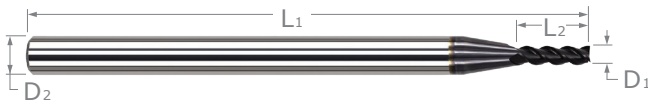
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	R <sup>+0.001"</sup> / <sub>-0.001"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.125 (1/8)	.005	.187 (1.5x)	7	1/8	1-1/2	872308-C6	32.40
.125 (1/8)	.005	.375 (3x)	7	1/8	1-1/2	873108-C6	32.10
.125 (1/8)	.010	.187 (1.5x)	7	1/8	1-1/2	880108-C6	32.40
.125 (1/8)	.010	.375 (3x)	7	1/8	1-1/2	882708-C6	32.10
<b>NEW</b> .125 (1/8)	.015	.375 (3x)	7	1/8	1-1/2	<b>813808-C6</b>	32.10
.125 (1/8)	.030	.187 (1.5x)	7	1/8	1-1/2	890508-C6	32.40
.125 (1/8)	.030	.375 (3x)	7	1/8	1-1/2	892708-C6	32.10
.187 (3/16)	.005	.285 (1.5x)	7	3/16	2	872312-C6	36.50
.187 (3/16)	.005	.570 (3x)	7	3/16	2	873112-C6	36.00
.187 (3/16)	.010	.285 (1.5x)	7	3/16	2	880112-C6	36.50
.187 (3/16)	.010	.570 (3x)	7	3/16	2	882712-C6	36.00
<b>NEW</b> .187 (3/16)	.015	.570 (3x)	7	3/16	2	<b>813812-C6</b>	36.00
.187 (3/16)	.030	.285 (1.5x)	7	3/16	2	890512-C6	36.50
.187 (3/16)	.030	.570 (3x)	7	3/16	2	892712-C6	36.00
.250 (1/4)	.005	.375 (1.5x)	7	1/4	2-1/2	872316-C6	47.00
.250 (1/4)	.005	.750 (3x)	7	1/4	2-1/2	873116-C6	46.20
.250 (1/4)	.010	.375 (1.5x)	7	1/4	2-1/2	880116-C6	47.00
.250 (1/4)	.010	.750 (3x)	7	1/4	2-1/2	882716-C6	46.20
<b>NEW</b> .250 (1/4)	.015	.750 (3x)	7	1/4	2-1/2	<b>813816-C6</b>	46.20
.250 (1/4)	.030	.375 (1.5x)	7	1/4	2-1/2	890516-C6	47.00
.250 (1/4)	.030	.750 (3x)	7	1/4	2-1/2	892716-C6	46.20

**PLEASE SEE SPEEDS & FEEDS ON PAGE 129**



# 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

**mm & in**

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN 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					
.010		.0100	<b>.015</b> (1.5x)	3	1/8	1-1/2	964910-C3	51.20
.010		.0100	<b>.030</b> (3x)	3	1/8	1-1/2	958510-C3	51.20
.015 (1/64)		.0150	<b>.023</b> (1.5x)	3	1/8	1-1/2	964915-C3	41.70
.015 (1/64)		.0150	<b>.045</b> (3x)	3	1/8	1-1/2	958515-C3	41.70
.015 (1/64)		.0150	<b>.078</b> (5x)	3	1/8	2-1/2	952615-C3	51.20
.5 mm		.0196	<b>1.50 mm</b> (3x)	3	4 mm	50 mm	945911-C3	40.10
.020		.0200	<b>.030</b> (1.5x)	3	1/8	1-1/2	964920-C3	36.60
.020		.0200	<b>.060</b> (3x)	3	1/8	1-1/2	958520-C3	36.60
.020		.0200	<b>.100</b> (5x)	3	1/8	2-1/2	952620-C3	45.10
.025		.0250	<b>.038</b> (1.5x)	3	1/8	1-1/2	964925-C3	35.20
.025		.0250	<b>.075</b> (3x)	3	1/8	1-1/2	958525-C3	35.20
.025		.0250	<b>.125</b> (5x)	3	1/8	2-1/2	952625-C3	43.70
.030		.0300	<b>.090</b> (3x)	3	1/8	1-1/2	958530-C3	35.00
.031 (1/32)		.0310	<b>.047</b> (1.5x)	3	1/8	1-1/2	964931-C3	29.70
.031 (1/32)		.0310	<b>.093</b> (3x)	3	1/8	1-1/2	958531-C3	29.70
.031 (1/32)		.0310	<b>.156</b> (5x)	3	1/8	2-1/2	952631-C3	38.20
.035		.0350	<b>.053</b> (1.5x)	3	1/8	1-1/2	964935-C3	29.70 <span style="color: red;">NEW</span>
.035		.0350	<b>.105</b> (3x)	3	1/8	1-1/2	958535-C3	29.70
1.0 mm		.0393	<b>3.00 mm</b> (3x)	3	4 mm	50 mm	945922-C3	33.30
.040		.0400	<b>.060</b> (1.5x)	3	1/8	1-1/2	964940-C3	29.90
.040		.0400	<b>.120</b> (3x)	3	1/8	1-1/2	958540-C3	29.90
.040		.0400	<b>.203</b> (5x)	3	1/8	2-1/2	952640-C3	38.40
.045		.0450	<b>.068</b> (1.5x)	3	1/8	1-1/2	964945-C3	29.90
.045		.0450	<b>.135</b> (3x)	3	1/8	1-1/2	958545-C3	29.90
.045		.0450	<b>.225</b> (5x)	3	1/8	2-1/2	952645-C3	38.40
.047 (3/64)		.0470	<b>.071</b> (1.5x)	3	1/8	1-1/2	964947-C3	29.70
.047 (3/64)		.0470	<b>.141</b> (3x)	3	1/8	1-1/2	958547-C3	29.70
.047 (3/64)		.0470	<b>.250</b> (5x)	3	1/8	2-1/2	952647-C3	38.20
.050		.0500	<b>.075</b> (1.5x)	3	1/8	1-1/2	964950-C3	29.90
.050		.0500	<b>.150</b> (3x)	3	1/8	1-1/2	958550-C3	29.90
.055		.0550	<b>.165</b> (3x)	3	1/8	1-1/2	958555-C3	29.70
1.5 mm		.0590	<b>4.50 mm</b> (3x)	3	4 mm	50 mm	945933-C3	31.50
.060		.0600	<b>.180</b> (3x)	3	1/8	1-1/2	958560-C3	30.80
.062 (1/16)		.0620	<b>.050</b> (0.8x)	3	1/8	1-1/2	835762-C3	30.70
.062 (1/16)		.0620	<b>.093</b> (1.5x)	3	1/8	1-1/2	964962-C3	27.80
.062 (1/16)		.0620	<b>.186</b> (3x)	3	1/8	1-1/2	958562-C3	27.80
.062 (1/16)		.0620	<b>.250</b> (4x)	3	1/8	2-1/2	814862-C3	32.10 <span style="color: red;">NEW</span>
.062 (1/16)		.0620	<b>.312</b> (5x)	3	1/8	2-1/2	952662-C3	36.50
.070		.0700	<b>.105</b> (1.5x)	3	1/8	1-1/2	964970-C3	27.80
.070		.0700	<b>.210</b> (3x)	3	1/8	1-1/2	958570-C3	27.80
.078 (5/64)		.0780	<b>.118</b> (1.5x)	3	1/8	1-1/2	964978-C3	27.80
.078 (5/64)		.0780	<b>.234</b> (3x)	3	1/8	1-1/2	958578-C3	27.80
.078 (5/64)		.0780	<b>.406</b> (5x)	3	1/8	2-1/2	952678-C3	36.50



# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Square (cont.)



continued from previous page

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					
2.0 mm	.0787		<b>6.00 mm (3x)</b>	3	4 mm	50 mm	945945-C3	31.50
.080	.0800		<b>.240 (3x)</b>	3	1/8	1-1/2	958580-C3	27.80
.090	.0900		<b>.270 (3x)</b>	3	1/8	1-1/2	958590-C3	27.80
.093 (3/32)	.0930		<b>.074 (0.8x)</b>	3	1/8	1-1/2	835793-C3	30.70
.093 (3/32)	.0930		<b>.140 (1.5x)</b>	3	1/8	1-1/2	964993-C3	27.80
.093 (3/32)	.0930		<b>.279 (3x)</b>	3	1/8	1-1/2	958593-C3	27.80
<b>NEW</b> .093 (3/32)	.0930		<b>.375 (4x)</b>	3	1/8	2-1/2	<b>814893-C3</b>	32.10
.093 (3/32)	.0930		<b>.500 (5x)</b>	3	1/8	2-1/2	952693-C3	36.50
.100	.1000		<b>.150 (1.5x)</b>	3	1/8	1-1/2	965000-C3	27.80
.100	.1000		<b>.300 (3x)</b>	3	1/8	1-1/2	958600-C3	27.80
.109 (7/64)	.1090		<b>.164 (1.5x)</b>	3	1/8	1-1/2	965002-C3	27.80
.109 (7/64)	.1090		<b>.327 (3x)</b>	3	1/8	1-1/2	958602-C3	27.80
3.0 mm	.1181		<b>9.00 mm (3x)</b>	3	4 mm	50 mm	945957-C3	31.50

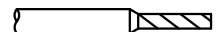
CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AISI COATED	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .000" - .002"	+ .00mm - .04mm		+ .030" - .000" + .75mm - .00mm					
.125 (1/8)	.1250		<b>.100 (0.8x)</b>	4	1/8	1-1/2	835808-C3	29.60
.125 (1/8)	.1250		<b>.187 (1.5x)</b>	4	1/8	1-1/2	965008-C3	26.70
.125 (1/8)	.1250		<b>.375 (3x)</b>	4	1/8	1-1/2	958608-C3	26.70
<b>NEW</b> .125 (1/8)	.1250		<b>.500 (4x)</b>	4	1/8	2-1/2	<b>814908-C3</b>	33.50
.125 (1/8)	.1250		<b>.625 (5x)</b>	4	1/8	2-1/2	952708-C3	36.30
.140 (9/64)	.1406		<b>.220 (1.5x)</b>	4	3/16	2	965009-C3	37.90
.140 (9/64)	.1406		<b>.425 (3x)</b>	4	3/16	2	958609-C3	37.90
.156 (5/32)	.1562		<b>.235 (1.5x)</b>	4	3/16	2	965010-C3	28.80
.156 (5/32)	.1562		<b>.470 (3x)</b>	4	3/16	2	958610-C3	28.80
.156 (5/32)	.1562		<b>.750 (5x)</b>	4	3/16	3	952710-C3	38.80
.187 (3/16)	.1875		<b>.150 (0.8x)</b>	4	3/16	2	835812-C3	31.60
.187 (3/16)	.1875		<b>.285 (1.5x)</b>	4	3/16	2	965012-C3	28.80
.187 (3/16)	.1875		<b>.562 (3x)</b>	4	3/16	2	958612-C3	28.80
.187 (3/16)	.1875		<b>1.000 (5x)</b>	4	3/16	3	952712-C3	38.80
6.0 mm	.2362		<b>18.00 mm (3x)</b>	4	6 mm	63 mm	945972-C3	31.50
.250 (1/4)	.2500		<b>.375 (1.5x)</b>	4	1/4	2-1/2	965016-C3	36.50
.250 (1/4)	.2500		<b>.750 (3x)</b>	4	1/4	2-1/2	958616-C3	36.50

## 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).

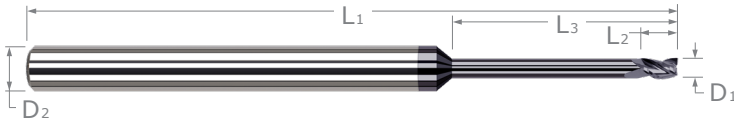
Material	Hardness (HBn)	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter									
			.015	.031	.047	.062	.078	.093	.125	.187	.250	
<b>Carbon Steels:</b> 1030 - 1095, 1140 - 1151, 13xx, 15xx, 2xxx, 3xxx, 4xxx & 4xLxx, 5xxx & 5xLxx, 50xxx & 50Lxxx, 51xxx & 51Lxxx, 52xxx, 52Lxxx, 6xxx, 8xxx, 9xxx	225 - 250	250	Slotting	.00008	.00017	.00026	.00035	.00043	.00052	.00066	.00099	.00133
			Roughing	.00010	.00021	.00032	.00042	.00052	.00062	.00080	.00120	.00160
			Finishing	.00012	.00025	.00038	.00050	.00063	.00075	.00096	.00144	.00193
			Max	.00016	.00032	.00049	.00064	.00081	.00097	.00124	.00185	.00248
<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

## Square – Long Reach, Stub Flute



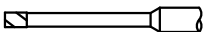
- ⚡ Optimized for readily machinable medium alloy steels, stainless steels, and tool steels
- ⚡ Long reach design for deep cavities
- ⚡ Reduced neck diameter to avoid heeling
- ⚡ Variable helix design (approx. 37°) reduces chatter and harmonics and increases material removal rates
- ⚡ AlTiN coated for 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

**mm & in**

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN 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"	+ .00mm	decimal	+ .010"	+ .010"					
- .0005"	- .02mm	equivalent	- .000"	- .000"					
			+ .25mm	+ .25mm					
			- .00mm	- .00mm					
.015 (1/64)	.0150	.0150	.023	<b>.078</b> (5x)	3	1/8	2-1/2	936115-C3	54.40
.015 (1/64)	.0150	.0150	.023	<b>.125</b> (8x)	3	1/8	2-1/2	933815-C3	55.80
.020	.0200	.0200	.030	<b>.105</b> (5x)	3	1/8	2-1/2	936120-C3	52.40
.020	.0200	.0200	.030	<b>.160</b> (8x)	3	1/8	2-1/2	933820-C3	53.60
.025	.0250	.0250	.038	<b>.125</b> (5x)	3	1/8	2-1/2	936125-C3	51.00
.025	.0250	.0250	.038	<b>.203</b> (8x)	3	1/8	2-1/2	933825-C3	52.40
.030	.0300	.0300	.045	<b>.156</b> (5x)	3	1/8	2-1/2	936130-C3	48.00
.030	.0300	.0300	.045	<b>.250</b> (8x)	3	1/8	2-1/2	933830-C3	49.10
.031 (1/32)	.0310	.0310	.047	<b>.093</b> (3x)	3	1/8	1-1/2	945331-C3	46.50
.031 (1/32)	.0310	.0310	.047	<b>.156</b> (5x)	3	1/8	2-1/2	936131-C3	48.00
.031 (1/32)	.0310	.0310	.047	<b>.250</b> (8x)	3	1/8	2-1/2	933831-C3	49.10
.031 (1/32)	.0310	.0310	.047	<b>.312</b> (10x)	3	1/8	2-1/2	931131-C3	51.50
1.0 mm	.0393	.0393	1.50 mm	<b>5.0 mm</b> (5x)	3	4 mm	50 mm	886422-C3	50.80
1.0 mm	.0393	.0393	1.50 mm	<b>8.0 mm</b> (8x)	3	4 mm	50 mm	887122-C3	52.20
.040	.0400	.0400	.060	<b>.203</b> (5x)	3	1/8	2-1/2	936140-C3	50.80
.040	.0400	.0400	.060	<b>.325</b> (8x)	3	1/8	2-1/2	933840-C3	52.20
.047 (3/64)	.0470	.0470	.071	<b>.250</b> (5x)	3	1/8	2-1/2	936147-C3	48.00
.047 (3/64)	.0470	.0470	.071	<b>.375</b> (8x)	3	1/8	2-1/2	933847-C3	49.10
.062 (1/16)	.0620	.0620	.093	<b>.186</b> (3x)	3	1/8	1-1/2	945362-C3	46.80
.062 (1/16)	.0620	.0620	.093	<b>.312</b> (5x)	3	1/8	2-1/2	936162-C3	47.80
.062 (1/16)	.0620	.0620	.093	<b>.500</b> (8x)	3	1/8	2-1/2	933862-C3	49.10
.062 (1/16)	.0620	.0620	.093	<b>.625</b> (10x)	3	1/8	2-1/2	931162-C3	51.50
.078 (5/64)	.0780	.0780	.118	<b>.406</b> (5x)	3	1/8	2-1/2	936178-C3	47.80
.078 (5/64)	.0780	.0780	.118	<b>.625</b> (8x)	3	1/8	2-1/2	933878-C3	49.10
2.0 mm	.0787	.0787	3.00 mm	<b>10.0 mm</b> (5x)	3	4 mm	50 mm	886445-C3	50.80
2.0 mm	.0787	.0787	3.00 mm	<b>16.0 mm</b> (8x)	3	4 mm	50 mm	887145-C3	52.20
.093 (3/32)	.0930	.0930	.140	<b>.279</b> (3x)	3	1/8	1-1/2	945393-C3	46.80
.093 (3/32)	.0930	.0930	.140	<b>.500</b> (5x)	3	1/8	2-1/2	936193-C3	47.80
.093 (3/32)	.0930	.0930	.140	<b>.750</b> (8x)	3	1/8	2-1/2	933893-C3	49.10
.093 (3/32)	.0930	.0930	.140	<b>.950</b> (10x)	3	1/8	2-1/2	931193-C3	51.50

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			
							TOOL #	PRICE	
.100	.1000	.150	<b>.500</b> (5x)	3	1/8	2-1/2	936200-C3	50.80	
.100	.1000	.150	<b>.800</b> (8x)	3	1/8	2-1/2	933900-C3	52.20	
.109 (7/64)	.1090	.164	<b>.570</b> (5x)	3	1/8	2-1/2	936202-C3	50.80	
.109 (7/64)	.1090	.164	<b>.900</b> (8x)	3	1/8	2-1/2	933902-C3	52.20	
3.0 mm	.1181	4.50 mm	<b>15.0 mm</b> (5x)	3	4 mm	50 mm	886457-C3	52.00	
3.0 mm	.1181	4.50 mm	<b>24.0 mm</b> (8x)	3	4 mm	50 mm	887157-C3	53.20	
D <sub>1</sub> + .000" - .002"	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	46.80	
.125 (1/8)	.1250	.187	<b>.625</b> (5x)	4	1/8	2-1/2	936208-C3	47.20	
.125 (1/8)	.1250	.187	<b>1.000</b> (8x)	4	1/8	2-1/2	933908-C3	48.60	
.125 (1/8)	.1250	.187	<b>1.250</b> (10x)	4	1/8	2-1/2	931208-C3	49.40	
.156 (5/32)	.1562	.235	<b>.750</b> (5x)	4	3/16	3	936210-C3	52.40	
.187 (3/16)	.1875	.285	<b>1.000</b> (5x)	4	3/16	3	936212-C3	52.40	
.250 (1/4)	.2500	.375	<b>1.250</b> (5x)	4	1/4	4	936216-C3	58.50	

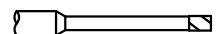
MEDIUM ALLOY STEELS

**PLEASE SEE SPEEDS & FEEDS ON PAGE 141**



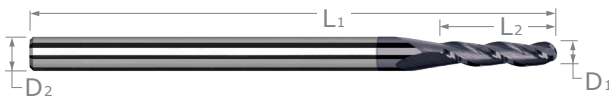
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# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## 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

**mm & in**

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN 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 mm	.0078		<b>.60 mm</b> (3x)	3	4 mm	50 mm	974804-C3	59.30
.010	.0100		<b>.030</b> (3x)	3	1/8	1-1/2	971810-C3	57.90
.015 (1/64)	.0150		<b>.023</b> (1.5x)	3	1/8	1-1/2	963015-C3	48.90
.015 (1/64)	.0150		<b>.045</b> (3x)	3	1/8	1-1/2	971815-C3	48.90
.4 mm	.0157		<b>1.20 mm</b> (3x)	3	4 mm	50 mm	974809-C3	51.40
.5 mm	.0196		<b>1.50 mm</b> (3x)	3	4 mm	50 mm	974811-C3	44.30
.020	.0200		<b>.030</b> (1.5x)	3	1/8	1-1/2	963020-C3	44.30
.020	.0200		<b>.060</b> (3x)	3	1/8	1-1/2	971820-C3	43.90
.6 mm	.0236		<b>1.80 mm</b> (3x)	3	4 mm	50 mm	974813-C3	42.90
.025	.0250		<b>.075</b> (3x)	3	1/8	1-1/2	971825-C3	42.50
.031 (1/32)	.0310		<b>.025</b> (0.8x)	3	1/8	1-1/2	883931-C3	39.50
.031 (1/32)	.0310		<b>.047</b> (1.5x)	3	1/8	1-1/2	963031-C3	36.80
.031 (1/32)	.0310		<b>.093</b> (3x)	3	1/8	1-1/2	971831-C3	36.80
.031 (1/32)	.0310		<b>.156</b> (5x)	3	1/8	2-1/2	888631-C3	46.10
.8 mm	.0314		<b>2.40 mm</b> (3x)	3	4 mm	50 mm	974818-C3	37.30
1.0 mm	.0393		<b>1.50 mm</b> (1.5x)	3	4 mm	50 mm	929222-C3	37.30
1.0 mm	.0393		<b>3.00 mm</b> (3x)	3	4 mm	50 mm	974822-C3	37.30
.040	.0400		<b>.120</b> (3x)	3	1/8	1-1/2	971840-C3	36.80
.047 (3/64)	.0470		<b>.038</b> (0.8x)	3	1/8	1-1/2	883947-C3	40.30
.047 (3/64)	.0470		<b>.071</b> (1.5x)	3	1/8	1-1/2	963047-C3	36.80
.047 (3/64)	.0470		<b>.141</b> (3x)	3	1/8	1-1/2	971847-C3	36.80
1.2 mm	.0472		<b>3.50 mm</b> (3x)	3	4 mm	50 mm	974827-C3	37.30
.050	.0500		<b>.150</b> (3x)	3	1/8	1-1/2	971850-C3	36.80
1.4 mm	.0551		<b>4.00 mm</b> (3x)	3	4 mm	50 mm	974831-C3	37.30
1.5 mm	.0590		<b>4.50 mm</b> (3x)	3	4 mm	50 mm	974833-C3	35.20
.060	.0600		<b>.180</b> (3x)	3	1/8	1-1/2	971860-C3	36.80
.062 (1/16)	.0620		<b>.050</b> (0.8x)	3	1/8	1-1/2	883962-C3	37.30
.062 (1/16)	.0620		<b>.093</b> (1.5x)	3	1/8	1-1/2	963062-C3	34.80
.062 (1/16)	.0620		<b>.186</b> (3x)	3	1/8	1-1/2	971862-C3	34.80
.062 (1/16)	.0620		<b>.312</b> (5x)	3	1/8	2-1/2	888662-C3	43.90
1.6 mm	.0629		<b>5.00 mm</b> (3x)	3	4 mm	50 mm	974836-C3	35.20
.070	.0700		<b>.210</b> (3x)	3	1/8	1-1/2	971870-C3	34.80
1.8 mm	.0708		<b>5.50 mm</b> (3x)	3	4 mm	50 mm	974840-C3	35.20
.078 (5/64)	.0780		<b>.062</b> (0.8x)	3	1/8	1-1/2	883978-C3	39.30
.078 (5/64)	.0780		<b>.118</b> (1.5x)	3	1/8	1-1/2	963078-C3	34.80
.078 (5/64)	.0780		<b>.234</b> (3x)	3	1/8	1-1/2	971878-C3	34.80

continued on next page



# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Ball (cont.)



continued from previous page

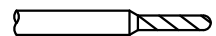
MEDIUM ALLOY STEELS

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN COATED	
D <sub>1</sub> +.0005" -.0005"	+ .00mm -.02mm	decimal equivalent	L <sub>2</sub> +.010" -.000" +.25mm -.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
2.0 mm	.0787		<b>6.00 mm</b> (3x)	3	4 mm	50 mm	974845-C3	35.20
.080	.0800		<b>.240</b> (3x)	3	1/8	1-1/2	971880-C3	34.80
.090	.0900		<b>.270</b> (3x)	3	1/8	1-1/2	971890-C3	34.80
.093 (3/32)	.0930		<b>.074</b> (0.8x)	3	1/8	1-1/2	883993-C3	37.30
.093 (3/32)	.0930		<b>.140</b> (1.5x)	3	1/8	1-1/2	963093-C3	34.80
.093 (3/32)	.0930		<b>.279</b> (3x)	3	1/8	1-1/2	971893-C3	34.80
.093 (3/32)	.0930		<b>.500</b> (5x)	3	1/8	2-1/2	888693-C3	43.90
.100	.1000		<b>.300</b> (3x)	3	1/8	1-1/2	971900-C3	34.80
.109 (7/64)	.1090		<b>.327</b> (3x)	3	1/8	1-1/2	971902-C3	34.80
3.0 mm	.1181		<b>4.50 mm</b> (1.5x)	3	4 mm	50 mm	929257-C3	35.40
3.0 mm	.1181		<b>9.00 mm</b> (3x)	3	4 mm	50 mm	974857-C3	35.40

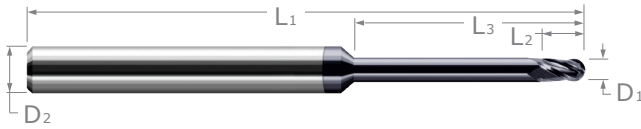
D <sub>1</sub> +.000" -.002"	decimal equivalent	L <sub>2</sub> +.030" -.000"		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.125 (1/8)	.1250	<b>.100</b> (0.8x)	4	1/8	1-1/2	884008-C3	37.30
.125 (1/8)	.1250	<b>.187</b> (1.5x)	4	1/8	1-1/2	963108-C3	33.30
.125 (1/8)	.1250	<b>.375</b> (3x)	4	1/8	1-1/2	971908-C3	33.30
.125 (1/8)	.1250	<b>.625</b> (5x)	4	1/8	2-1/2	888708-C3	43.90
.140 (9/64)	.1406	<b>.425</b> (3x)	4	3/16	2	971909-C3	46.10
.156 (5/32)	.1562	<b>.235</b> (1.5x)	4	3/16	2	963110-C3	37.10
.156 (5/32)	.1562	<b>.470</b> (3x)	4	3/16	2	971910-C3	37.10
.187 (3/16)	.1875	<b>.150</b> (0.8x)	4	3/16	2	884012-C3	39.80
.187 (3/16)	.1875	<b>.285</b> (1.5x)	4	3/16	2	963112-C3	35.50
.187 (3/16)	.1875	<b>.562</b> (3x)	4	3/16	2	971912-C3	35.50
.250 (1/4)	.2500	<b>.375</b> (1.5x)	4	1/4	2-1/2	963116-C3	43.40
.250 (1/4)	.2500	<b>.750</b> (3x)	4	1/4	2-1/2	971916-C3	43.40

**PLEASE SEE SPEEDS & FEEDS ON PAGE 135**



# 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
- Center cutting
- Solid carbide
- CNC ground in the USA

IMPROVES PERFORMANCE

Contour Profiling

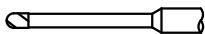
Tipped Multi-Axis Machining

MEDIUM ALLOY STEELS

**mm & in**

CUTTER DIAMETER			LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN 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" - .0005"	+ .00mm - .02mm	decimal equivalent	+ .010" - .000" + .25mm - .00mm	+ .010" - .000" + .25mm - .00mm					
.015 (1/64)		.0150	.022	<b>.078</b> (5x)	4	1/8	2-1/2	64215-C3	61.50
.015 (1/64)		.0150	.022	<b>.125</b> (8x)	4	1/8	2-1/2	56615-C3	62.70
.015 (1/64)		.0150	.022	<b>.187</b> (12x)	4	1/8	2-1/2	65415-C3	66.50
	.4 mm	.0157	.60 mm	<b>2.0 mm</b> (5x)	4	4 mm	50 mm	984709-C3	66.50
	.4 mm	.0157	.60 mm	<b>3.2 mm</b> (8x)	4	4 mm	50 mm	971009-C3	67.70
	.4 mm	.0157	.60 mm	<b>4.8 mm</b> (12x)	4	4 mm	50 mm	988309-C3	73.10
	.5 mm	.0196	.75 mm	<b>2.5 mm</b> (5x)	4	4 mm	50 mm	984711-C3	64.00
	.5 mm	.0196	.75 mm	<b>4.0 mm</b> (8x)	4	4 mm	50 mm	971011-C3	65.50
	.5 mm	.0196	.75 mm	<b>6.0 mm</b> (12x)	4	4 mm	50 mm	988311-C3	70.70
	.5 mm	.0196	.75 mm	<b>8.0 mm</b> (16x)	4	4 mm	50 mm	979511-C3	73.70
.020		.0200	.030	<b>.100</b> (5x)	4	1/8	2-1/2	64220-C3	58.70
.020		.0200	.030	<b>.160</b> (8x)	4	1/8	2-1/2	56620-C3	59.90
.020		.0200	.030	<b>.250</b> (12x)	4	1/8	2-1/2	65420-C3	64.30
	.6 mm	.0236	.90 mm	<b>3.0 mm</b> (5x)	4	4 mm	50 mm	984713-C3	62.60
	.6 mm	.0236	.90 mm	<b>4.8 mm</b> (8x)	4	4 mm	50 mm	971013-C3	63.80
	.6 mm	.0236	.90 mm	<b>7.2 mm</b> (12x)	4	4 mm	50 mm	988313-C3	68.00
.025		.0250	.037	<b>.125</b> (5x)	4	1/8	2-1/2	64225-C3	57.30
.025		.0250	.037	<b>.203</b> (8x)	4	1/8	2-1/2	56625-C3	58.30
.025		.0250	.037	<b>.312</b> (12x)	4	1/8	2-1/2	65425-C3	63.10
.031 (1/32)		.0310	.046	<b>.156</b> (5x)	4	1/8	2-1/2	64231-C3	53.60
.031 (1/32)		.0310	.046	<b>.250</b> (8x)	4	1/8	2-1/2	56631-C3	54.80
.031 (1/32)		.0310	.046	<b>.375</b> (12x)	4	1/8	2-1/2	65431-C3	56.80
	.8 mm	.0314	1.20 mm	<b>4.0 mm</b> (5x)	4	4 mm	50 mm	984718-C3	58.50
	.8 mm	.0314	1.20 mm	<b>6.5 mm</b> (8x)	4	4 mm	50 mm	971018-C3	59.60
	.8 mm	.0314	1.20 mm	<b>9.5 mm</b> (12x)	4	4 mm	50 mm	988318-C3	61.60
	1.0 mm	.0393	1.50 mm	<b>5.0 mm</b> (5x)	4	4 mm	50 mm	984722-C3	58.50
	1.0 mm	.0393	1.50 mm	<b>8.0 mm</b> (8x)	4	4 mm	50 mm	971022-C3	59.60
	1.0 mm	.0393	1.50 mm	<b>12.0 mm</b> (12x)	4	4 mm	50 mm	988322-C3	61.60
	1.0 mm	.0393	1.50 mm	<b>16.0 mm</b> (16x)	4	4 mm	50 mm	979522-C3	64.40
.047 (3/64)		.0470	.070	<b>.250</b> (5x)	4	1/8	2-1/2	64247-C3	53.60
.047 (3/64)		.0470	.070	<b>.375</b> (8x)	4	1/8	2-1/2	56647-C3	54.80
.047 (3/64)		.0470	.070	<b>.570</b> (12x)	4	1/8	2-1/2	65447-C3	56.80

continued on next page



# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Ball – Long Reach, Stub Flute (cont.)



continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN COATED	
						4 FL	PRICE
D <sub>1</sub> +.0005" -.0005"	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>		
1.5 mm .0590 1.5 mm .0590 1.5 mm .0590 1.5 mm .0590	2.20 mm 2.20 mm 2.20 mm 2.20 mm	<b>7.5 mm (5x)</b> <b>12.0 mm (8x)</b> <b>18.0 mm (12x)</b> <b>24.0 mm (16x)</b>	4 4 4 4	4 mm 4 mm 4 mm 4 mm	50 mm 50 mm 50 mm 63 mm	984733-C3 971033-C3 988333-C3 979533-C3	58.50 59.60 61.60 64.40
.062 (1/16) .062 (1/16) .062 (1/16)	.093 .093 .093	<b>.312 (5x)</b> <b>.500 (8x)</b> <b>.750 (12x)</b>	4 4 4	1/8 1/8 1/8	2-1/2 2-1/2 2-1/2	64262-C3 56662-C3 65462-C3	53.60 54.80 56.80
.078 (5/64) .078 (5/64) .078 (5/64)	.117 .117 .117	<b>.406 (5x)</b> <b>.625 (8x)</b> <b>.940 (12x)</b>	4 4 4	1/8 1/8 1/8	2-1/2 2-1/2 2-1/2	64278-C3 56678-C3 65478-C3	53.60 54.80 56.80
2.0 mm .0787 2.0 mm .0787 2.0 mm .0787 2.0 mm .0787	3.00 mm 3.00 mm 3.00 mm 3.00 mm	<b>10.0 mm (5x)</b> <b>16.0 mm (8x)</b> <b>24.0 mm (12x)</b> <b>32.0 mm (16x)</b>	4 4 4 4	4 mm 4 mm 4 mm 4 mm	50 mm 50 mm 63 mm 63 mm	984745-C3 971045-C3 988345-C3 979545-C3	58.50 59.60 61.60 64.40
.093 (3/32) .093 (3/32) .093 (3/32)	.139 .139 .139	<b>.500 (5x)</b> <b>.750 (8x)</b> <b>1.125 (12x)</b>	4 4 4	1/8 1/8 1/8	2-1/2 2-1/2 2-1/2	64293-C3 56693-C3 65493-C3	53.60 54.80 56.80
3.0 mm .1181	4.50 mm	<b>15.0 mm (5x)</b>	4	4 mm	50 mm	984757-C3	55.80

MEDIUM ALLOY STEELS

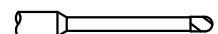
D <sub>1</sub> +.000" -.002"	decimal equivalent	L <sub>2</sub> +.030" -.000"	L <sub>3</sub> +.030" -.000"	D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
.125 (1/8)	.1250	.187	<b>.625 (5x)</b>	1/8	2-1/2	64308-C3	53.00
.125 (1/8)	.1250	.187	<b>1.000 (8x)</b>	1/8	2-1/2	56708-C3	54.20
.125 (1/8)	.1250	.187	<b>1.500 (12x)</b>	1/8	3	65508-C3	56.80
.156 (5/32)	.1562	.234	<b>.750 (5x)</b>	3/16	3	64310-C3	58.30
.156 (5/32)	.1562	.234	<b>1.250 (8x)</b>	3/16	3	56710-C3	59.60
.187 (3/16)	.1875	.281	<b>1.000 (5x)</b>	3/16	3	64312-C3	59.00
.187 (3/16)	.1875	.281	<b>1.500 (8x)</b>	3/16	3	56712-C3	60.10
.250 (1/4)	.2500	.375	<b>1.250 (5x)</b>	1/4	4	64316-C3	65.00
.250 (1/4)	.2500	.375	<b>2.000 (8x)</b>	1/4	4	56716-C3	66.30

## 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).

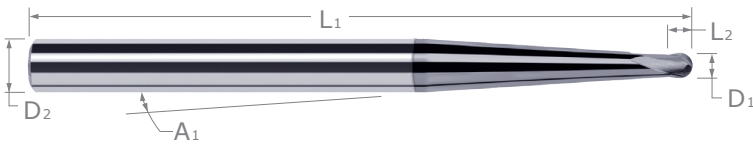
Material	Hardness (HBn)	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter									
			.015	.031	.047	.062	.078	.093	.125	.187	.250	
<b>Carbon Steels:</b> 1030 - 1095, 1140 - 1151, 13xx, 15xx, 2xxx, 3xxx, 4xxx & 4xLxx, 5xxx & 5xLxx, 50xxx & 50Lxxx, 51xxx & 51Lxxx, 52xxx 52Lxxx, 6xxx, 8xxx, 9xxx <b>Stainless 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.



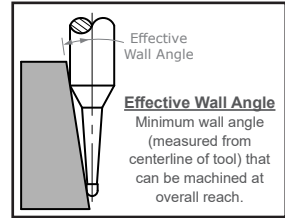
# HIGH HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Ball – Tapered Reach (Mold Cutters)



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

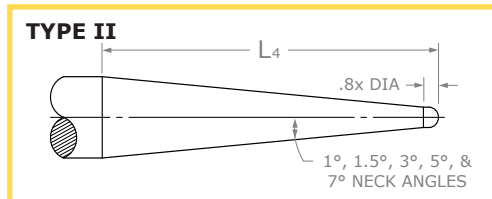
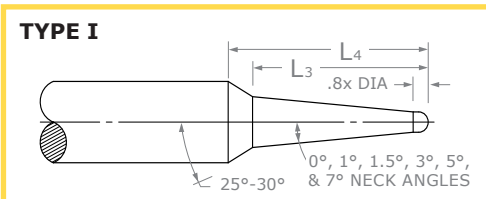
- Very short length of cut and solid tapered neck for maximum rigidity
- Ideal for contour machining of mold and die cavities
- 35° helix for increased cutting performance
- h6 shank tolerance for high precision tool holders
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- 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	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		
0° (straight neck)	.062 (1/16)	.050	I	.500	<b>.610</b>	6.2°	3/16	2	882843-C6	54.80
	.062 (1/16)	.050	I	1.000	<b>1.110</b>	3.3°	3/16	2-1/2	882850-C6	59.90
	.093 (3/32)	.074	I	.750	<b>.833</b>	3.4°	3/16	2	882864-C6	54.80
	.093 (3/32)	.074	I	1.125	<b>1.208</b>	2.3°	3/16	2-1/2	882871-C6	59.90
	.125 (1/8)	.100	I	1.000	<b>1.058</b>	1.8°	3/16	2-1/2	882877-C6	59.90
	.125 (1/8)	.100	I	1.750	<b>1.808</b>	1.0°	3/16	3	882885-C6	61.70
1°	.062 (1/16)	.050	I	.500	<b>.595</b>	6.4°	3/16	2	927543-C6	54.40
	.062 (1/16)	.050	I	1.000	<b>1.080</b>	3.5°	3/16	2-1/2	927550-C6	59.40
	.093 (3/32)	.074	I	.750	<b>.811</b>	3.6°	3/16	2	927564-C6	54.40
	.093 (3/32)	.074	I	1.125	<b>1.175</b>	2.4°	3/16	2-1/2	927571-C6	59.40
	.125 (1/8)	.100	I	1.000	<b>1.027</b>	1.9°	3/16	2	927577-C6	56.60
	.125 (1/8)	.100	II	1.890	<b>1.890</b>	1.0°	3/16	3	927585-C6	61.40
	.187 (3/16)	.150	II	1.940	<b>1.940</b>	1.0°	1/4	4	927587-C6	72.10
.250 (1/4)	.200	II	1.990	<b>1.990</b>	1.0°	5/16	4	927592-C6	77.00	
1.5°	.015 (1/64)	.012	I	.125	<b>.269</b>	18.2°	3/16	2	19001-C6	61.20
	.015 (1/64)	.012	I	.250	<b>.389</b>	12.8°	3/16	2	19008-C6	61.20
	.031 (1/32)	.025	I	.250	<b>.375</b>	12.3°	3/16	2	19015-C6	60.40
	.031 (1/32)	.025	I	.500	<b>.614</b>	7.5°	3/16	2	19022-C6	60.40
	.039 (1 mm)	.031	I	.375	<b>.488</b>	9.0°	3/16	2	19025-C6	57.20
	.047 (3/64)	.038	I	.375	<b>.481</b>	8.7°	3/16	2	19029-C6	57.20
	.047 (3/64)	.038	I	.750	<b>.839</b>	5.0°	3/16	2	19036-C6	57.20
	.062 (1/16)	.050	I	.500	<b>.588</b>	6.4°	3/16	2	19043-C6	54.40
	.062 (1/16)	.050	I	1.000	<b>1.066</b>	3.5°	3/16	2-1/2	19050-C6	59.40
	.062 (1/16)	.050	I	1.500	<b>1.543</b>	2.4°	3/16	3	19053-C6	61.70
	.078 (5/64)	.062	I	.625	<b>.694</b>	4.8°	3/16	2	19057-C6	54.40
	.093 (3/32)	.074	I	.750	<b>.801</b>	3.6°	3/16	2	19064-C6	54.40
	.093 (3/32)	.074	I	1.500	<b>1.517</b>	1.9°	3/16	2-1/2	19066-C6	59.40
	.093 (3/32)	.074	II	1.878	<b>1.878</b>	1.5°	3/16	3	19068-C6	61.70
	.125 (1/8)	.100	II	1.293	<b>1.293</b>	1.5°	3/16	2-1/2	19071-C6	56.60
	.125 (1/8)	.100	II	2.487	<b>2.487</b>	1.5°	1/4	4	19078-C6	66.50
	.187 (3/16)	.150	II	1.343	<b>1.343</b>	1.5°	1/4	2-1/2	19085-C6	60.90
.250 (1/4)	.200	II	1.393	<b>1.393</b>	1.5°	5/16	2-1/2	19092-C6	78.40	

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# HIGH HELIX END MILLS FOR MEDIUM ALLOY STEELS

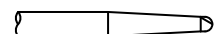
## Ball – Tapered Reach (Mold Cutters) (cont.)

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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> -0°30'	D <sub>1</sub> <sup>+0.000"</sup> -0.001"	L <sub>2</sub> <sup>+0.010"</sup> -0.000"		L <sub>3</sub>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>			
	.015 (1/64)	.012	I	.156	<b>.292</b>	16.8°	3/16	2-1/2	36901-C6	65.80	
	.015 (1/64)	.012	I	.375	<b>.491</b>	10.1°	3/16	2-1/2	66643-C6	61.70	
	.015 (1/64)	.012	I	.875	<b>.946</b>	5.3°	3/16	2-1/2	66648-C6	61.70	
	.020	.016	I	.250	<b>.374</b>	13.0°	3/16	2-1/2	36904-C6	65.80	
	.020	.016	I	.500	<b>.601</b>	8.1°	3/16	2-1/2	36907-C6	65.80	
	.025	.020	I	.250	<b>.370</b>	12.8°	3/16	2-1/2	36910-C6	65.50	
	.025	.020	I	.500	<b>.597</b>	7.9°	3/16	2-1/2	36913-C6	65.50	
	.031 (1/32)	.025	I	.312	<b>.421</b>	10.9°	3/16	2-1/2	36916-C6	65.50	
	.031 (1/32)	.025	I	.750	<b>.820</b>	5.6°	3/16	2-1/2	67046-C6	54.20	
	.031 (1/32)	.025	II	1.518	<b>1.518</b>	3.0°	3/16	2-1/2	36931-C6	54.20	
	.039 (1 mm)	.031	I	.375	<b>.472</b>	9.3°	3/16	2-1/2	36917-C6	65.50	
	.039 (1 mm)	.031	I	.750	<b>.813</b>	5.4°	3/16	2-1/2	36919-C6	65.50	
	.039 (1 mm)	.031	II	1.448	<b>1.448</b>	3.0°	3/16	2-1/2	36921-C6	65.50	
	.047 (3/64)	.038	I	.375	<b>.466</b>	9.0°	3/16	2-1/2	36922-C6	62.70	
	.047 (3/64)	.038	I	.875	<b>.921</b>	4.5°	3/16	2-1/2	67348-C6	51.20	
	.047 (3/64)	.038	II	1.378	<b>1.378</b>	3.0°	3/16	2-1/2	36947-C6	51.20	
	.050	.040	I	.500	<b>.577</b>	7.1°	3/16	2-1/2	36925-C6	62.70	
	.060	.048	I	.625	<b>.683</b>	5.6°	3/16	2-1/2	36928-C6	62.70	
	3°	.062 (1/16)	.050	I	.375	<b>.454</b>	8.4°	3/16	2-1/2	36934-C6	59.10
		.062 (1/16)	.050	I	.625	<b>.681</b>	5.5°	3/16	2-1/2	66946-C6	51.20
		.062 (1/16)	.050	I	.875	<b>.909</b>	4.1°	3/16	2-1/2	36937-C6	59.10
		.062 (1/16)	.050	II	1.247	<b>1.247</b>	3.0°	3/16	2-1/2	36962-C6	51.20
		.062 (1/16)	.050	II	1.843	<b>1.843</b>	3.0°	1/4	3	37362-C6	67.60
		.078 (5/64)	.062	I	.500	<b>.555</b>	6.1°	3/16	2-1/2	36940-C6	59.10
		.078 (5/64)	.062	II	1.107	<b>1.107</b>	3.0°	3/16	2-1/2	36978-C6	49.80
		.093 (3/32)	.074	I	.625	<b>.657</b>	4.5°	3/16	2	36943-C6	54.40
		.093 (3/32)	.074	II	.976	<b>.976</b>	3.0°	3/16	2	36993-C6	45.40
		.093 (3/32)	.074	II	1.572	<b>1.572</b>	3.0°	1/4	3	37393-C6	65.80
		.100	.080	II	1.511	<b>1.511</b>	3.0°	1/4	3	37400-C6	68.00
		.109 (7/64)	.087	II	1.432	<b>1.432</b>	3.0°	1/4	3	37402-C6	68.00
		.118 (3 mm)	.094	II	1.354	<b>1.354</b>	2.9°	1/4	2-1/2	37405-C6	68.00
		.125 (1/8)	.100	I	.875	<b>.913</b>	4.2°	1/4	2-1/2	36946-C6	65.00
		.125 (1/8)	.100	II	1.293	<b>1.293</b>	2.9°	1/4	2-1/2	37408-C6	61.90
		.125 (1/8)	.100	II	2.485	<b>2.485</b>	3.0°	3/8	4	37708-C6	96.90
		.156 (5/32)	.125	II	1.020	<b>1.020</b>	2.8°	1/4	2-1/2	37410-C6	67.60
.187 (3/16)		.150	II	.746	<b>.746</b>	2.8°	1/4	2-1/2	37412-C6	66.90	
.187 (3/16)	.150	II	1.343	<b>1.343</b>	2.9°	5/16	2-1/2	36949-C6	78.40		
.187 (3/16)	.150	II	1.939	<b>1.939</b>	2.9°	3/8	4	37712-C6	96.90		
.250 (1/4)	.200	II	1.393	<b>1.393</b>	2.9°	3/8	2-1/2	37716-C6	80.80		
5°	.015 (1/64)	.012	I	.375	<b>.469</b>	10.6°	3/16	2	66664-C6	55.90	
	.015 (1/64)	.012	II	.998	<b>.998</b>	5.0°	3/16	2	38515-C6	55.60	
	.020	.016	I	.562	<b>.624</b>	7.8°	3/16	2	38907-C6	60.70	
	.020	.016	II	.973	<b>.973</b>	5.0°	3/16	2	38520-C6	60.40	
	.025	.020	I	.562	<b>.621</b>	7.6°	3/16	2	38914-C6	60.70	
	.025	.020	II	.949	<b>.949</b>	5.0°	3/16	2	38525-C6	60.40	
	.031 (1/32)	.025	I	.375	<b>.457</b>	10.1°	3/16	2	67065-C6	49.70	
	.031 (1/32)	.025	II	.919	<b>.919</b>	5.0°	3/16	2	38531-C6	49.70	
	.039 (1 mm)	.031	I	.625	<b>.664</b>	6.6°	3/16	2	38921-C6	60.40	

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MEDIUM ALLOY STEELS



# HIGH HELIX END MILLS FOR MEDIUM ALLOY STEELS

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

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MEDIUM ALLOY STEELS

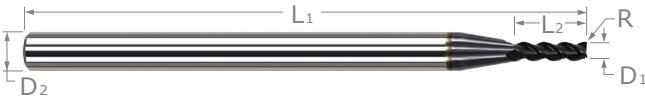
NECK ANGLE	CUTTER DIAMETER	LENGTH OF CUT	TYPE	TAPERED REACH	OVERALL REACH	EFFECTIVE WALL ANGLE	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
									2 FL	PRICE
A1 <sup>+0°00'</sup> <sub>-0°30'</sub>	D1 <sup>+0.000"</sup> <sub>-.001"</sub>	L2 <sup>+0.010"</sup> <sub>-.000"</sub>		L3	L4		D2 (h6)	L1		
5°	.047 (3/64)	.038	II	.841	<b>.841</b>	5.0°	3/16	2	38547-C6	49.70
	.047 (3/64)	.038	II	1.198	<b>1.198</b>	5.0°	1/4	2-1/2	38947-C6	66.90
	.050	.040	II	.826	<b>.826</b>	4.9°	3/16	2	38928-C6	50.00
	.060	.048	II	.777	<b>.777</b>	4.9°	3/16	2	38935-C6	50.00
	.060	.048	II	1.134	<b>1.134</b>	5.0°	1/4	2-1/2	38960-C6	66.90
	.062 (1/16)	.050	I	.375	<b>.434</b>	8.8°	3/16	2	66963-C6	46.80
	.062 (1/16)	.050	II	.767	<b>.767</b>	4.9°	3/16	2	38562-C6	46.80
	.062 (1/16)	.050	II	1.124	<b>1.124</b>	5.0°	1/4	2-1/2	38962-C6	66.90
	.078 (5/64)	.062	II	1.045	<b>1.045</b>	4.9°	1/4	2-1/2	38978-C6	63.90
	.093 (3/32)	.074	II	.972	<b>.972</b>	4.9°	1/4	2-1/2	38993-C6	63.90
	.093 (3/32)	.074	II	1.686	<b>1.686</b>	5.0°	3/8	3	39293-C6	84.70
	.100	.080	II	.937	<b>.937</b>	4.9°	1/4	2-1/2	39000-C6	64.30
	.109 (7/64)	.087	II	.893	<b>.893</b>	4.8°	1/4	2-1/2	39002-C6	64.30
	.118 (3 mm)	.094	II	.849	<b>.849</b>	4.7°	1/4	2-1/2	39005-C6	64.30
	.125 (1/8)	.100	I	.500	<b>.548</b>	7.3°	1/4	2-1/2	38942-C6	61.20
	.125 (1/8)	.100	II	.814	<b>.814</b>	4.8°	1/4	2-1/2	39008-C6	60.90
	.125 (1/8)	.100	II	1.529	<b>1.529</b>	4.9°	3/8	3	39308-C6	81.80
	.156 (5/32)	.125	II	.661	<b>.661</b>	4.6°	1/4	2-1/2	39010-C6	63.90
	.187 (3/16)	.150	II	1.222	<b>1.222</b>	4.8°	3/8	2-1/2	39312-C6	78.40
	.187 (3/16)	.150	II	1.222	<b>1.222</b>	4.8°	3/8	4	922312-C6	87.50
.250 (1/4)	.200	II	.914	<b>.914</b>	4.5°	3/8	2-1/2	39316-C6	78.40	
.250 (1/4)	.200	II	.914	<b>.914</b>	4.5°	3/8	4	922316-C6	87.50	
7°	.015 (1/64)	.012	I	.187	<b>.299</b>	16.5°	3/16	2	66678-C6	55.90
	.015 (1/64)	.012	II	.714	<b>.714</b>	7.0°	3/16	2	40015-C6	55.90
	.020	.016	II	.698	<b>.698</b>	7.0°	3/16	2	40020-C6	55.90
	.031 (1/32)	.025	I	.250	<b>.338</b>	13.6°	3/16	2	67078-C6	50.00
	.031 (1/32)	.025	II	.662	<b>.662</b>	6.9°	3/16	2	40031-C6	50.00
	.031 (1/32)	.025	II	.917	<b>.917</b>	7.0°	1/4	2-1/2	40431-C6	63.90
	.039 (1 mm)	.031	II	.636	<b>.636</b>	6.9°	3/16	2	40007-C6	50.00
	.047 (3/64)	.038	I	.375	<b>.425</b>	9.9°	3/16	2	40014-C6	50.00
	.047 (3/64)	.038	II	.610	<b>.610</b>	6.9°	3/16	2	40047-C6	50.00
	.047 (3/64)	.038	II	.864	<b>.864</b>	6.9°	1/4	2-1/2	40447-C6	63.90
	.060	.048	II	.822	<b>.822</b>	6.9°	1/4	2-1/2	40460-C6	63.90
	.062 (1/16)	.050	I	.500	<b>.567</b>	9.9°	1/4	2-1/2	66980-C6	63.90
	.062 (1/16)	.050	II	.815	<b>.815</b>	6.9°	1/4	2-1/2	40462-C6	63.90
	.062 (1/16)	.050	II	1.324	<b>1.324</b>	6.9°	3/8	2-1/2	40862-C6	81.10
	.078 (5/64)	.062	II	1.272	<b>1.272</b>	6.9°	3/8	2-1/2	40878-C6	81.10
	.093 (3/32)	.074	II	.714	<b>.714</b>	6.7°	1/4	2-1/2	40493-C6	60.90
	.093 (3/32)	.074	II	1.223	<b>1.223</b>	6.9°	3/8	2-1/2	40893-C6	81.10
	.125 (1/8)	.100	II	.609	<b>.609</b>	6.5°	1/4	2-1/2	40508-C6	58.00
	.125 (1/8)	.100	II	1.118	<b>1.118</b>	6.8°	3/8	2-1/2	40908-C6	78.40
	.187 (3/16)	.150	II	.914	<b>.914</b>	6.5°	3/8	2-1/2	40912-C6	78.40
.187 (3/16)	.150	II	.914	<b>.914</b>	6.5°	3/8	4	917212-C6	87.50	





# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Corner Radius

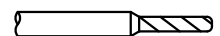


- Optimized for readily machinable medium alloy steels, stainless steels, and tool steels
- Variable helix design (approx. 37°) reduces chatter and harmonics and increases material removal rates
- AlTiN coated for improved lubricity and heat resistance
- h6 shank tolerance for high precision tool holders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

**mm & in**

CUTTER DIAMETER D <sub>1</sub>	CORNER RADIUS R	LENGTH OF CUT L <sub>2</sub>	FLUTES	SHANK DIAMETER D <sub>2</sub> (h6)	OVERALL LENGTH L <sub>1</sub>	AlTiN COATED	
						TOOL #	PRICE
+ .0005" / -.0005" / +.00mm / -.02mm / decimal equivalent	+ .001" / -.001" / +.025mm / -.025mm	+ .010" / -.000" / L <sub>2</sub> +.25mm / -.00mm					
.2 mm .0078	<b>.05 mm</b>	.30 mm (1.5x)	3	4 mm	50 mm	985604-C3	54.40
.2 mm .0078	<b>.05 mm</b>	.60 mm (3x)	3	4 mm	50 mm	976804-C3	54.40
.10 .0100	<b>.003</b>	.015 (1.5x)	3	1/8	1-1/2	52610-C3	51.40
.10 .0100	<b>.003</b>	.030 (3x)	3	1/8	1-1/2	45610-C3	51.40
.3 mm .0118	<b>.08 mm</b>	.90 mm (3x)	3	4 mm	50 mm	976806-C3	53.40
.015 (1/64) .0150	<b>.003</b>	.022 (1.5x)	3	1/8	1-1/2	52615-C3	42.50
.015 (1/64) .0150	<b>.003</b>	.045 (3x)	3	1/8	1-1/2	45615-C3	42.50
.015 (1/64) .0150	<b>.003</b>	.078 (5x)	3	1/8	2-1/2	53815-C3	51.50
.4 mm .0157	<b>.08 mm</b>	.60 mm (1.5x)	3	4 mm	50 mm	985609-C3	45.50
.4 mm .0157	<b>.08 mm</b>	1.20 mm (3x)	3	4 mm	50 mm	976809-C3	45.50
.5 mm .0196	<b>.10 mm</b>	.75 mm (1.5x)	3	4 mm	50 mm	985611-C3	40.70
.5 mm .0196	<b>.10 mm</b>	1.50 mm (3x)	3	4 mm	50 mm	976811-C3	40.70
.020 .0200	<b>.004</b>	.030 (1.5x)	3	1/8	1-1/2	52620-C3	37.30
.020 .0200	<b>.004</b>	.060 (3x)	3	1/8	1-1/2	45620-C3	37.30
.020 .0200	<b>.004</b>	.100 (5x)	3	1/8	2-1/2	53820-C3	45.70
.6 mm .0236	<b>.10 mm</b>	.90 mm (1.5x)	3	4 mm	50 mm	985613-C3	39.50
.6 mm .0236	<b>.10 mm</b>	1.80 mm (3x)	3	4 mm	50 mm	976813-C3	39.50
.025 .0250	<b>.004</b>	.038 (1.5x)	3	1/8	1-1/2	52625-C3	36.00
.025 .0250	<b>.004</b>	.075 (3x)	3	1/8	1-1/2	45625-C3	36.00
.025 .0250	<b>.004</b>	.125 (5x)	3	1/8	2-1/2	53825-C3	44.30
.7 mm .0275	<b>.10 mm</b>	2.10 mm (3x)	3	4 mm	50 mm	976815-C3	39.50
.031 (1/32) .0310	<b>.005</b>	.047 (1.5x)	3	1/8	1-1/2	52631-C3	30.40
.031 (1/32) .0310	<b>.005</b>	.093 (3x)	3	1/8	1-1/2	45631-C3	30.40
.031 (1/32) .0310	<b>.005</b>	.156 (5x)	3	1/8	2-1/2	53831-C3	38.20
.031 (1/32) .0310	<b>.010</b>	.093 (3x)	3	1/8	1-1/2	907231-C3	30.30
.8 mm .0314	<b>.10 mm</b>	1.20 mm (1.5x)	3	4 mm	50 mm	985618-C3	34.00
.8 mm .0314	<b>.10 mm</b>	2.40 mm (3x)	3	4 mm	50 mm	976818-C3	34.00
.035 .0350	<b>.005</b>	.053 (1.5x)	3	1/8	1-1/2	52635-C3	30.50
.035 .0350	<b>.005</b>	.105 (3x)	3	1/8	1-1/2	45635-C3	30.50
.035 .0350	<b>.005</b>	.187 (5x)	3	1/8	2-1/2	53835-C3	38.20
.9 mm .0354	<b>.10 mm</b>	2.70 mm (3x)	3	4 mm	50 mm	976820-C3	34.00

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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	AITIN 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 - .00mm					
	1.0 mm	.0393	<b>.10 mm</b>	1.50 mm (1.5x)	3	4 mm	50 mm	985622-C3	34.00
	1.0 mm	.0393	<b>.10 mm</b>	3.00 mm (3x)	3	4 mm	50 mm	976822-C3	34.00
.040		.0400	<b>.005</b>	.060 (1.5x)	3	1/8	1-1/2	52640-C3	30.50
.040		.0400	<b>.005</b>	.120 (3x)	3	1/8	1-1/2	45640-C3	30.50
.040		.0400	<b>.005</b>	.203 (5x)	3	1/8	2-1/2	53840-C3	38.20
	1.1 mm	.0433	<b>.10 mm</b>	3.00 mm (3x)	3	4 mm	50 mm	976824-C3	34.00
.045		.0450	<b>.005</b>	.068 (1.5x)	3	1/8	1-1/2	52645-C3	30.50
.045		.0450	<b>.005</b>	.135 (3x)	3	1/8	1-1/2	45645-C3	30.50
.045		.0450	<b>.005</b>	.225 (5x)	3	1/8	2-1/2	53845-C3	38.20
.047 (3/64)		.0470	<b>.005</b>	.071 (1.5x)	3	1/8	1-1/2	52647-C3	30.40
.047 (3/64)		.0470	<b>.005</b>	.141 (3x)	3	1/8	1-1/2	45647-C3	30.40
.047 (3/64)		.0470	<b>.005</b>	.250 (5x)	3	1/8	2-1/2	53847-C3	38.20
.047 (3/64)		.0470	<b>.010</b>	.141 (3x)	3	1/8	1-1/2	907247-C3	30.40
.047 (3/64)		.0470	<b>.015</b>	.141 (3x)	3	1/8	1-1/2	903447-C3	30.40
	1.2 mm	.0472	<b>.10 mm</b>	1.80 mm (1.5x)	3	4 mm	50 mm	985627-C3	34.00
	1.2 mm	.0472	<b>.10 mm</b>	3.50 mm (3x)	3	4 mm	50 mm	976827-C3	34.00
.050		.0500	<b>.005</b>	.075 (1.5x)	3	1/8	1-1/2	52650-C3	30.50
.050		.0500	<b>.005</b>	.150 (3x)	3	1/8	1-1/2	45650-C3	30.50
.050		.0500	<b>.005</b>	.250 (5x)	3	1/8	2-1/2	53850-C3	38.20
	1.3 mm	.0511	<b>.10 mm</b>	4.00 mm (3x)	3	4 mm	50 mm	976829-C3	34.00
.055		.0550	<b>.005</b>	.083 (1.5x)	3	1/8	1-1/2	52655-C3	30.50
.055		.0550	<b>.005</b>	.165 (3x)	3	1/8	1-1/2	45655-C3	30.50
.055		.0550	<b>.005</b>	.275 (5x)	3	1/8	2-1/2	53855-C3	38.20
	1.4 mm	.0551	<b>.10 mm</b>	2.10 mm (1.5x)	3	4 mm	50 mm	985631-C3	34.00
	1.4 mm	.0551	<b>.10 mm</b>	4.00 mm (3x)	3	4 mm	50 mm	976831-C3	34.00
	1.5 mm	.0590	<b>.20 mm</b>	2.20 mm (1.5x)	3	4 mm	50 mm	985633-C3	32.00
	1.5 mm	.0590	<b>.20 mm</b>	4.50 mm (3x)	3	4 mm	50 mm	976833-C3	32.00
.060		.0600	<b>.010</b>	.090 (1.5x)	3	1/8	1-1/2	52660-C3	30.50
.060		.0600	<b>.010</b>	.180 (3x)	3	1/8	1-1/2	45660-C3	30.50
.060		.0600	<b>.010</b>	.312 (5x)	3	1/8	2-1/2	53860-C3	38.20
.062 (1/16)		.0620	<b>.005</b>	.093 (1.5x)	3	1/8	1-1/2	881862-C3	28.20
.062 (1/16)		.0620	<b>.005</b>	.186 (3x)	3	1/8	1-1/2	913862-C3	28.20
.062 (1/16)		.0620	<b>.010</b>	.093 (1.5x)	3	1/8	1-1/2	52662-C3	28.20
.062 (1/16)		.0620	<b>.010</b>	.186 (3x)	3	1/8	1-1/2	45662-C3	28.20
.062 (1/16)		.0620	<b>.010</b>	.312 (5x)	3	1/8	2-1/2	53862-C3	36.80
.062 (1/16)		.0620	<b>.015</b>	.186 (3x)	3	1/8	1-1/2	903462-C3	28.20
.062 (1/16)		.0620	<b>.020</b>	.186 (3x)	3	1/8	1-1/2	931362-C3	28.20
	1.6 mm	.0629	<b>.20 mm</b>	2.40 mm (1.5x)	3	4 mm	50 mm	985636-C3	32.00
	1.6 mm	.0629	<b>.20 mm</b>	5.00 mm (3x)	3	4 mm	50 mm	976836-C3	32.00
	1.7 mm	.0669	<b>.20 mm</b>	5.00 mm (3x)	3	4 mm	50 mm	976838-C3	32.00
.070		.0700	<b>.010</b>	.105 (1.5x)	3	1/8	1-1/2	52670-C3	28.30
.070		.0700	<b>.010</b>	.210 (3x)	3	1/8	1-1/2	45670-C3	28.30
	1.8 mm	.0708	<b>.20 mm</b>	2.70 mm (1.5x)	3	4 mm	50 mm	985640-C3	32.00
	1.8 mm	.0708	<b>.20 mm</b>	5.50 mm (3x)	3	4 mm	50 mm	976840-C3	32.00

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# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Corner Radius (cont.)



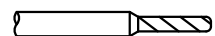
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MEDIUM ALLOY STEELS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AISI 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					
1.9 mm	.0748		<b>.20 mm</b>	5.50 mm (3x)	3	4 mm	50 mm	976842-C3	32.00
.078 (5/64)	.0780		<b>.005</b>	.234 (3x)	3	1/8	1-1/2	913878-C3	28.30
.078 (5/64)	.0780		<b>.010</b>	.118 (1.5x)	3	1/8	1-1/2	52678-C3	28.30
.078 (5/64)	.0780		<b>.010</b>	.234 (3x)	3	1/8	1-1/2	45678-C3	28.30
.078 (5/64)	.0780		<b>.010</b>	.406 (5x)	3	1/8	2-1/2	53878-C3	36.80
.078 (5/64)	.0780		<b>.015</b>	.234 (3x)	3	1/8	1-1/2	903478-C3	28.30
.078 (5/64)	.0780		<b>.020</b>	.234 (3x)	3	1/8	1-1/2	931378-C3	28.30
2.0 mm	.0787		<b>.20 mm</b>	3.00 mm (1.5x)	3	4 mm	50 mm	985645-C3	32.00
2.0 mm	.0787		<b>.20 mm</b>	6.00 mm (3x)	3	4 mm	50 mm	976845-C3	32.00
.080	.0800		<b>.010</b>	.240 (3x)	3	1/8	1-1/2	45680-C3	28.30
.090	.0900		<b>.010</b>	.270 (3x)	3	1/8	1-1/2	45690-C3	28.30
.093 (3/32)	.0930		<b>.005</b>	.279 (3x)	3	1/8	1-1/2	913893-C3	28.20
.093 (3/32)	.0930		<b>.010</b>	.140 (1.5x)	3	1/8	1-1/2	52693-C3	28.20
.093 (3/32)	.0930		<b>.010</b>	.279 (3x)	3	1/8	1-1/2	45693-C3	28.20
.093 (3/32)	.0930		<b>.010</b>	.500 (5x)	3	1/8	2-1/2	53893-C3	36.80
.093 (3/32)	.0930		<b>.015</b>	.279 (3x)	3	1/8	1-1/2	903493-C3	28.20
.093 (3/32)	.0930		<b>.020</b>	.279 (3x)	3	1/8	1-1/2	931393-C3	28.20
.093 (3/32)	.0930		<b>.030</b>	.279 (3x)	3	1/8	1-1/2	927893-C3	33.10
2.5 mm	.0984		<b>.20 mm</b>	3.70 mm (1.5x)	3	4 mm	50 mm	985651-C3	32.00
2.5 mm	.0984		<b>.20 mm</b>	7.50 mm (3x)	3	4 mm	50 mm	976851-C3	32.00
.100	.1000		<b>.010</b>	.150 (1.5x)	3	1/8	1-1/2	52700-C3	28.30
.100	.1000		<b>.010</b>	.300 (3x)	3	1/8	1-1/2	45700-C3	28.30
.100	.1000		<b>.010</b>	.500 (5x)	3	1/8	2-1/2	53900-C3	36.50
.109 (7/64)	.1090		<b>.010</b>	.164 (1.5x)	3	1/8	1-1/2	52702-C3	28.30
.109 (7/64)	.1090		<b>.010</b>	.327 (3x)	3	1/8	1-1/2	45702-C3	28.30
3.0 mm	.1181		<b>.20 mm</b>	4.50 mm (1.5x)	3	4 mm	50 mm	985657-C3	32.00
3.0 mm	.1181		<b>.20 mm</b>	9.00 mm (3x)	3	4 mm	50 mm	976857-C3	32.00

D <sub>1</sub>	decimal equivalent	R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .000"		+ .001"	+ .030"					
-.002"		-.001"	-.000"					
.125 (1/8)	.1250	<b>.005</b>	.375 (3x)	4	1/8	1-1/2	913908-C3	28.30
.125 (1/8)	.1250	<b>.010</b>	.375 (3x)	4	1/8	1-1/2	907308-C3	27.10
.125 (1/8)	.1250	<b>.015</b>	.187 (1.5x)	4	1/8	1-1/2	52708-C3	27.10
.125 (1/8)	.1250	<b>.015</b>	.375 (3x)	4	1/8	1-1/2	45708-C3	27.10
.125 (1/8)	.1250	<b>.015</b>	.625 (5x)	4	1/8	2-1/2	53908-C3	36.80
.125 (1/8)	.1250	<b>.020</b>	.375 (3x)	4	1/8	1-1/2	931408-C3	27.10
.125 (1/8)	.1250	<b>.030</b>	.375 (3x)	4	1/8	1-1/2	927908-C3	32.10
.140 (9/64)	.1406	<b>.015</b>	.220 (1.5x)	4	3/16	2	52709-C3	34.10
.140 (9/64)	.1406	<b>.015</b>	.425 (3x)	4	3/16	2	45709-C3	34.10
.156 (5/32)	.1562	<b>.015</b>	.235 (1.5x)	4	3/16	2	52710-C3	30.70
.156 (5/32)	.1562	<b>.015</b>	.470 (3x)	4	3/16	2	45710-C3	30.70
<b>NEW</b> .156 (5/32)	.1562	<b>.030</b>	.470 (3x)	4	3/16	2	927910-C3	35.60
.156 (5/32)	.1562	<b>.015</b>	.750 (5x)	4	3/16	3	53910-C3	39.80

continued on next page



# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Corner Radius (cont.)

**mm & in** continued from previous page

MEDIUM ALLOY STEELS

CUTTER DIAMETER		CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AISI IN 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
.187 (3/16)	.1875	<b>.005</b>	.562 (3x)	4	3/16	2	913912-C3	30.60
.187 (3/16)	.1875	<b>.015</b>	.285 (1.5x)	4	3/16	2	52712-C3	29.40
.187 (3/16)	.1875	<b>.015</b>	.562 (3x)	4	3/16	2	45712-C3	29.40
.187 (3/16)	.1875	<b>.015</b>	1.000 (5x)	4	3/16	3	53912-C3	39.80
.187 (3/16)	.1875	<b>.030</b>	.562 (3x)	4	3/16	2	927912-C3	34.30
.187 (3/16)	.1875	<b>.060</b>	.562 (3x)	4	3/16	2	816812-C3	34.30
.250 (1/4)	.2500	<b>.015</b>	.375 (1.5x)	4	1/4	2-1/2	52716-C3	37.10
.250 (1/4)	.2500	<b>.015</b>	.750 (3x)	4	1/4	2-1/2	45716-C3	37.10
.250 (1/4)	.2500	<b>.015</b>	1.250 (5x)	4	1/4	4	53916-C3	49.40
.312 (5/16)	.3125	<b>.015</b>	.470 (1.5x)	4	5/16	2-1/2	52720-C3	54.40
.312 (5/16)	.3125	<b>.015</b>	1.000 (3x)	4	5/16	2-1/2	45720-C3	54.40
.375 (3/8)	.3750	<b>.015</b>	.570 (1.5x)	4	3/8	2-1/2	52724-C3	63.20
.375 (3/8)	.3750	<b>.015</b>	1.125 (3x)	4	3/8	2-1/2	45724-C3	63.20
.500 (1/2)	.5000	<b>.030</b>	.750 (1.5x)	4	1/2	3	52732-C3	81.80

NEW

NEW

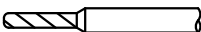
NEW

PLEASE SEE SPEEDS & FEEDS ON PAGE 139



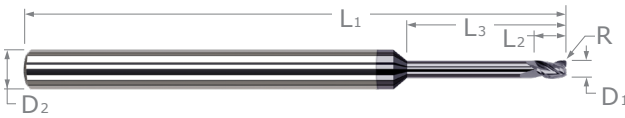
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# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Corner Radius – Long Reach, Stub Flute

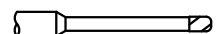


- Optimized for readily machinable medium alloy steels, stainless steels, and tool steels
- Long reach design for deep cavities
- Reduced neck diameter to avoid heeling
- Variable helix design (approx. 37°) reduces chatter and harmonics and increases material removal rates
- Corner radius for improved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

mm & in

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"	+ .00mm	decimal	+ .001"	+ .010"	+ .010"					
- .0005"	- .02mm	equivalent	- .001"	- .000"	- .000"					
			+ .025mm	+ .25mm	+ .25mm					
			- .025mm	- .00mm	- .00mm					
.015 (1/64)		.0150	.003	.022	.078 (5x)	3	1/8	2-1/2	62415-C3	55.00
.015 (1/64)		.0150	.003	.022	.125 (8x)	3	1/8	2-1/2	55015-C3	56.10
.015 (1/64)		.0150	.003	.022	.187 (12x)	3	1/8	2-1/2	63815-C3	61.50
	.4 mm	.0157	.08 mm	.60 mm	2.0 mm (5x)	3	4 mm	50 mm	986709-C3	60.90
	.4 mm	.0157	.08 mm	.60 mm	3.2 mm (8x)	3	4 mm	50 mm	978009-C3	62.10
	.4 mm	.0157	.08 mm	.60 mm	4.8 mm (12x)	3	4 mm	50 mm	982309-C3	67.40
	.5 mm	.0196	.10 mm	.75 mm	2.5 mm (5x)	3	4 mm	50 mm	986711-C3	58.50
	.5 mm	.0196	.10 mm	.75 mm	4.0 mm (8x)	3	4 mm	50 mm	978011-C3	59.60
	.5 mm	.0196	.10 mm	.75 mm	6.0 mm (12x)	3	4 mm	50 mm	982311-C3	65.20
	.5 mm	.0196	.10 mm	.75 mm	8.0 mm (16x)	3	4 mm	50 mm	975511-C3	68.20
.020		.0200	.004	.030	.100 (5x)	3	1/8	2-1/2	62420-C3	52.40
.020		.0200	.004	.030	.160 (8x)	3	1/8	2-1/2	55020-C3	53.60
.020		.0200	.004	.030	.250 (12x)	3	1/8	2-1/2	63820-C3	59.30
	.6 mm	.0236	.10 mm	.90 mm	3.0 mm (5x)	3	4 mm	50 mm	986713-C3	57.20
	.6 mm	.0236	.10 mm	.90 mm	4.8 mm (8x)	3	4 mm	50 mm	978013-C3	58.50
	.6 mm	.0236	.10 mm	.90 mm	7.2 mm (12x)	3	4 mm	50 mm	982313-C3	62.40
.025		.0250	.004	.038	.125 (5x)	3	1/8	2-1/2	62425-C3	51.00
.025		.0250	.004	.038	.203 (8x)	3	1/8	2-1/2	55025-C3	52.40
.025		.0250	.004	.038	.312 (12x)	3	1/8	2-1/2	63825-C3	57.70
.031 (1/32)		.0310	.005	.047	.156 (5x)	3	1/8	2-1/2	62431-C3	48.30
.031 (1/32)		.0310	.005	.047	.250 (8x)	3	1/8	2-1/2	55031-C3	49.40
.031 (1/32)		.0310	.005	.047	.375 (12x)	3	1/8	2-1/2	63831-C3	51.50
	.8 mm	.0314	.10 mm	1.20 mm	4.0 mm (5x)	3	4 mm	50 mm	986718-C3	52.80
	.8 mm	.0314	.10 mm	1.20 mm	6.5 mm (8x)	3	4 mm	50 mm	978018-C3	53.80
	.8 mm	.0314	.10 mm	1.20 mm	9.5 mm (12x)	3	4 mm	50 mm	982318-C3	55.80
.035		.0350	.005	.053	.187 (5x)	3	1/8	2-1/2	62435-C3	48.60
	1.0 mm	.0393	.10 mm	1.50 mm	5.0 mm (5x)	3	4 mm	50 mm	986722-C3	52.80
	1.0 mm	.0393	.10 mm	1.50 mm	8.0 mm (8x)	3	4 mm	50 mm	978022-C3	53.80
	1.0 mm	.0393	.10 mm	1.50 mm	12.0 mm (12x)	3	4 mm	50 mm	982322-C3	55.80
	1.0 mm	.0393	.10 mm	1.50 mm	16.0 mm (16x)	3	4 mm	50 mm	975522-C3	59.00
.040		.0400	.005	.060	.203 (5x)	3	1/8	2-1/2	62440-C3	48.60
.045		.0450	.005	.068	.225 (5x)	3	1/8	2-1/2	62445-C3	48.60
.047 (3/64)		.0470	.005	.070	.250 (5x)	3	1/8	2-1/2	62447-C3	48.60
.047 (3/64)		.0470	.005	.070	.375 (8x)	3	1/8	2-1/2	55047-C3	49.40
.047 (3/64)		.0470	.005	.070	.570 (12x)	3	1/8	2-1/2	63847-C3	51.50

continued on next page



# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

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

**mm & in** continued from previous page

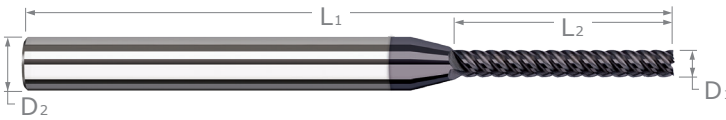
MEDIUM ALLOY STEELS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AISI IN 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>	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm		+ .001" - .001" + .025mm - .025mm	+ .010" - .000" + .25mm - .00mm	+ .010" - .000" + .25mm - .00mm					
.050		.0500	.005	.075	.250 (5x)	3	1/8	2-1/2	62450-C3	48.00
.055		.0550	.005	.083	.275 (5x)	3	1/8	2-1/2	62455-C3	48.00
	1.5 mm	.0590	.20 mm	2.20 mm	7.5 mm (5x)	3	4 mm	50 mm	986733-C3	52.80
	1.5 mm	.0590	.20 mm	2.20 mm	12.0 mm (8x)	3	4 mm	50 mm	978033-C3	53.80
	1.5 mm	.0590	.20 mm	2.20 mm	18.0 mm (12x)	3	4 mm	50 mm	982333-C3	55.80
	1.5 mm	.0590	.20 mm	2.20 mm	24.0 mm (16x)	3	4 mm	63 mm	975533-C3	59.00
.060		.0600	.010	.090	.312 (5x)	3	1/8	2-1/2	62460-C3	48.60
.062 (1/16)		.0620	.005	.093	.312 (5x)	3	1/8	2-1/2	815662-C3	50.40 NEW
.062 (1/16)		.0620	.005	.093	.500 (8x)	3	1/8	2-1/2	816562-C3	51.50 NEW
.062 (1/16)		.0620	.010	.093	.312 (5x)	3	1/8	2-1/2	62462-C3	48.30
.062 (1/16)		.0620	.010	.093	.500 (8x)	3	1/8	2-1/2	55062-C3	49.40
.062 (1/16)		.0620	.010	.093	.750 (12x)	3	1/8	2-1/2	63862-C3	51.50
.078 (5/64)		.0780	.010	.117	.406 (5x)	3	1/8	2-1/2	62478-C3	48.30
.078 (5/64)		.0780	.010	.117	.625 (8x)	3	1/8	2-1/2	55078-C3	49.40
.078 (5/64)		.0780	.010	.117	.940 (12x)	3	1/8	2-1/2	63878-C3	51.50
	2.0 mm	.0787	.20 mm	3.00 mm	10.0 mm (5x)	3	4 mm	50 mm	986745-C3	52.80
	2.0 mm	.0787	.20 mm	3.00 mm	16.0 mm (8x)	3	4 mm	50 mm	978045-C3	53.80
	2.0 mm	.0787	.20 mm	3.00 mm	24.0 mm (12x)	3	4 mm	63 mm	982345-C3	55.80
	2.0 mm	.0787	.20 mm	3.00 mm	32.0 mm (16x)	3	4 mm	63 mm	975545-C3	59.00
.093 (3/32)		.0930	.005	.139	.500 (5x)	3	1/8	2-1/2	815693-C3	50.40 NEW
.093 (3/32)		.0930	.005	.139	.750 (8x)	3	1/8	2-1/2	816593-C3	51.50 NEW
.093 (3/32)		.0930	.010	.139	.500 (5x)	3	1/8	2-1/2	62493-C3	48.30
.093 (3/32)		.0930	.010	.139	.750 (8x)	3	1/8	2-1/2	55093-C3	49.40
.093 (3/32)		.0930	.010	.139	1.125 (12x)	3	1/8	2-1/2	63893-C3	51.50
.100		.1000	.010	.150	.500 (5x)	3	1/8	2-1/2	62500-C3	49.40
	3.0 mm	.1181	.20 mm	4.50 mm	15.0 mm (5x)	3	4 mm	50 mm	986757-C3	50.00
D <sub>1</sub>		decimal equivalent	R	L <sub>2</sub>	L <sub>3</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .000" - .002"			+ .001" - .001"	+ .030" - .000"	+ .030" - .000"					
.125 (1/8)		.1250	.010	.187	.625 (5x)	4	1/8	2-1/2	815708-C3	48.00 NEW
.125 (1/8)		.1250	.010	.187	1.000 (8x)	4	1/8	2-1/2	816608-C3	49.10 NEW
.125 (1/8)		.1250	.015	.187	.625 (5x)	4	1/8	2-1/2	62508-C3	48.00
.125 (1/8)		.1250	.015	.187	1.000 (8x)	4	1/8	2-1/2	55108-C3	49.10
.125 (1/8)		.1250	.015	.187	1.500 (12x)	4	1/8	3	63908-C3	51.50
.156 (5/32)		.1562	.015	.235	.750 (5x)	4	3/16	3	62510-C3	53.00
.156 (5/32)		.1562	.015	.235	1.250 (8x)	4	3/16	3	55110-C3	54.20
.156 (5/32)		.1562	.015	.235	1.875 (12x)	4	3/16	4	63910-C3	66.30
.156 (5/32)		.1562	.030	.235	1.250 (8x)	4	3/16	3	817310-C3	59.20 NEW
.187 (3/16)		.1875	.015	.281	1.000 (5x)	4	3/16	3	62512-C3	53.00
.187 (3/16)		.1875	.015	.281	1.500 (8x)	4	3/16	3	55112-C3	54.20
.187 (3/16)		.1875	.015	.281	2.250 (12x)	4	3/16	4	63912-C3	66.30
.187 (3/16)		.1875	.030	.281	1.500 (8x)	4	3/16	3	817312-C3	59.20 NEW
.250 (1/4)		.2500	.015	.375	1.250 (5x)	4	1/4	4	62516-C3	59.00
.250 (1/4)		.2500	.015	.375	2.000 (8x)	4	1/4	4	55116-C3	60.10
.250 (1/4)		.2500	.015	.375	3.000 (12x)	4	1/4	6	63916-C3	73.30

PLEASE SEE SPEEDS & FEEDS ON PAGE 141

# 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			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		.60 mm (3x)	4	4 mm	50 mm	977704-C6	51.00
.2 mm	.0078		1.00 mm (5x)	4	4 mm	50 mm	980104-C6	59.00
.2 mm	.0078		1.60 mm (8x)	4	4 mm	50 mm	981704-C6	60.40
.3 mm	.0118		.90 mm (3x)	4	4 mm	50 mm	977706-C6	47.20
.015 (1/64)	.0150		.045 (3x)	4	1/8	1-1/2	24315-C6	41.40
.015 (1/64)	.0150		.078 (5x)	4	1/8	2-1/2	53315-C6	51.40
.015 (1/64)	.0150		.125 (8x)	4	1/8	2-1/2	62815-C6	53.00
.4 mm	.0157		1.20 mm (3x)	4	4 mm	50 mm	977709-C6	44.90
.4 mm	.0157		2.00 mm (5x)	4	4 mm	50 mm	980109-C6	53.00
.4 mm	.0157		3.20 mm (8x)	4	4 mm	50 mm	981709-C6	54.20
.5 mm	.0196		1.50 mm (3x)	4	4 mm	50 mm	977711-C6	44.30
.5 mm	.0196		2.50 mm (5x)	4	4 mm	50 mm	980111-C6	51.50
.5 mm	.0196		4.00 mm (8x)	4	4 mm	50 mm	981711-C6	53.40
.020	.0200		.030 (1.5x)	4	1/8	1-1/2	935920-C6	40.70
.020	.0200		.060 (3x)	4	1/8	1-1/2	24320-C6	40.70
.020	.0200		.100 (5x)	4	1/8	2-1/2	53320-C6	51.00
.020	.0200		.160 (8x)	4	1/8	2-1/2	62820-C6	52.00
.6 mm	.0236		1.80 mm (3x)	4	4 mm	50 mm	977713-C6	44.30
.6 mm	.0236		3.00 mm (5x)	4	4 mm	50 mm	980113-C6	51.50
.6 mm	.0236		4.80 mm (8x)	4	4 mm	50 mm	981713-C6	53.40
.025	.0250		.038 (1.5x)	4	1/8	1-1/2	935925-C6	38.20
.025	.0250		.075 (3x)	4	1/8	1-1/2	24325-C6	38.20
.025	.0250		.125 (5x)	4	1/8	2-1/2	53325-C6	49.40
.025	.0250		.203 (8x)	4	1/8	2-1/2	62825-C6	50.40
.7 mm	.0275		2.10 mm (3x)	4	4 mm	50 mm	977715-C6	44.30
.031 (1/32)	.0310		.047 (1.5x)	5	1/8	1-1/2	935931-C6	34.00
.031 (1/32)	.0310		.093 (3x)	5	1/8	1-1/2	24331-C6	34.00
.031 (1/32)	.0310		.125 (4x)	5	1/8	2-1/2	835331-C6	47.00
.031 (1/32)	.0310		.156 (5x)	5	1/8	2-1/2	53331-C6	47.50
.031 (1/32)	.0310		.250 (8x)	5	1/8	2-1/2	62831-C6	48.30
.031 (1/32)	.0310		.312 (10x)	5	1/8	2-1/2	882431-C6	55.40
.031 (1/32)	.0310		.375 (12x)	5	1/8	2-1/2	68531-C6	59.60

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					
.8 mm	.0314		<b>2.40 mm</b> (3x)	5	4 mm	50 mm	977718-C6	39.00
.8 mm	.0314		<b>4.00 mm</b> (5x)	5	4 mm	50 mm	980118-C6	48.60
.8 mm	.0314		<b>6.50 mm</b> (8x)	5	4 mm	50 mm	981718-C6	50.00
.9 mm	.0354		<b>2.70 mm</b> (3x)	5	4 mm	50 mm	977720-C6	39.00
1.0 mm	.0393		<b>3.00 mm</b> (3x)	5	4 mm	50 mm	977722-C6	39.00
1.0 mm	.0393		<b>5.00 mm</b> (5x)	5	4 mm	50 mm	980122-C6	48.60
1.0 mm	.0393		<b>8.00 mm</b> (8x)	5	4 mm	50 mm	981722-C6	50.00
.040	.0400		<b>.060</b> (1.5x)	5	1/8	1-1/2	935940-C6	34.00
.040	.0400		<b>.120</b> (3x)	5	1/8	1-1/2	24340-C6	34.00
.040	.0400		<b>.203</b> (5x)	5	1/8	2-1/2	53340-C6	47.50
.040	.0400		<b>.325</b> (8x)	5	1/8	2-1/2	62840-C6	48.30
1.1 mm	.0433		<b>3.00 mm</b> (3x)	5	4 mm	50 mm	977724-C6	39.00
.047 (3/64)	.0470		<b>.071</b> (1.5x)	5	1/8	1-1/2	935947-C6	34.00
.047 (3/64)	.0470		<b>.141</b> (3x)	5	1/8	1-1/2	24347-C6	34.00
.047 (3/64)	.0470		<b>.250</b> (5x)	5	1/8	2-1/2	53347-C6	47.50
.047 (3/64)	.0470		<b>.375</b> (8x)	5	1/8	2-1/2	62847-C6	48.30
.047 (3/64)	.0470		<b>.480</b> (10x)	5	1/8	2-1/2	882447-C6	55.40
.047 (3/64)	.0470		<b>.570</b> (12x)	5	1/8	2-1/2	68547-C6	59.60
1.2 mm	.0472		<b>3.50 mm</b> (3x)	5	4 mm	50 mm	977727-C6	39.00
1.2 mm	.0472		<b>6.00 mm</b> (5x)	5	4 mm	50 mm	980127-C6	48.60
1.2 mm	.0472		<b>9.50 mm</b> (8x)	5	4 mm	50 mm	981727-C6	50.00
.050	.0500		<b>.075</b> (1.5x)	5	1/8	1-1/2	935950-C6	34.00
.050	.0500		<b>.150</b> (3x)	5	1/8	1-1/2	24350-C6	34.00
.050	.0500		<b>.250</b> (5x)	5	1/8	2-1/2	53350-C6	47.50
.050	.0500		<b>.400</b> (8x)	5	1/8	2-1/2	62850-C6	48.30
1.3 mm	.0511		<b>4.00 mm</b> (3x)	5	4 mm	50 mm	977729-C6	39.00
1.4 mm	.0551		<b>4.00 mm</b> (3x)	5	4 mm	50 mm	977731-C6	39.00
1.4 mm	.0551		<b>7.00 mm</b> (5x)	5	4 mm	50 mm	980131-C6	48.60
1.4 mm	.0551		<b>11.00 mm</b> (8x)	5	4 mm	50 mm	981731-C6	50.00
1.5 mm	.0590		<b>4.50 mm</b> (3x)	5	4 mm	50 mm	977733-C6	37.70
1.5 mm	.0590		<b>7.50 mm</b> (5x)	5	4 mm	50 mm	980133-C6	47.20
1.5 mm	.0590		<b>12.00 mm</b> (8x)	5	4 mm	50 mm	981733-C6	48.90
.060	.0600		<b>.090</b> (1.5x)	5	1/8	1-1/2	935960-C6	34.00
.060	.0600		<b>.180</b> (3x)	5	1/8	1-1/2	24360-C6	34.00
.060	.0600		<b>.312</b> (5x)	5	1/8	2-1/2	53360-C6	47.50
.060	.0600		<b>.500</b> (8x)	5	1/8	2-1/2	62860-C6	48.30
.062 (1/16)	.0620		<b>.093</b> (1.5x)	5	1/8	1-1/2	935962-C6	32.00
.062 (1/16)	.0620		<b>.186</b> (3x)	5	1/8	1-1/2	24362-C6	32.00
.062 (1/16)	.0620		<b>.250</b> (4x)	5	1/8	2-1/2	835362-C6	44.20
.062 (1/16)	.0620		<b>.312</b> (5x)	5	1/8	2-1/2	53362-C6	44.70
.062 (1/16)	.0620		<b>.500</b> (8x)	5	1/8	2-1/2	62862-C6	45.40
.062 (1/16)	.0620		<b>.625</b> (10x)	5	1/8	2-1/2	882462-C6	56.40
.062 (1/16)	.0620		<b>.750</b> (12x)	5	1/8	2-1/2	68562-C6	63.60
.062 (1/16)	.0620		<b>.950</b> (15x)	5	1/8	2-1/2	68962-C6	80.10
1.6 mm	.0629		<b>5.00 mm</b> (3x)	5	4 mm	50 mm	977736-C6	37.70
1.6 mm	.0629		<b>8.00 mm</b> (5x)	5	4 mm	50 mm	980136-C6	47.50
1.6 mm	.0629		<b>13.00 mm</b> (8x)	5	4 mm	50 mm	981736-C6	48.30

continued on next page





## 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					
1.7 mm		.0669	<b>5.00 mm</b> (3x)	5	4 mm	50 mm	977738-C6	37.70
.070		.0700	<b>.210</b> (3x)	5	1/8	1-1/2	24370-C6	32.00
.070		.0700	<b>.375</b> (5x)	5	1/8	2-1/2	53370-C6	44.70
.070		.0700	<b>.570</b> (8x)	5	1/8	2-1/2	62870-C6	45.40
1.8 mm		.0708	<b>5.50 mm</b> (3x)	5	4 mm	50 mm	977740-C6	37.70
1.8 mm		.0708	<b>9.00 mm</b> (5x)	5	4 mm	50 mm	980140-C6	47.20
1.8 mm		.0708	<b>14.00 mm</b> (8x)	5	4 mm	50 mm	981740-C6	48.90
1.9 mm		.0748	<b>5.50 mm</b> (3x)	5	4 mm	50 mm	977742-C6	37.70
.078 (5/64)		.0780	<b>.117</b> (1.5x)	5	1/8	1-1/2	935978-C6	32.00
.078 (5/64)		.0780	<b>.234</b> (3x)	5	1/8	1-1/2	24378-C6	32.00
.078 (5/64)		.0780	<b>.406</b> (5x)	5	1/8	2-1/2	53378-C6	44.70
.078 (5/64)		.0780	<b>.625</b> (8x)	5	1/8	2-1/2	62878-C6	45.40
.078 (5/64)		.0780	<b>.800</b> (10x)	5	1/8	2-1/2	882478-C6	56.40
.078 (5/64)		.0780	<b>.940</b> (12x)	5	1/8	2-1/2	68578-C6	63.60
.078 (5/64)		.0780	<b>1.187</b> (15x)	5	1/8	2-1/2	68978-C6	80.10
2.0 mm		.0787	<b>6.00 mm</b> (3x)	5	4 mm	50 mm	977745-C6	37.70
2.0 mm		.0787	<b>10.00 mm</b> (5x)	5	4 mm	50 mm	980145-C6	47.20
2.0 mm		.0787	<b>16.00 mm</b> (8x)	5	4 mm	50 mm	981745-C6	48.90
.080		.0800	<b>.120</b> (1.5x)	5	1/8	1-1/2	935980-C6	32.00
.080		.0800	<b>.240</b> (3x)	5	1/8	1-1/2	24380-C6	32.00
.080		.0800	<b>.406</b> (5x)	5	1/8	2-1/2	53380-C6	44.70
.080		.0800	<b>.650</b> (8x)	5	1/8	2-1/2	62880-C6	45.40
.090		.0900	<b>.270</b> (3x)	5	1/8	1-1/2	24390-C6	32.00
.090		.0900	<b>.450</b> (5x)	5	1/8	2-1/2	53390-C6	44.70
.090		.0900	<b>.750</b> (8x)	5	1/8	2-1/2	62890-C6	45.40
.093 (3/32)		.0930	<b>.140</b> (1.5x)	5	1/8	1-1/2	935993-C6	32.00
.093 (3/32)		.0930	<b>.279</b> (3x)	5	1/8	1-1/2	24393-C6	32.00
.093 (3/32)		.0930	<b>.375</b> (4x)	5	1/8	2-1/2	835393-C6	44.20
.093 (3/32)		.0930	<b>.500</b> (5x)	5	1/8	2-1/2	53393-C6	44.70
.093 (3/32)		.0930	<b>.750</b> (8x)	5	1/8	2-1/2	62893-C6	45.40
.093 (3/32)		.0930	<b>.950</b> (10x)	5	1/8	2-1/2	882493-C6	56.40
.093 (3/32)		.0930	<b>1.125</b> (12x)	5	1/8	2-1/2	68593-C6	63.60
.093 (3/32)		.0930	<b>1.400</b> (15x)	5	1/8	3	68993-C6	80.80
2.5 mm		.0984	<b>7.50 mm</b> (3x)	5	4 mm	50 mm	977751-C6	37.70
.100		.1000	<b>.150</b> (1.5x)	5	1/8	1-1/2	936000-C6	32.00
.100		.1000	<b>.300</b> (3x)	5	1/8	1-1/2	24399-C6	32.00
.100		.1000	<b>.500</b> (5x)	5	1/8	2-1/2	53399-C6	44.70
.100		.1000	<b>.800</b> (8x)	5	1/8	2-1/2	53400-C6	45.40
.109 (7/64)		.1090	<b>.327</b> (3x)	5	1/8	1-1/2	24402-C6	32.20
.109 (7/64)		.1090	<b>.570</b> (5x)	5	1/8	2-1/2	63502-C6	44.70
3.0 mm		.1181	<b>9.00 mm</b> (3x)	5	4 mm	50 mm	977757-C6	37.70
3.0 mm		.1181	<b>15.00 mm</b> (5x)	5	4 mm	50 mm	980157-C6	46.80
3.0 mm		.1181	<b>24.00 mm</b> (8x)	5	4 mm	50 mm	981757-C6	49.10

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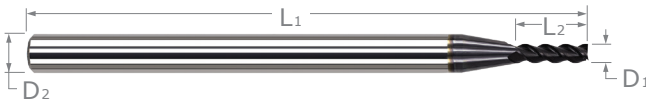
MEDIUM ALLOY STEELS





# VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

Square



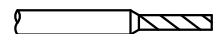
- Optimized for free machining varieties of carbon steels and stainless steels
- Variable helix design (approx. 38°) reduces chatter and harmonics and increases material removal rates
- AlTiN coated for improved lubricity and heat resistance
- h6 shank tolerance for high precision tool holders
- Center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

**mm & in**

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" - .0005"	+ .00mm - .02mm	decimal equivalent	+ .010" - .000" + .25mm - .00mm					
.015 (1/64)		.0150	<b>.023</b> (1.5x)	3	1/8	1-1/2	939815-C3	41.10
.015 (1/64)		.0150	<b>.045</b> (3x)	3	1/8	1-1/2	945715-C3	41.10
	.5 mm	.0196	<b>1.50 mm</b> (3x)	3	4 mm	50 mm	952411-C3	40.10
.020		.0200	<b>.060</b> (3x)	3	1/8	1-1/2	945720-C3	37.10
.025		.0250	<b>.075</b> (3x)	3	1/8	1-1/2	945725-C3	35.80
.031 (1/32)		.0310	<b>.047</b> (1.5x)	3	1/8	1-1/2	939831-C3	29.80
.031 (1/32)		.0310	<b>.093</b> (3x)	3	1/8	1-1/2	945731-C3	29.80
.031 (1/32)		.0310	<b>.156</b> (5x)	3	1/8	2-1/2	900531-C3	38.20
	1.0 mm	.0393	<b>1.50 mm</b> (1.5x)	3	4 mm	50 mm	926022-C3	33.30
	1.0 mm	.0393	<b>3.00 mm</b> (3x)	3	4 mm	50 mm	952422-C3	33.30
.040		.0400	<b>.120</b> (3x)	3	1/8	1-1/2	945740-C3	30.70
.047 (3/64)		.0470	<b>.071</b> (1.5x)	3	1/8	1-1/2	939847-C3	29.80
.047 (3/64)		.0470	<b>.141</b> (3x)	3	1/8	1-1/2	945747-C3	29.80
	1.5 mm	.0590	<b>4.50 mm</b> (3x)	3	4 mm	50 mm	952433-C3	31.50
.062 (1/16)		.0620	<b>.093</b> (1.5x)	3	1/8	1-1/2	939862-C3	27.90
.062 (1/16)		.0620	<b>.186</b> (3x)	3	1/8	1-1/2	945762-C3	27.90
.062 (1/16)		.0620	<b>.312</b> (5x)	3	1/8	2-1/2	900562-C3	36.50
.078 (5/64)		.0780	<b>.118</b> (1.5x)	3	1/8	1-1/2	939878-C3	27.90
.078 (5/64)		.0780	<b>.234</b> (3x)	3	1/8	1-1/2	945778-C3	27.90
	2.0 mm	.0787	<b>6.00 mm</b> (3x)	3	4 mm	50 mm	952445-C3	31.50
.093 (3/32)		.0930	<b>.140</b> (1.5x)	3	1/8	1-1/2	939893-C3	27.90
.093 (3/32)		.0930	<b>.279</b> (3x)	3	1/8	1-1/2	945793-C3	27.90
.093 (3/32)		.0930	<b>.500</b> (5x)	3	1/8	2-1/2	900593-C3	36.50
	3.0 mm	.1181	<b>4.50 mm</b> (1.5x)	3	4 mm	50 mm	926057-C3	31.50
	3.0 mm	.1181	<b>9.00 mm</b> (3x)	3	4 mm	50 mm	952457-C3	31.50
D <sub>1</sub> + .000" - .002"		decimal equivalent	L <sub>2</sub> + .030" - .000"		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.125 (1/8)		.1250	<b>.187</b> (1.5x)	4	1/8	1-1/2	939908-C3	26.70
.125 (1/8)		.1250	<b>.375</b> (3x)	4	1/8	1-1/2	945808-C3	26.70
.125 (1/8)		.1250	<b>.625</b> (5x)	4	1/8	2-1/2	900608-C3	36.30
.156 (5/32)		.1562	<b>.235</b> (1.5x)	4	3/16	2	939910-C3	29.90
.156 (5/32)		.1562	<b>.470</b> (3x)	4	3/16	2	945810-C3	29.90
.187 (3/16)		.1875	<b>.285</b> (1.5x)	4	3/16	2	939912-C3	28.80
.187 (3/16)		.1875	<b>.562</b> (3x)	4	3/16	2	945812-C3	28.80
.250 (1/4)		.2500	<b>.375</b> (1.5x)	4	1/4	2-1/2	939916-C3	36.50
.250 (1/4)		.2500	<b>.750</b> (3x)	4	1/4	2-1/2	945816-C3	36.50

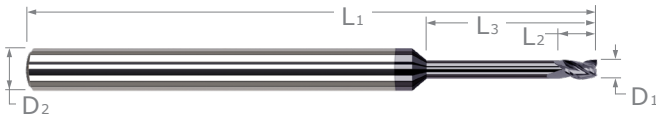
FREE MACHINING STEELS

**PLEASE SEE SPEEDS & FEEDS ON PAGE 158**



# 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

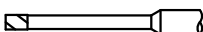
CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AlTiN COATED	
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$		$D_2$ (h6)	$L_1$	TOOL #	PRICE
.015 (1/64)	.023	<b>.078</b> (5x)	3	1/8	2-1/2	915015-C3	53.40
.015 (1/64)	.023	<b>.125</b> (8x)	3	1/8	2-1/2	920215-C3	54.40
.020	.030	<b>.100</b> (5x)	3	1/8	2-1/2	915020-C3	51.40
.020	.030	<b>.160</b> (8x)	3	1/8	2-1/2	920220-C3	52.60
.025	.038	<b>.125</b> (5x)	3	1/8	2-1/2	915025-C3	50.00
.025	.038	<b>.203</b> (8x)	3	1/8	2-1/2	920225-C3	51.20
.031 (1/32)	.047	<b>.093</b> (3x)	3	1/8	1-1/2	927331-C3	46.80
.031 (1/32)	.047	<b>.156</b> (5x)	3	1/8	2-1/2	915031-C3	47.20
.031 (1/32)	.047	<b>.250</b> (8x)	3	1/8	2-1/2	920231-C3	48.30
.031 (1/32)	.047	<b>.312</b> (10x)	3	1/8	2-1/2	909531-C3	50.00
.047 (3/64)	.071	<b>.250</b> (5x)	3	1/8	2-1/2	915047-C3	47.20
.047 (3/64)	.071	<b>.375</b> (8x)	3	1/8	2-1/2	920247-C3	48.30
.062 (1/16)	.093	<b>.186</b> (3x)	3	1/8	1-1/2	927362-C3	46.80
.062 (1/16)	.093	<b>.312</b> (5x)	3	1/8	2-1/2	915062-C3	47.20
.062 (1/16)	.093	<b>.500</b> (8x)	3	1/8	2-1/2	920262-C3	48.00
.062 (1/16)	.093	<b>.625</b> (10x)	3	1/8	2-1/2	909562-C3	50.00
.078 (5/64)	.118	<b>.406</b> (5x)	3	1/8	2-1/2	915078-C3	47.20
.078 (5/64)	.118	<b>.625</b> (8x)	3	1/8	2-1/2	920278-C3	48.00
.093 (3/32)	.140	<b>.279</b> (3x)	3	1/8	1-1/2	927393-C3	46.80
.093 (3/32)	.140	<b>.500</b> (5x)	3	1/8	2-1/2	915093-C3	47.20
.093 (3/32)	.140	<b>.750</b> (8x)	3	1/8	2-1/2	920293-C3	48.00
.093 (3/32)	.140	<b>.950</b> (10x)	3	1/8	2-1/2	909593-C3	50.00

continued on next page



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# 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> $\begin{matrix} +.000'' \\ -.002'' \end{matrix}$	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>		
.125 (1/8)	.187	<b>.375</b> (3x)	4	1/8	1-1/2	927408-C3	46.80
.125 (1/8)	.187	<b>.625</b> (5x)	4	1/8	2-1/2	915108-C3	47.20
.125 (1/8)	.187	<b>1.000</b> (8x)	4	1/8	2-1/2	920308-C3	48.00
.125 (1/8)	.187	<b>1.250</b> (10x)	4	1/8	2-1/2	909608-C3	50.00
.156 (5/32)	.235	<b>.750</b> (5x)	4	3/16	3	915110-C3	51.00
.187 (3/16)	.285	<b>1.000</b> (5x)	4	3/16	3	915112-C3	51.00
.250 (1/4)	.375	<b>1.250</b> (5x)	4	1/4	4	915116-C3	57.30

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								

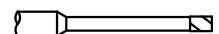
\* If less than minimum Axial or Radial DOC values are used, increased feed rates are possible. If greater than maximum Axial and Radial DOC values are used, decreased feed rates may be needed.



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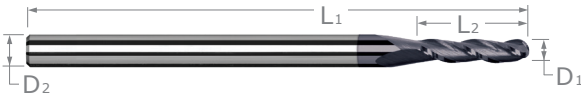
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# VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

## 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	
$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$		$D_2$ (h6)	$L_1$	TOOL #	PRICE
.015 (1/64)	<b>.045</b> (3x)	3	1/8	1-1/2	950015-C3	48.90
.031 (1/32)	<b>.047</b> (1.5x)	3	1/8	1-1/2	911531-C3	36.80
.031 (1/32)	<b>.093</b> (3x)	3	1/8	1-1/2	950031-C3	36.80
.047 (3/64)	<b>.141</b> (3x)	3	1/8	1-1/2	950047-C3	36.80
.062 (1/16)	<b>.093</b> (1.5x)	3	1/8	1-1/2	911562-C3	36.80
.062 (1/16)	<b>.186</b> (3x)	3	1/8	1-1/2	950062-C3	35.80
.078 (5/64)	<b>.234</b> (3x)	3	1/8	1-1/2	950078-C3	34.80
.093 (3/32)	<b>.140</b> (1.5x)	3	1/8	1-1/2	911593-C3	34.80
.093 (3/32)	<b>.279</b> (3x)	3	1/8	1-1/2	950093-C3	34.80

$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$		$D_2$ (h6)	$L_1$	TOOL #	PRICE
.125 (1/8)	<b>.187</b> (1.5x)	4	1/8	1-1/2	911608-C3	33.30
.125 (1/8)	<b>.375</b> (3x)	4	1/8	1-1/2	950108-C3	33.30
.156 (5/32)	<b>.470</b> (3x)	4	3/16	2	950110-C3	37.10
.187 (3/16)	<b>.562</b> (3x)	4	3/16	2	950112-C3	35.50
.250 (1/4)	<b>.750</b> (3x)	4	1/4	2-1/2	950116-C3	43.40

### 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).

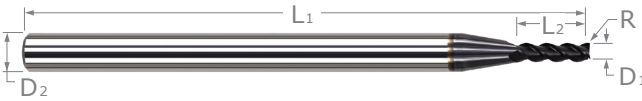
Material	Hardness (HBn)	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter												
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375	.500	
<b>Carbon Steels:</b> 10xx - 1030, 10Lxx, 11xx - 1140, 11Lxx, 12xx - 1215, 12Lxx	100-125	500	Slotting	.00013	.00026	.00040	.00053	.00067	.00079	.00099	.00148	.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
	Max	.00024	.00050	.00075	.00099	.00125	.00149	.00185	.00277	.00370	.00485	.00583	.00777		
<b>Stainless Steels:</b> 203 EZ, 303 (all types), 416, 416 Se, 416 Plus X, 420 F, 420 F Se	150-175	400	<b>Radial Depth of Cut*:</b>						<b>Axial Depth of Cut*:</b>						
	175-200	375	Slotting: 1x Dia						Slotting: .5x Dia						
			Roughing: .5x Dia						Roughing: .5x - 1x Dia						
	200-225	350	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

Corner Radius



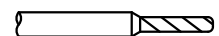
- ⚡ Optimized for free machining varieties of carbon steels and stainless steels
- ⚡ Variable helix design (approx. 38°) reduces chatter and harmonics and increases material removal rates
- ⚡ AlTiN coated for improved lubricity and heat resistance ⚡ h6 shank tolerance for high precision tool holders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

**mm & in**

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" - .0005"	+ .00mm - .02mm decimal equivalent	+ .001" - .001" + .25mm - .25mm	+ .010" - .000" + .25mm - .00mm					
.015 (1/64)	.0150	.002	.023 (1.5x)	3	1/8	1-1/2	969415-C3	42.50
.015 (1/64)	.0150	.002	.045 (3x)	3	1/8	1-1/2	971215-C3	42.50
.015 (1/64)	.0150	.002	.078 (5x)	3	1/8	2-1/2	980315-C3	51.50
.015 (1/64)	.0150	.005	.045 (3x)	3	1/8	1-1/2	859815-C3	42.50
.020	.0200	.002	.060 (3x)	3	1/8	1-1/2	971220-C3	37.40
.020	.0200	.005	.060 (3x)	3	1/8	1-1/2	859820-C3	37.30
.025	.0250	.002	.075 (3x)	3	1/8	1-1/2	971225-C3	36.00
.025	.0250	.005	.075 (3x)	3	1/8	1-1/2	859825-C3	36.00
.031 (1/32)	.0310	.003	.047 (1.5x)	3	1/8	1-1/2	969431-C3	30.50
.031 (1/32)	.0310	.003	.093 (3x)	3	1/8	1-1/2	971231-C3	30.50
.031 (1/32)	.0310	.003	.156 (5x)	3	1/8	2-1/2	980331-C3	38.20
.031 (1/32)	.0310	.005	.093 (3x)	3	1/8	1-1/2	859831-C3	30.40
.031 (1/32)	.0310	.010	.093 (3x)	3	1/8	1-1/2	856631-C3	32.60
1.0 mm	.0393	.08 mm	3.00 mm (3x)	3	4 mm	50 mm	901822-C3	33.60
.040	.0400	.003	.120 (3x)	3	1/8	1-1/2	971240-C3	30.50
.040	.0400	.005	.120 (3x)	3	1/8	1-1/2	859840-C3	30.40
.047 (3/64)	.0470	.003	.071 (1.5x)	3	1/8	1-1/2	969447-C3	30.50
.047 (3/64)	.0470	.003	.141 (3x)	3	1/8	1-1/2	971247-C3	30.50
.047 (3/64)	.0470	.003	.250 (5x)	3	1/8	2-1/2	980347-C3	38.20
.047 (3/64)	.0470	.005	.141 (3x)	3	1/8	1-1/2	859847-C3	30.40
.047 (3/64)	.0470	.010	.141 (3x)	3	1/8	1-1/2	856647-C3	30.40
.047 (3/64)	.0470	.015	.141 (3x)	3	1/8	1-1/2	857447-C3	32.60
.050	.0500	.003	.150 (3x)	3	1/8	1-1/2	971250-C3	30.40
.050	.0500	.005	.150 (3x)	3	1/8	1-1/2	859850-C3	30.40
.060	.0600	.005	.180 (3x)	3	1/8	1-1/2	971260-C3	30.40
.060	.0600	.010	.180 (3x)	3	1/8	1-1/2	856660-C3	30.40
.062 (1/16)	.0620	.005	.093 (1.5x)	3	1/8	1-1/2	969462-C3	28.30
.062 (1/16)	.0620	.005	.186 (3x)	3	1/8	1-1/2	971262-C3	28.30
.062 (1/16)	.0620	.005	.312 (5x)	3	1/8	2-1/2	980362-C3	36.80
.062 (1/16)	.0620	.010	.186 (3x)	3	1/8	1-1/2	856662-C3	28.30
.062 (1/16)	.0620	.020	.186 (3x)	3	1/8	1-1/2	858262-C3	30.50
.078 (5/64)	.0780	.005	.118 (1.5x)	3	1/8	1-1/2	969478-C3	28.30
.078 (5/64)	.0780	.005	.234 (3x)	3	1/8	1-1/2	971278-C3	28.30
.078 (5/64)	.0780	.005	.406 (5x)	3	1/8	2-1/2	980378-C3	36.80
.078 (5/64)	.0780	.010	.234 (3x)	3	1/8	1-1/2	856678-C3	28.30
.078 (5/64)	.0780	.020	.234 (3x)	3	1/8	1-1/2	858278-C3	30.50

continued on next page

FREE MACHINING STEELS



# VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

Corner Radius (cont.)



continued from previous page

FREE MACHINING STEELS

CUTTER DIAMETER		CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	A1TiN 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	31.80
.093 (3/32)	.0930	<b>.005</b>	.140 (1.5x)	3	1/8	1-1/2	969493-C3	28.30
.093 (3/32)	.0930	<b>.005</b>	.279 (3x)	3	1/8	1-1/2	971293-C3	28.30
.093 (3/32)	.0930	<b>.005</b>	.500 (5x)	3	1/8	2-1/2	980393-C3	36.80
.093 (3/32)	.0930	<b>.010</b>	.279 (3x)	3	1/8	1-1/2	856693-C3	28.30
.093 (3/32)	.0930	<b>.030</b>	.279 (3x)	3	1/8	1-1/2	859093-C3	30.50
.100	.1000	<b>.005</b>	.300 (3x)	3	1/8	1-1/2	971300-C3	28.30
3.0 mm	.1181	<b>.10 mm</b>	9.00 mm (3x)	3	4 mm	50 mm	901857-C3	31.80

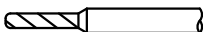
D <sub>1</sub> + .000" - .002"	decimal equivalent	R + .001" - .001"	L <sub>2</sub> + .030" - .000"		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
.125 (1/8)	.1250	<b>.005</b>	.187 (1.5x)	4	1/8	1-1/2	969508-C3	27.10
.125 (1/8)	.1250	<b>.005</b>	.375 (3x)	4	1/8	1-1/2	971308-C3	27.10
.125 (1/8)	.1250	<b>.005</b>	.625 (5x)	4	1/8	2-1/2	980408-C3	36.80
.125 (1/8)	.1250	<b>.010</b>	.375 (3x)	4	1/8	1-1/2	856708-C3	28.30
.125 (1/8)	.1250	<b>.030</b>	.375 (3x)	4	1/8	1-1/2	859108-C3	30.50
.156 (5/32)	.1562	<b>.010</b>	.235 (1.5x)	4	3/16	2	969510-C3	30.70
.156 (5/32)	.1562	<b>.010</b>	.470 (3x)	4	3/16	2	971310-C3	30.70
.156 (5/32)	.1562	<b>.010</b>	.750 (5x)	4	3/16	3	980410-C3	39.80
.187 (3/16)	.1875	<b>.010</b>	.285 (1.5x)	4	3/16	2	969512-C3	29.40
.187 (3/16)	.1875	<b>.010</b>	.562 (3x)	4	3/16	2	971312-C3	29.40
.187 (3/16)	.1875	<b>.010</b>	1.000 (5x)	4	3/16	3	980412-C3	39.80
.250 (1/4)	.2500	<b>.010</b>	.375 (1.5x)	4	1/4	2-1/2	969516-C3	37.10
.250 (1/4)	.2500	<b>.010</b>	.750 (3x)	4	1/4	2-1/2	971316-C3	37.10
.250 (1/4)	.2500	<b>.010</b>	1.250 (5x)	4	1/4	4	980416-C3	49.40
.312 (5/16)	.3125	<b>.010</b>	.470 (1.5x)	4	5/16	2-1/2	969520-C3	54.40
.312 (5/16)	.3125	<b>.010</b>	1.000 (3x)	4	5/16	2-1/2	971320-C3	54.40
.375 (3/8)	.3750	<b>.010</b>	.570 (1.5x)	4	3/8	2-1/2	969524-C3	63.20
.375 (3/8)	.3750	<b>.010</b>	1.125 (3x)	4	3/8	2-1/2	971324-C3	63.20
.500 (1/2)	.5000	<b>.015</b>	.750 (1.5x)	4	1/2	3	969532-C3	81.80

**PLEASE SEE SPEEDS & FEEDS ON PAGE 158**



View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

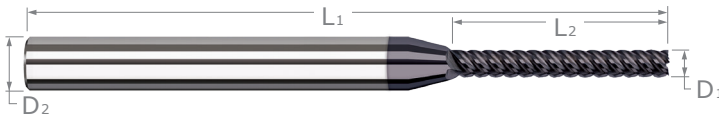
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# VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

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

**mm & in**

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AISI COATED	
D <sub>2</sub>			L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+0.0005" -0.0005"	+0.00mm -0.02mm	decimal equivalent	+0.010" -0.000" +0.25mm -0.00mm					
.015 (1/64)		.0150	<b>.045</b> (3x)	4	1/8	1-1/2	967815-C3	41.40
.015 (1/64)		.0150	<b>.078</b> (5x)	4	1/8	2-1/2	972415-C3	51.40
.015 (1/64)		.0150	<b>.125</b> (8x)	4	1/8	2-1/2	983615-C3	52.00
.020		.0200	<b>.060</b> (3x)	4	1/8	1-1/2	967820-C3	40.70
.020		.0200	<b>.100</b> (5x)	4	1/8	2-1/2	972420-C3	51.00
.025		.0250	<b>.075</b> (3x)	4	1/8	1-1/2	967825-C3	38.20
.025		.0250	<b>.125</b> (5x)	4	1/8	2-1/2	972425-C3	49.40
.031 (1/32)		.0310	<b>.047</b> (1.5x)	5	1/8	1-1/2	935131-C3	34.00
.031 (1/32)		.0310	<b>.093</b> (3x)	5	1/8	1-1/2	967831-C3	34.00
.031 (1/32)		.0310	<b>.156</b> (5x)	5	1/8	2-1/2	972431-C3	47.50
.031 (1/32)		.0310	<b>.250</b> (8x)	5	1/8	2-1/2	983631-C3	48.30
	1.0 mm	.0393	<b>3.00 mm</b> (3x)	5	4 mm	50 mm	921922-C3	39.00
	1.0 mm	.0393	<b>5.00 mm</b> (5x)	5	4 mm	50 mm	916422-C3	48.60
.040		.0400	<b>.120</b> (3x)	5	1/8	1-1/2	967840-C3	34.70
.040		.0400	<b>.203</b> (5x)	5	1/8	2-1/2	972440-C3	48.00
.047 (3/64)		.0470	<b>.141</b> (3x)	5	1/8	1-1/2	967847-C3	34.00
.047 (3/64)		.0470	<b>.250</b> (5x)	5	1/8	2-1/2	972447-C3	47.50
.047 (3/64)		.0470	<b>.375</b> (8x)	5	1/8	2-1/2	983647-C3	48.30
.050		.0500	<b>.150</b> (3x)	5	1/8	1-1/2	967850-C3	34.70
.050		.0500	<b>.250</b> (5x)	5	1/8	2-1/2	972450-C3	48.00
.060		.0600	<b>.180</b> (3x)	5	1/8	1-1/2	967860-C3	34.70
.060		.0600	<b>.312</b> (5x)	5	1/8	2-1/2	972460-C3	48.00
.062 (1/16)		.0620	<b>.093</b> (1.5x)	5	1/8	1-1/2	935162-C3	32.00
.062 (1/16)		.0620	<b>.186</b> (3x)	5	1/8	1-1/2	967862-C3	32.00
.062 (1/16)		.0620	<b>.312</b> (5x)	5	1/8	2-1/2	972462-C3	44.70
.062 (1/16)		.0620	<b>.500</b> (8x)	5	1/8	2-1/2	983662-C3	45.40
.078 (5/64)		.0780	<b>.234</b> (3x)	5	1/8	1-1/2	967878-C3	32.00
.078 (5/64)		.0780	<b>.406</b> (5x)	5	1/8	2-1/2	972478-C3	44.70
.078 (5/64)		.0780	<b>.625</b> (8x)	5	1/8	2-1/2	983678-C3	45.40
	2.0 mm	.0787	<b>6.00 mm</b> (3x)	5	4 mm	50 mm	921945-C3	37.70
	2.0 mm	.0787	<b>10.00 mm</b> (5x)	5	4 mm	50 mm	916445-C3	47.20

continued on next page

FREE MACHINING STEELS



# VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

Finishers – Square (cont.)

**mm & in** continued from previous page

FREE MACHINING STEELS

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AISI IN COATED	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .0005"	+ .00mm		+ .010"					
- .0005"	- .02mm		- .000"					
			+ .25mm					
			- .00mm					
.093 (3/32)		.0930	<b>.140</b> (1.5x)	5	1/8	1-1/2	935193-C3	32.00
.093 (3/32)		.0930	<b>.279</b> (3x)	5	1/8	1-1/2	967893-C3	32.00
.093 (3/32)		.0930	<b>.500</b> (5x)	5	1/8	2-1/2	972493-C3	44.70
.093 (3/32)		.0930	<b>.750</b> (8x)	5	1/8	2-1/2	983693-C3	45.40
.100		.1000	<b>.300</b> (3x)	5	1/8	1-1/2	967900-C3	32.50
.100		.1000	<b>.500</b> (5x)	5	1/8	2-1/2	972500-C3	44.70
	3.0 mm	.1181	<b>9.00 mm</b> (3x)	5	4 mm	50 mm	921957-C3	37.70
	3.0 mm	.1181	<b>15.00 mm</b> (5x)	5	4 mm	50 mm	916457-C3	47.20
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE
+ .000"			+ .030"					
- .002"			- .000"					
.125 (1/8)		.1250	<b>.187</b> (1.5x)	5	1/8	1-1/2	935208-C3	30.40
.125 (1/8)		.1250	<b>.375</b> (3x)	5	1/8	1-1/2	967908-C3	30.40
.125 (1/8)		.1250	<b>.625</b> (5x)	5	1/8	2-1/2	972508-C3	43.70
.125 (1/8)		.1250	<b>1.000</b> (8x)	5	1/8	2-1/2	983708-C3	44.70
.156 (5/32)		.1562	<b>.470</b> (3x)	5	3/16	2	967910-C3	34.70
.156 (5/32)		.1562	<b>.750</b> (5x)	5	3/16	3	972510-C3	46.50
.187 (3/16)		.1875	<b>.570</b> (3x)	5	3/16	2	967912-C3	34.70
.187 (3/16)		.1875	<b>1.000</b> (5x)	5	3/16	3	972512-C3	46.50
.187 (3/16)		.1875	<b>1.500</b> (8x)	5	3/16	3	983712-C3	47.30
.250 (1/4)		.2500	<b>.750</b> (3x)	5	1/4	2-1/2	967916-C3	44.00
.250 (1/4)		.2500	<b>1.250</b> (5x)	5	1/4	4	972516-C3	56.80
.250 (1/4)		.2500	<b>2.000</b> (8x)	5	1/4	4	983716-C3	57.90

## 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



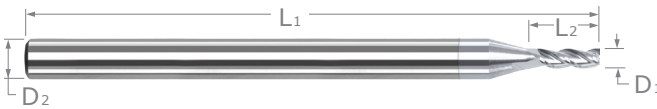
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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Square



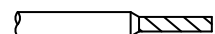
- Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- Variable helix design (approx. 42°) reduces chatter and harmonics, and increases material removal rates
- h6 shank tolerance for high precision tool holders
- 3 flutes
- Center cutting
- Solid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

mm & in

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
D <sub>1</sub>							L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL
+ .0005"	+ .00mm	decimal	+ .010"	L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
- .0005"	- .02mm	equivalent	+ .010"									
.010		.0100	<b>.015</b> (1.5x)	3	1/8	1-1/2	968710	46.40	968710-C8	53.20		
.010		.0100	<b>.030</b> (3x)	3	1/8	1-1/2	942210	46.40	942210-C8	53.00		
.015 (1/64)		.0150	<b>.023</b> (1.5x)	3	1/8	1-1/2	968715	37.40	968715-C8	43.80		
.015 (1/64)		.0150	<b>.045</b> (3x)	3	1/8	1-1/2	942215	37.40	942215-C8	43.80	942215-C4	49.00
.015 (1/64)		.0150	<b>.078</b> (5x)	3	1/8	2-1/2	923015	47.30	923015-C8	53.80		
0.5 mm	.0196		<b>1.50 mm</b> (3x)	3	4 mm	50 mm	900411	37.30	900411-C8	44.40		
.020		.0200	<b>.030</b> (1.5x)	3	1/8	1-1/2	968720	33.00	968720-C8	39.10		
.020		.0200	<b>.060</b> (3x)	3	1/8	1-1/2	942220	33.00	942220-C8	39.10	942220-C4	44.40
.020		.0200	<b>.100</b> (5x)	3	1/8	2-1/2	923020	42.70	923020-C8	48.90		
.025		.0250	<b>.038</b> (1.5x)	3	1/8	1-1/2	968725	33.00	968725-C8	39.10		
.025		.0250	<b>.075</b> (3x)	3	1/8	1-1/2	942225	33.00	942225-C8	39.10	942225-C4	44.40
.025		.0250	<b>.125</b> (5x)	3	1/8	2-1/2	923025	42.70	923025-C8	48.90		
.030		.0300	<b>.045</b> (1.5x)	3	1/8	1-1/2	968730	33.00	968730-C8	39.10		
.030		.0300	<b>.090</b> (3x)	3	1/8	1-1/2	942230	33.00	942230-C8	39.10	942230-C4	44.40
.030		.0300	<b>.156</b> (5x)	3	1/8	2-1/2	923030	42.70	923030-C8	48.90		
.031 (1/32)		.0310	<b>.025</b> (.8x)	3	1/8	1-1/2	873531	29.00	873531-C8	35.80		
.031 (1/32)		.0310	<b>.047</b> (1.5x)	3	1/8	1-1/2	968731	26.20	968731-C8	32.30	968731-C4	37.60
.031 (1/32)		.0310	<b>.093</b> (3x)	3	1/8	1-1/2	942231	26.20	942231-C8	32.30	942231-C4	37.60
.031 (1/32)		.0310	<b>.125</b> (4x)	3	1/8	2-1/2	857231	36.00	857231-C8	42.80		
.031 (1/32)		.0310	<b>.156</b> (5x)	3	1/8	2-1/2	923031	36.00	923031-C8	42.20	923031-C4	47.70
.035		.0350	<b>.105</b> (3x)	3	1/8	1-1/2	942235	30.60	942235-C8	37.40		
1.0 mm	.0393		<b>3.00 mm</b> (3x)	3	4 mm	50 mm	900422	28.80	900422-C8	34.70	900422-C4	44.90
.040		.0400	<b>.060</b> (1.5x)	3	1/8	1-1/2	968740	26.40	968740-C8	32.30		
.040		.0400	<b>.120</b> (3x)	3	1/8	1-1/2	942240	26.40	942240-C8	32.30	942240-C4	37.60
.040		.0400	<b>.203</b> (5x)	3	1/8	2-1/2	923040	36.00	923040-C8	42.20		
.045		.0450	<b>.135</b> (3x)	3	1/8	1-1/2	942245	26.40	942245-C8	33.20		
.047 (3/64)		.0470	<b>.071</b> (1.5x)	3	1/8	1-1/2	968747	26.20	968747-C8	32.30	968747-C4	37.60
.047 (3/64)		.0470	<b>.141</b> (3x)	3	1/8	1-1/2	942247	26.20	942247-C8	32.30	942247-C4	37.60
.047 (3/64)		.0470	<b>.187</b> (4x)	3	1/8	2-1/2	857247	36.00	857247-C8	42.80		
.047 (3/64)		.0470	<b>.250</b> (5x)	3	1/8	2-1/2	923047	36.00	923047-C8	42.20	923047-C4	47.70
.050		.0500	<b>.075</b> (1.5x)	3	1/8	1-1/2	968750	26.40	968750-C8	32.30		
.050		.0500	<b>.150</b> (3x)	3	1/8	1-1/2	942250	26.40	942250-C8	32.30	942250-C4	37.60
.050		.0500	<b>.250</b> (5x)	3	1/8	2-1/2	923050	36.00	923050-C8	42.20		
<b>NEW</b>		.0550	<b>.083</b> (1.5x)	3	1/8	1-1/2	<b>968755</b>	26.40	<b>968755-C8</b>	33.20		
.055		.0550	<b>.165</b> (3x)	3	1/8	1-1/2	942255	26.40	942255-C8	33.20		
1.5 mm	.0590		<b>4.50 mm</b> (3x)	3	4 mm	50 mm	900433	30.50	900433-C8	37.60		

ALUMINUM ALLOYS

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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

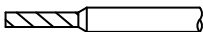
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ALUMINUM ALLOYS

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									
.060		.0600	<b>.090</b> (1.5x)	3	1/8	1-1/2	968760	24.50	968760-C8	31.30		
.060		.0600	<b>.180</b> (3x)	3	1/8	1-1/2	942260	26.40	942260-C8	32.30	942260-C4	37.60
.060		.0600	<b>.312</b> (5x)	3	1/8	2-1/2	923060	36.00	923060-C8	42.20		
.062 (1/16)		.0620	<b>.050</b> (.8x)	3	1/8	1-1/2	873562	26.20	873562-C8	33.00		
.062 (1/16)		.0620	<b>.093</b> (1.5x)	3	1/8	1-1/2	968762	24.40	968762-C8	30.20	968762-C4	35.50
.062 (1/16)		.0620	<b>.186</b> (3x)	3	1/8	1-1/2	942262	24.40	942262-C8	30.20	942262-C4	35.50
.062 (1/16)		.0620	<b>.250</b> (4x)	3	1/8	2-1/2	857262	34.00	857262-C8	40.80		
.062 (1/16)		.0620	<b>.312</b> (5x)	3	1/8	2-1/2	923062	34.00	923062-C8	40.00	923062-C4	45.70
.070		.0700	<b>.105</b> (1.5x)	3	1/8	1-1/2	968770	24.50	968770-C8	31.30		
.070		.0700	<b>.210</b> (3x)	3	1/8	1-1/2	942270	24.50	942270-C8	30.20	942270-C4	35.50
.070		.0700	<b>.375</b> (5x)	3	1/8	2-1/2	923070	34.00	923070-C8	40.00		
.075		.0750	<b>.225</b> (3x)	3	1/8	1-1/2	942275	24.50	942275-C8	31.30		NEW
.078 (5/64)		.0780	<b>.117</b> (1.5x)	3	1/8	1-1/2	968778	24.40	968778-C8	30.20	968778-C4	35.50
.078 (5/64)		.0780	<b>.234</b> (3x)	3	1/8	1-1/2	942278	24.40	942278-C8	30.20	942278-C4	35.50
.078 (5/64)		.0780	<b>.312</b> (4x)	3	1/8	2-1/2	857278	34.00	857278-C8	40.80		
.078 (5/64)		.0780	<b>.406</b> (5x)	3	1/8	2-1/2	923078	34.00	923078-C8	40.00	923078-C4	45.70
2.0 mm	.0787		<b>6.00 mm</b> (3x)	3	4 mm	50 mm	900445	26.90	900445-C8	32.70	900445-C4	43.00
.080		.0800	<b>.120</b> (1.5x)	3	1/8	1-1/2	968780	24.50	968780-C8	31.30		
.080		.0800	<b>.240</b> (3x)	3	1/8	1-1/2	942280	24.50	942280-C8	30.20	942280-C4	35.50
.080		.0800	<b>.406</b> (5x)	3	1/8	2-1/2	923080	34.00	923080-C8	40.00		
.090		.0900	<b>.135</b> (1.5x)	3	1/8	1-1/2	968790	24.50	968790-C8	31.30		
.090		.0900	<b>.270</b> (3x)	3	1/8	1-1/2	942290	24.50	942290-C8	30.20	942290-C4	35.50
.090		.0900	<b>.450</b> (5x)	3	1/8	2-1/2	923090	34.00	923090-C8	40.00		
.093 (3/32)		.0930	<b>.074</b> (.8x)	3	1/8	1-1/2	873593	26.20	873593-C8	33.00		
.093 (3/32)		.0930	<b>.140</b> (1.5x)	3	1/8	1-1/2	968793	24.40	968793-C8	30.20	968793-C4	35.50
.093 (3/32)		.0930	<b>.279</b> (3x)	3	1/8	1-1/2	942293	24.40	942293-C8	30.20	942293-C4	35.50
.093 (3/32)		.0930	<b>.375</b> (4x)	3	1/8	2-1/2	857293	34.00	857293-C8	40.80	857293-C4	45.70
.093 (3/32)		.0930	<b>.500</b> (5x)	3	1/8	2-1/2	923093	34.00	923093-C8	40.00	923093-C4	45.70
2.5 mm	.0984		<b>7.50 mm</b> (3x)	3	4 mm	50 mm	900451	28.60	900451-C8	35.70		
.100		.1000	<b>.150</b> (1.5x)	3	1/8	1-1/2	968800	24.50	968800-C8	30.20		
.100		.1000	<b>.300</b> (3x)	3	1/8	1-1/2	942300	24.50	942300-C8	30.20	942300-C4	35.50
.100		.1000	<b>.500</b> (5x)	3	1/8	2-1/2	923100	34.00	923100-C8	40.00		
.109 (7/64)		.1090	<b>.164</b> (1.5x)	3	1/8	1-1/2	968802	24.50	968802-C8	30.20		
.109 (7/64)		.1090	<b>.327</b> (3x)	3	1/8	1-1/2	942302	24.50	942302-C8	30.20	942302-C4	35.50
.109 (7/64)		.1090	<b>.570</b> (5x)	3	1/8	2-1/2	923102	34.00	923102-C8	40.00		
3.0 mm	.1181		<b>4.50 mm</b> (1.5x)	3	4 mm	50mm	858457	27.20	858457-C8	34.30		
3.0 mm	.1181		<b>9.00 mm</b> (3x)	3	4 mm	50 mm	900457	26.90	900457-C8	32.70	900457-C4	43.00
3.0 mm	.1181		<b>15.00 mm</b> (5x)	3	4 mm	50 mm	845957	30.20	845957-C8	37.30		
D <sub>1</sub>	+ .000" / - .002"	decimal equivalent	L <sub>2</sub>	+ .030" / - .000"	D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.125 (1/8)		.1250	<b>.100</b> (.8x)	3	1/8	1-1/2	873608	27.00	873608-C8	33.80		
.125 (1/8)		.1250	<b>.187</b> (1.5x)	3	1/8	1-1/2	968808	23.40	968808-C8	30.20	968808-C4	35.10
.125 (1/8)		.1250	<b>.375</b> (3x)	3	1/8	1-1/2	942308	23.40	942308-C8	30.20	942308-C4	35.10
.125 (1/8)		.1250	<b>.500</b> (4x)	3	1/8	2-1/2	857308	33.80	857308-C8	40.60		
.125 (1/8)		.1250	<b>.625</b> (5x)	3	1/8	2-1/2	923108	33.80	923108-C8	40.00	923108-C4	45.50

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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Square (cont.)

**mm & in** continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	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> +.000" -.002"	L <sub>2</sub> +.030" -.000" +.75mm -.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>						
+.00mm -.04mm decimal equivalent										
.140 (9/64)	.1406	<b>.425</b> (3x)	3	3/16	2	942309	25.20	942309-C8	32.00	
.156 (5/32)	.1562	<b>.235</b> (1.5x)	3	3/16	2	968810	25.40	968810-C8	32.20	968810-C4 41.50
.156 (5/32)	.1562	<b>.469</b> (3x)	3	3/16	2	942310	25.40	942310-C8	32.20	942310-C4 41.50
<b>NEW</b> .156 (5/32)	.1562	<b>.750</b> (5x)	3	3/16	3	923110	35.00	923110-C8	41.80	<b>923110-C4</b> 51.10
.187 (3/16)	.1875	<b>.150</b> (.8x)	3	3/16	2	873612	28.10	873612-C8	34.90	
.187 (3/16)	.1875	<b>.285</b> (1.5x)	3	3/16	2	968812	25.20	968812-C8	32.00	968812-C4 41.30
.187 (3/16)	.1875	<b>.562</b> (3x)	3	3/16	2	942312	25.20	942312-C8	32.00	942312-C4 41.30
.187 (3/16)	.1875	<b>1.000</b> (5x)	3	3/16	3	923112	35.00	923112-C8	41.80	923112-C4 51.10
6.0 mm	.2362	<b>18.00 mm</b> (3x)	3	6 mm	63 mm	900466	37.10	900466-C8	44.40	
.250 (1/4)	.2500	<b>.200</b> (.8x)	3	1/4	2-1/2	873616	35.00	873616-C8	42.30	
.250 (1/4)	.2500	<b>.375</b> (1.5x)	3	1/4	2-1/2	968816	30.40	968816-C8	38.40	968816-C4 48.70
.250 (1/4)	.2500	<b>.750</b> (3x)	3	1/4	2-1/2	942316	30.40	942316-C8	37.70	942316-C4 48.70
.250 (1/4)	.2500	<b>1.250</b> (5x)	3	1/4	4	923116	41.50	923116-C8	49.70	923116-C4 59.80
.312 (5/16)	.3125	<b>1.000</b> (3x)	3	5/16	2-1/2	942320	38.10	942320-C8	53.60	
<b>NEW</b> .375 (3/8)	.3750	<b>.570</b> (1.5x)	3	3/8	2-1/2	<b>968824</b>	41.40	<b>968824-C8</b>	60.20	
<b>NEW</b> .375 (3/8)	.3750	<b>1.125</b> (3x)	3	3/8	2-1/2	942324	41.40	942324-C8	60.20	<b>942324-C4</b> 63.50
.500 (1/2)	.5000	<b>.750</b> (1.5x)	3	1/2	3	968832	43.80	968832-C8	66.00	

ALUMINUM ALLOYS

**PLEASE SEE SPEEDS & FEEDS ON PAGE 177**



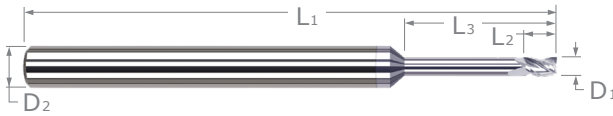
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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

## Square – Long Reach, Stub Flute

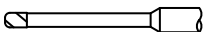


- ↻ Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- ↻ Long reach design for deep cavities
- ↻ Reduced neck diameter to avoid heeling
- ↻ Variable helix design (approx. 42°) reduces chatter and harmonics and increases material removal rates
- ↻ h6 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 DIAMETER	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
						3 FL	PRICE	3 FL	PRICE	3 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> (h6)	L <sub>1</sub>						
.015 (1/64)	.023	<b>.078</b> (5x)	3	1/8	2-1/2	930815	48.60	930815-C8	55.40		
.015 (1/64)	.023	<b>.125</b> (8x)	3	1/8	2-1/2	927115	49.80	927115-C8	56.60		
.020	.030	<b>.100</b> (5x)	3	1/8	2-1/2	930820	46.50	930820-C8	53.30		
.020	.030	<b>.160</b> (8x)	3	1/8	2-1/2	927120	47.80	927120-C8	54.60		
.020	.030	<b>.200</b> (10x)	3	1/8	2-1/2	919320	49.70	919320-C8	56.50		
.025	.038	<b>.125</b> (5x)	3	1/8	2-1/2	930825	45.40	930825-C8	52.20		
.025	.038	<b>.203</b> (8x)	3	1/8	2-1/2	927125	46.50	927125-C8	53.30		
.030	.045	<b>.250</b> (8x)	3	1/8	2-1/2	927130	46.50	927130-C8	53.30		
.031 (1/32)	.047	<b>.093</b> (3x)	3	1/8	1-1/2	924531	42.00	924531-C8	48.80		
.031 (1/32)	.047	<b>.125</b> (4x)	3	1/8	2-1/2	<b>814331</b>	42.50	<b>814331-C8</b>	49.30		NEW
.031 (1/32)	.047	<b>.156</b> (5x)	3	1/8	2-1/2	930831	42.50	930831-C8	49.30	930831-C4	54.20
.031 (1/32)	.047	<b>.250</b> (8x)	3	1/8	2-1/2	927131	43.50	927131-C8	50.30	927131-C4	55.20
.031 (1/32)	.047	<b>.312</b> (10x)	3	1/8	2-1/2	919331	45.40	919331-C8	52.20		
.031 (1/32)	.047	<b>.375</b> (12x)	3	1/8	2-1/2	879231	47.00	879231-C8	53.80		
.040	.060	<b>.325</b> (8x)	3	1/8	2-1/2	927140	45.70	927140-C8	52.50		
.047 (3/64)	.071	<b>.250</b> (5x)	3	1/8	2-1/2	930847	42.50	930847-C8	49.30		
.047 (3/64)	.071	<b>.375</b> (8x)	3	1/8	2-1/2	927147	43.50	927147-C8	50.30		
.047 (3/64)	.071	<b>.480</b> (10x)	3	1/8	2-1/2	919347	45.70	919347-C8	52.50		
.050	.075	<b>.400</b> (8x)	3	1/8	2-1/2	927150	47.30	927150-C8	54.10		
.060	.090	<b>.500</b> (8x)	3	1/8	2-1/2	927160	47.30	927160-C8	54.10		
.062 (1/16)	.093	<b>.186</b> (3x)	3	1/8	1-1/2	924562	42.00	924562-C8	48.80		
.062 (1/16)	.093	<b>.250</b> (4x)	3	1/8	2-1/2	<b>814362</b>	42.50	<b>814362-C8</b>	49.30		NEW
.062 (1/16)	.093	<b>.312</b> (5x)	3	1/8	2-1/2	930862	42.50	930862-C8	49.30	930862-C4	54.20
.062 (1/16)	.093	<b>.375</b> (6x)	3	1/8	2-1/2	<b>814162</b>	43.20	<b>814162-C8</b>	50.00		NEW
.062 (1/16)	.093	<b>.437</b> (7x)	3	1/8	2-1/2	<b>813962</b>	43.20	<b>813962-C8</b>	50.00		NEW
.062 (1/16)	.093	<b>.500</b> (8x)	3	1/8	2-1/2	927162	43.20	927162-C8	50.00	927162-C4	54.90
.062 (1/16)	.093	<b>.625</b> (10x)	3	1/8	2-1/2	919362	45.40	919362-C8	52.20		
.062 (1/16)	.093	<b>.750</b> (12x)	3	1/8	2-1/2	879262	47.00	879262-C8	53.80		
.078 (5/64)	.118	<b>.406</b> (5x)	3	1/8	2-1/2	930878	42.50	930878-C8	49.30		
.078 (5/64)	.118	<b>.625</b> (8x)	3	1/8	2-1/2	927178	43.20	927178-C8	50.00		
.078 (5/64)	.118	<b>.800</b> (10x)	3	1/8	2-1/2	919378	45.70	919378-C8	52.50		

continued on next page



# 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 DIAMETER	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
	D <sub>1</sub>	D <sub>2</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>3</sub>	L <sub>3</sub>				3 FL	PRICE	3 FL	PRICE	3 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> (h6)	L <sub>1</sub>						
	.093 (3/32)		.140		<b>.279</b> (3x)		3	1/8	1-1/2	924593	42.00	924593-C8	48.80		
NEW	.093 (3/32)		.140		<b>.375</b> (4x)		3	1/8	2-1/2	814393	42.50	814393-C8	49.30		
	.093 (3/32)		.140		<b>.500</b> (5x)		3	1/8	2-1/2	930893	42.50	930893-C8	49.30	930893-C4	54.20
NEW	.093 (3/32)		.140		<b>.585</b> (6x)		3	1/8	2-1/2	814193	43.20	814193-C8	50.00		
NEW	.093 (3/32)		.140		<b>.670</b> (7x)		3	1/8	2-1/2	813993	43.20	813993-C8	50.00		
	.093 (3/32)		.140		<b>.750</b> (8x)		3	1/8	2-1/2	927193	43.20	927193-C8	50.00	927193-C4	54.90
	.093 (3/32)		.140		<b>.950</b> (10x)		3	1/8	2-1/2	919393	45.40	919393-C8	52.20		
	.093 (3/32)		.140		<b>1.125</b> (12x)		3	1/8	2-1/2	879293	47.00	879293-C8	53.80		
	.100		.150		<b>.800</b> (8x)		3	1/8	2-1/2	927200	47.30	927200-C8	54.10		
	.109 (7/64)		.164		<b>.900</b> (8x)		3	1/8	2-1/2	927202	47.30	927202-C8	54.10		
	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> (h6)	L <sub>1</sub>						
	.125 (1/8)		.187		<b>.375</b> (3x)		3	1/8	1-1/2	924608	42.00	924608-C8	48.80		
NEW	.125 (1/8)		.187		<b>.500</b> (4x)		3	1/8	2-1/2	814408	42.50	814408-C8	49.30		
	.125 (1/8)		.187		<b>.625</b> (5x)		3	1/8	2-1/2	930908	42.50	930908-C8	49.30	930908-C4	54.20
NEW	.125 (1/8)		.187		<b>.750</b> (6x)		3	1/8	2-1/2	814208	43.20	814208-C8	50.00		
NEW	.125 (1/8)		.187		<b>.875</b> (7x)		3	1/8	2-1/2	814008	43.20	814008-C8	50.00		
	.125 (1/8)		.187		<b>1.000</b> (8x)		3	1/8	2-1/2	927208	43.20	927208-C8	50.00	927208-C4	54.90
	.125 (1/8)		.187		<b>1.250</b> (10x)		3	1/8	2-1/2	919408	45.40	919408-C8	52.20		
	.125 (1/8)		.187		<b>1.500</b> (12x)		3	1/8	3	879308	47.00	879308-C8	53.80		
	.140 (9/64)		.220		<b>1.125</b> (8x)		3	3/16	3	927209	50.00	927209-C8	56.80		
	.156 (5/32)		.235		<b>.750</b> (5x)		3	3/16	3	930910	46.50	930910-C8	53.30		
	.156 (5/32)		.235		<b>1.250</b> (8x)		3	3/16	3	927210	47.80	927210-C8	54.60		
	.156 (5/32)		.235		<b>1.570</b> (10x)		3	3/16	3	919410	49.50	919410-C8	56.30		
	.187 (3/16)		.285		<b>1.000</b> (5x)		3	3/16	3	930912	46.50	930912-C8	53.30		
	.187 (3/16)		.285		<b>1.500</b> (8x)		3	3/16	3	927212	47.80	927212-C8	54.60		
	.187 (3/16)		.285		<b>1.875</b> (10x)		3	3/16	4	919412	49.50	919412-C8	56.80		
	.250 (1/4)		.375		<b>1.250</b> (5x)		3	1/4	4	930916	49.70	930916-C8	57.90		
	.250 (1/4)		.375		<b>2.000</b> (8x)		3	1/4	4	927216	50.70	927216-C8	58.90		
	.250 (1/4)		.375		<b>2.500</b> (10x)		3	1/4	4	919416	52.40	919416-C8	60.60		

ALUMINUM ALLOYS

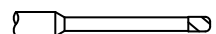
**PLEASE SEE SPEEDS & FEEDS ON PAGE 179**



"#HarveyTool plastic cutting end mills FTW. Love the finish these leave. We were having some wall and floor finish issues using 2 flute aluminum endmills. Gave these a try and problem fixed. Also, the feeds and speeds recommendations on the site worked out perfect."

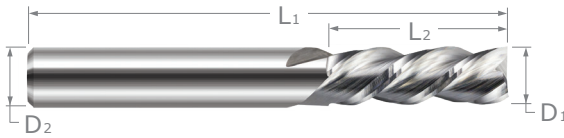
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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

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

ALUMINIUM ALLOYS

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> <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>				
.015 (1/64)	.045 (3x)	3	1/8	1-1/2	896215	42.20	896215-C8	49.00
.031 (1/32)	.047 (1.5x)	3	1/8	1-1/2	858531	29.80	858531-C8	36.60
.031 (1/32)	.093 (3x)	3	1/8	1-1/2	896231	29.60	896231-C8	36.40
.047 (3/64)	.141 (3x)	3	1/8	1-1/2	896247	29.60	896247-C8	36.40
.062 (1/16)	.093 (1.5x)	3	1/8	1-1/2	858562	27.70	858562-C8	34.50
.062 (1/16)	.186 (3x)	3	1/8	1-1/2	896262	27.50	896262-C8	34.30
.078 (5/64)	.234 (3x)	3	1/8	1-1/2	896278	27.50	896278-C8	34.30
.093 (3/32)	.140 (1.5x)	3	1/8	1-1/2	858593	27.70	858593-C8	34.50
.093 (3/32)	.279 (3x)	3	1/8	1-1/2	896293	27.50	896293-C8	34.30
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)	.187 (1.5x)	3	1/8	1-1/2	858608	27.70	858608-C8	34.50
.125 (1/8)	.375 (3x)	3	1/8	1-1/2	896308	27.50	896308-C8	34.30
.187 (3/16)	.285 (1.5x)	3	3/16	2	858612	28.90	858612-C8	35.70
.187 (3/16)	.562 (3x)	3	3/16	2	896312	28.70	896312-C8	35.50
.250 (1/4)	.375 (1.5x)	3	1/4	2-1/2	858616	35.90	858616-C8	43.20
.250 (1/4)	.750 (3x)	3	1/4	2-1/2	896316	35.50	896316-C8	42.80
.375 (3/8)	.570 (1.5x)	3	3/8	2-1/2	858624	47.90	858624-C8	66.70
.375 (3/8)	1.125 (3x)	3	3/8	2-1/2	896324	47.50	896324-C8	66.30

NEW  
NEW

**PLEASE SEE SPEEDS & FEEDS ON PAGE 177**



View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

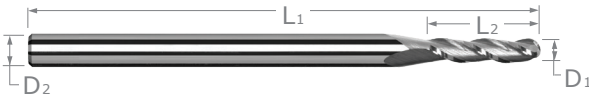
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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Ball



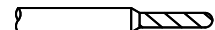
- ⚡ Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- ⚡ Variable helix design (approx. 42°) reduces chatter and harmonics and increases material removal rates
- ⚡ h6 shank tolerance for high precision tool holders ⚡ 3 flutes
- ⚡ Center cutting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

**mm & in**

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 (3x)</b>	3	4 mm	50 mm	977504	54.20	977504-C8	61.30		
.10 .0100	<b>.030 (3x)</b>	3	1/8	1-1/2	989710	55.30	989710-C8	62.10		
.015 (1/64) .0150	<b>.023 (1.5x)</b>	3	1/8	1-1/2	958115	44.70	958115-C8	51.50		
.015 (1/64) .0150	<b>.045 (3x)</b>	3	1/8	1-1/2	989715	44.70	989715-C8	51.50		
.4 mm .0157	<b>1.20 mm (3x)</b>	3	4 mm	50 mm	977509	43.90	977509-C8	51.00		
.5 mm .0196	<b>1.50 mm (3x)</b>	3	4 mm	50 mm	977511	39.30	977511-C8	46.40		
.020 .0200	<b>.030 (1.5x)</b>	3	1/8	1-1/2	958120	39.10	958120-C8	45.90		
.020 .0200	<b>.060 (3x)</b>	3	1/8	1-1/2	989720	39.10	989720-C8	45.90		
.6 mm .0236	<b>1.80 mm (3x)</b>	3	4 mm	50 mm	977513	37.30	977513-C8	44.40		
.025 .0250	<b>.075 (3x)</b>	3	1/8	1-1/2	989725	37.70	989725-C8	44.50		
.030 .0300	<b>.090 (3x)</b>	3	1/8	1-1/2	989730	33.10	989730-C8	39.90		
.031 (1/32) .0310	<b>.047 (1.5x)</b>	3	1/8	1-1/2	958131	32.70	958131-C8	39.50		
.031 (1/32) .0310	<b>.093 (3x)</b>	3	1/8	1-1/2	989731	32.30	989731-C8	39.10	989731-C4	44.00
.031 (1/32) .0310	<b>.156 (5x)</b>	3	1/8	2-1/2	850031	40.10	850031-C8	46.90		
.8 mm .0314	<b>2.40 mm (3x)</b>	3	4 mm	50 mm	977518	32.00	977518-C8	39.10		
1.0 mm .0393	<b>1.50 mm (1.5x)</b>	3	4 mm	50 mm	908322	32.00	908322-C8	39.10		
1.0 mm .0393	<b>3.00 mm (3x)</b>	3	4 mm	50 mm	977522	32.00	977522-C8	39.10		
.040 .0400	<b>.120 (3x)</b>	3	1/8	1-1/2	989740	34.50	989740-C8	41.30		
.047 (3/64) .0470	<b>.071 (1.5x)</b>	3	1/8	1-1/2	958147	32.70	958147-C8	39.50		
.047 (3/64) .0470	<b>.141 (3x)</b>	3	1/8	1-1/2	989747	32.30	989747-C8	39.10		
.047 (3/64) .0470	<b>.250 (5x)</b>	3	1/8	2-1/2	850047	40.10	850047-C8	46.90		
1.2 mm .0472	<b>3.50 mm (3x)</b>	3	4 mm	50 mm	977527	32.00	977527-C8	39.10		
.050 .0500	<b>.150 (3x)</b>	3	1/8	1-1/2	989750	33.30	989750-C8	40.10		
1.4 mm .0551	<b>4.00 mm (3x)</b>	3	4 mm	50 mm	977531	32.00	977531-C8	39.10		
1.5 mm .0590	<b>4.50 mm (3x)</b>	3	4 mm	50 mm	977533	30.00	977533-C8	37.10		
.060 .0600	<b>.180 (3x)</b>	3	1/8	1-1/2	989760	32.50	989760-C8	39.30		
.062 (1/16) .0620	<b>.093 (1.5x)</b>	3	1/8	1-1/2	958162	30.60	958162-C8	37.40		
.062 (1/16) .0620	<b>.186 (3x)</b>	3	1/8	1-1/2	989762	30.60	989762-C8	37.40	989762-C4	42.30
.062 (1/16) .0620	<b>.312 (5x)</b>	3	1/8	2-1/2	850062	38.20	850062-C8	45.00		
1.6 mm .0629	<b>5.00 mm (3x)</b>	3	4 mm	50 mm	977536	30.00	977536-C8	37.10		
1.8 mm .0708	<b>5.50 mm (3x)</b>	3	4 mm	50 mm	977540	30.00	977540-C8	37.10		
.078 (5/64) .0780	<b>.118 (1.5x)</b>	3	1/8	1-1/2	958178	30.60	958178-C8	37.40		
.078 (5/64) .0780	<b>.234 (3x)</b>	3	1/8	1-1/2	989778	30.60	989778-C8	37.40		
.078 (5/64) .0780	<b>.406 (5x)</b>	3	1/8	2-1/2	850078	38.20	850078-C8	45.00		
2.0 mm .0787	<b>3.00 mm (1.5x)</b>	3	4 mm	50 mm	908345	30.00	908345-C8	37.10		
2.0 mm .0787	<b>6.00 mm (3x)</b>	3	4 mm	50 mm	977545	30.00	977545-C8	37.10		

ALUMINUM ALLOYS

continued on next page



# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Ball (cont.)

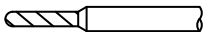
**mm & in** continued from previous page

CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
D <sub>1</sub> +.0005" -.0005"	+ .00mm -.02mm	decimal equivalent	L <sub>2</sub> +.010" -.000" +.25mm -.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.093 (3/32)		.0930	<b>.140</b> (1.5x)	3	1/8	1-1/2	958193	30.60	958193-C8	37.40		
.093 (3/32)		.0930	<b>.279</b> (3x)	3	1/8	1-1/2	989793	30.60	989793-C8	37.40	989793-C4	42.30
.093 (3/32)		.0930	<b>.500</b> (5x)	3	1/8	2-1/2	850093	38.20	850093-C8	45.00		
.100		.1000	<b>.300</b> (3x)	3	1/8	1-1/2	989800	30.70	989800-C8	37.50		
.109 (7/64)		.1094	<b>.327</b> (3x)	3	1/8	1-1/2	989802	31.50	989802-C8	37.60		
3.0 mm		.1181	<b>9.00 mm</b> (3x)	3	4 mm	50 mm	977557	30.90	977557-C8	38.00		

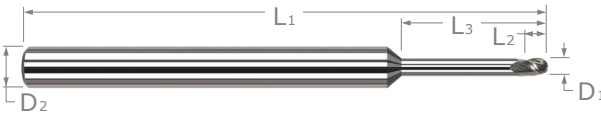
D <sub>1</sub> +.000" -.002"	decimal equivalent	L <sub>2</sub> +.030" -.000"		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.125 (1/8)	.1250	<b>.187</b> (1.5x)	3	1/8	1-1/2	958208	29.40	958208-C8	36.20		
.125 (1/8)	.1250	<b>.375</b> (3x)	3	1/8	1-1/2	989808	29.40	989808-C8	36.20	989808-C4	41.10
.125 (1/8)	.1250	<b>.625</b> (5x)	3	1/8	2-1/2	850108	38.20	850108-C8	45.00		
.156 (5/32)	.1562	<b>.235</b> (1.5x)	3	3/16	2	958210	31.60	958210-C8	38.40		
.156 (5/32)	.1562	<b>.470</b> (3x)	3	3/16	2	989810	31.60	989810-C8	38.40		
.187 (3/16)	.1875	<b>.285</b> (1.5x)	3	3/16	2	958212	30.40	958212-C8	37.20		
.187 (3/16)	.1875	<b>.562</b> (3x)	3	3/16	2	989812	30.40	989812-C8	37.20	989812-C4	46.50
.250 (1/4)	.2500	<b>.375</b> (1.5x)	3	1/4	2-1/2	958216	36.20	958216-C8	43.50		
.250 (1/4)	.2500	<b>.750</b> (3x)	3	1/4	2-1/2	989816	36.20	989816-C8	43.50	989816-C4	54.50

PLEASE SEE SPEEDS & FEEDS ON PAGE 177



# 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

**mm & in**

CUTTER DIA.	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)	.022	.078 (5x)	3	1/8	2-1/2	947015	48.90	947015-C8	55.70		
.015 (1/64)	.022	.125 (8x)	3	1/8	2-1/2	54415	56.80	54415-C8	63.60		
.020	.030	.100 (5x)	3	1/8	2-1/2	947020	52.60	947020-C8	59.40		
.020	.030	.160 (8x)	3	1/8	2-1/2	54420	53.60	54420-C8	60.40		
.025	.037	.125 (5x)	3	1/8	2-1/2	947025	51.20	947025-C8	58.00		
.025	.037	.203 (8x)	3	1/8	2-1/2	54425	52.40	54425-C8	59.20		
.031 (1/32)	.046	.156 (5x)	3	1/8	2-1/2	947031	48.30	947031-C8	55.10		
.031 (1/32)	.046	.250 (8x)	3	1/8	2-1/2	54431	50.40	54431-C8	57.20	54431-C4	62.10
.031 (1/32)	.046	.312 (10x)	3	1/8	2-1/2	925131	53.40	925131-C8	60.20		
.031 (1/32)	.046	.375 (12x)	3	1/8	2-1/2	879431	55.80	879431-C8	62.60		
1.0 mm	.0393	1.50 mm	5.0 mm (5x)	3	4 mm	50 mm	851322	54.20	851322-C8	61.30	
.047 (3/64)	.070	.250 (5x)	3	1/8	2-1/2	947047	48.30	947047-C8	55.10		
.047 (3/64)	.070	.375 (8x)	3	1/8	2-1/2	54447	48.90	54447-C8	55.70	54447-C4	60.60
.062 (1/16)	.093	.312 (5x)	3	1/8	2-1/2	947062	48.30	947062-C8	55.10		
.062 (1/16)	.093	.500 (8x)	3	1/8	2-1/2	54462	48.90	54462-C8	55.70	54462-C4	60.60
.062 (1/16)	.093	.625 (10x)	3	1/8	2-1/2	925162	53.40	925162-C8	60.20		
.062 (1/16)	.093	.750 (12x)	3	1/8	2-1/2	879462	56.30	879462-C8	63.10		
.078 (5/64)	.117	.406 (5x)	3	1/8	2-1/2	947078	48.30	947078-C8	55.10		
.078 (5/64)	.117	.625 (8x)	3	1/8	2-1/2	54478	48.90	54478-C8	55.70	54478-C4	60.60
2.0 mm	.0787	3.00 mm	10.0 mm (5x)	3	4 mm	50 mm	851345	50.40	851345-C8	57.00	
.093 (3/32)	.139	.500 (5x)	3	1/8	2-1/2	947093	48.30	947093-C8	55.10		
.093 (3/32)	.139	.750 (8x)	3	1/8	2-1/2	54493	48.90	54493-C8	55.70	54493-C4	60.60
.093 (3/32)	.139	.950 (10x)	3	1/8	2-1/2	925193	53.40	925193-C8	60.20		
.093 (3/32)	.139	1.125 (12x)	3	1/8	2-1/2	879493	56.30	879493-C8	63.10		
3.0 mm	.1181	4.50 mm	15.0 mm (5x)	3	4 mm	50 mm	851357	54.20	851357-C8	61.30	

ALUMINUM ALLOYS

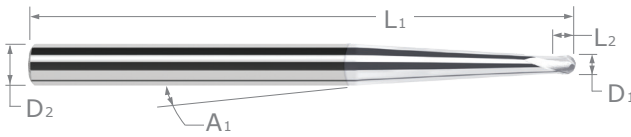
D <sub>1</sub>	decimal equivalent	L <sub>2</sub>	L <sub>3</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.125 (1/8)	.1250	.187	.625 (5x)	3	1/8	2-1/2	947108	47.30	947108-C8	54.10	
.125 (1/8)	.1250	.187	1.000 (8x)	3	1/8	2-1/2	54508	48.30	54508-C8	55.10	54508-C4
.125 (1/8)	.1250	.187	1.250 (10x)	3	1/8	2-1/2	925208	53.40	925208-C8	60.20	
.125 (1/8)	.1250	.187	1.500 (12x)	3	1/8	3	879508	56.30	879508-C8	63.10	
.156 (5/32)	.1562	.234	.750 (5x)	3	3/16	3	947110	53.40	947110-C8	60.20	
.156 (5/32)	.1562	.234	1.250 (8x)	3	3/16	3	54510	53.60	54510-C8	60.40	
.187 (3/16)	.1875	.281	1.000 (5x)	3	3/16	3	947112	53.40	947112-C8	60.20	
.187 (3/16)	.1875	.281	1.500 (8x)	3	3/16	3	54512	53.90	54512-C8	60.70	54512-C4
.250 (1/4)	.2500	.375	1.250 (5x)	3	1/4	4	947116	55.40	947116-C8	63.60	
.250 (1/4)	.2500	.375	2.000 (8x)	3	1/4	4	54516	56.40	54516-C8	64.60	54516-C4

PLEASE SEE SPEEDS & FEEDS ON PAGE 179



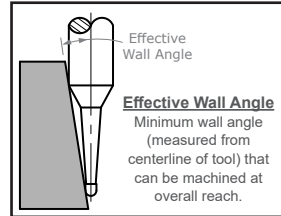
# HIGH HELIX END MILLS FOR ALUMINUM ALLOYS

## Ball – Tapered Reach (Mold Cutters)



Excellent in Aluminum & Other Non-Ferrous Materials

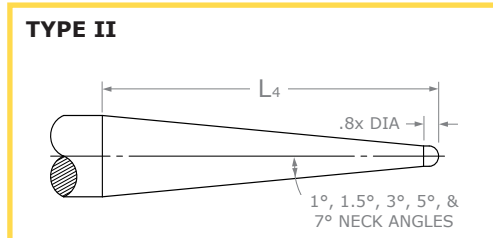
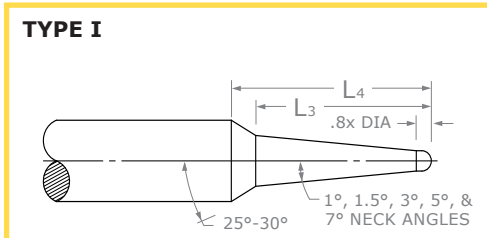
- Very short length of cut and solid tapered neck for maximum rigidity
- 1°, 1.5°, 3°, 5°, and 7° neck angles to address common draft angles for molds
- 45° helix, large flute valley, and sharper cutting edge for faster chip removal and better finish
- Offered with TiB<sub>2</sub> coating to minimize 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
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				
1°	.062 (1/16)	.050	I .500	<b>.595</b>	6.4°	3/16	2	925049	49.10	925049-C8	55.90
	.062 (1/16)	.050	I 1.000	<b>1.080</b>	3.5°	3/16	2-1/2	925056	49.10	925056-C8	55.90
	.093 (3/32)	.074	I .750	<b>.811</b>	3.6°	3/16	2	925070	46.50	925070-C8	53.30
	.093 (3/32)	.074	I 1.125	<b>1.175</b>	2.4°	3/16	2-1/2	925072	48.60	925072-C8	55.40
	.125 (1/8)	.100	I 1.000	<b>1.027</b>	1.9°	3/16	2	925091	59.40	925091-C8	66.20
	.125 (1/8)	.100	II 1.890	<b>1.890</b>	1.0°	3/16	3	925077	61.40	925077-C8	68.20
	.187 (3/16)	.150	II 1.940	<b>1.940</b>	1.0°	1/4	4	925087	61.90	925087-C8	70.10
	.250 (1/4)	.200	II 1.990	<b>1.990</b>	1.0°	5/16	4	925092	66.30	925092-C8	85.10
1.5°	.015 (1/64)	.012	I .125	<b>.269</b>	18.2°	3/16	2	997807	55.00	997807-C8	61.80
	.015 (1/64)	.012	I .250	<b>.389</b>	12.8°	3/16	2	997814	55.00	997814-C8	61.80
	.031 (1/32)	.025	I .250	<b>.375</b>	12.3°	3/16	2	997821	50.50	997821-C8	57.30
	.031 (1/32)	.025	I .500	<b>.614</b>	7.5°	3/16	2	997828	50.50	997828-C8	57.30
	.047 (3/64)	.038	I .375	<b>.481</b>	8.7°	3/16	2	997835	49.80	997835-C8	56.60
	.047 (3/64)	.038	I .750	<b>.839</b>	5.0°	3/16	2	997842	49.80	997842-C8	56.60
	.062 (1/16)	.050	I .500	<b>.588</b>	6.4°	3/16	2	997849	49.10	997849-C8	55.90
	.062 (1/16)	.050	I 1.000	<b>1.066</b>	3.5°	3/16	2-1/2	997856	49.10	997856-C8	55.90
	.078 (5/64)	.062	I .625	<b>.694</b>	4.8°	3/16	2	997863	47.50	997863-C8	54.30
	.093 (3/32)	.074	I .750	<b>.801</b>	3.6°	3/16	2	997870	46.50	997870-C8	53.30
	.125 (1/8)	.100	II 1.293	<b>1.293</b>	1.5°	3/16	2-1/2	997877	59.40	997877-C8	66.20
	.187 (3/16)	.150	II 1.343	<b>1.343</b>	1.5°	1/4	2-1/2	997887	60.10	997887-C8	67.40
	.250 (1/4)	.200	II 1.393	<b>1.393</b>	1.5°	5/16	2-1/2	997892	64.30	997892-C8	79.80

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	TYPE	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>				
3°	.031 (1/32)	.025	I	.750	<b>.820</b>	5.6°	3/16	2-1/2	996607	51.80	996607-C8	58.60
	.031 (1/32)	.025	II	1.518	<b>1.518</b>	3.0°	3/16	2-1/2	996614	51.80	996614-C8	58.60
	.047 (3/64)	.038	I	.875	<b>.921</b>	4.5°	3/16	2-1/2	996621	48.90	996621-C8	55.70
	.047 (3/64)	.038	II	1.378	<b>1.378</b>	3.0°	3/16	2-1/2	996628	48.90	996628-C8	55.70
	.062 (1/16)	.050	I	.625	<b>.681</b>	5.5°	3/16	2-1/2	996635	48.90	996635-C8	55.70
	.062 (1/16)	.050	II	1.247	<b>1.247</b>	3.0°	3/16	2-1/2	996642	48.90	996642-C8	55.70
	.078 (5/64)	.062	II	1.107	<b>1.107</b>	3.0°	3/16	2-1/2	996649	47.50	996649-C8	54.30
	.093 (3/32)	.074	II	.976	<b>.976</b>	3.0°	3/16	2	996656	42.90	996656-C8	49.70
	.125 (1/8)	.100	II	1.293	<b>1.293</b>	2.9°	1/4	2-1/2	996663	59.40	996663-C8	66.70
	.187 (3/16)	.150	II	.746	<b>.746</b>	2.8°	1/4	2-1/2	996670	64.30	996670-C8	71.60
	.187 (3/16)	.150	II	1.939	<b>1.939</b>	2.9°	3/8	4	996674	66.90	996674-C8	89.00
	.250 (1/4)	.200	II	1.393	<b>1.393</b>	2.9°	3/8	2-1/2	996692	65.50	996692-C8	84.30
5°	.031 (1/32)	.025	II	.919	<b>.919</b>	5.0°	3/16	2	996007	47.20	996007-C8	54.00
	.047 (3/64)	.038	II	.841	<b>.841</b>	5.0°	3/16	2	996014	47.20	996014-C8	54.00
	.062 (1/16)	.050	II	.767	<b>.767</b>	4.9°	3/16	2	996021	44.30	996021-C8	51.10
	.078 (5/64)	.062	II	1.045	<b>1.045</b>	4.9°	1/4	2-1/2	996028	61.40	996028-C8	68.70
	.093 (3/32)	.074	II	.971	<b>.971</b>	4.9°	1/4	2-1/2	996035	61.40	996035-C8	68.70
	.125 (1/8)	.100	II	.814	<b>.814</b>	4.8°	1/4	2-1/2	996042	63.90	996042-C8	71.20
	.187 (3/16)	.150	II	1.222	<b>1.222</b>	4.8°	3/8	2-1/2	996087	65.50	996087-C8	84.30
	.250 (1/4)	.200	II	.914	<b>.914</b>	4.5°	3/8	2-1/2	996092	65.50	996092-C8	84.30
7°	.031 (1/32)	.025	II	.662	<b>.662</b>	6.9°	3/16	2	995607	47.20	995607-C8	54.00
	.047 (3/64)	.038	II	.610	<b>.610</b>	6.9°	3/16	2	995614	47.20	995614-C8	54.00
	.062 (1/16)	.050	II	.816	<b>.816</b>	6.9°	1/4	2-1/2	995621	61.40	995621-C8	68.70
	.078 (5/64)	.062	II	.762	<b>.762</b>	6.8°	1/4	2-1/2	995628	61.40	995628-C8	68.70
	.093 (3/32)	.074	II	.713	<b>.713</b>	6.7°	1/4	2-1/2	995635	58.30	995635-C8	65.60
	.125 (1/8)	.100	II	.609	<b>.609</b>	6.5°	1/4	2-1/2	995642	55.60	995642-C8	62.90
	.187 (3/16)	.150	II	.914	<b>.914</b>	6.5°	3/8	2-1/2	995687	65.50	995687-C8	84.30

ALUMINUM ALLOYS



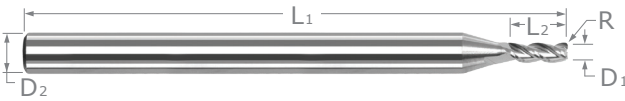
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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

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

ALUMINUM ALLOYS

**mm & in**

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 equivalent	+ .001" - .001"	+ .010" - .000"									
- .0005"	- .02mm		+ .025mm - .025mm	+ .25mm - .00mm									
.2 mm	.0078		<b>.03 mm</b>	.30 mm (1.5x)	3	4 mm	50 mm	986204	49.70	986204-C8	56.80		
.2 mm	.0078		<b>.03 mm</b>	.60 mm (3x)	3	4 mm	50 mm	973504	49.70	973504-C8	56.80		
.10	.0100		<b>.002</b>	.030 (3x)	3	1/8	1-1/2	50010	41.10	50010-C8	47.90		
.3 mm	.0118		<b>.05 mm</b>	.90 mm (3x)	3	4 mm	50 mm	973506	48.30	973506-C8	55.40		
.015 (1/64)	.0150		<b>.002</b>	.022 (1.5x)	3	1/8	1-1/2	61715	38.40	61715-C8	45.20		
.015 (1/64)	.0150		<b>.002</b>	.045 (3x)	3	1/8	1-1/2	50015	38.40	50015-C8	45.20	50015-C4	50.10
.015 (1/64)	.0150		<b>.002</b>	.078 (5x)	3	1/8	2-1/2	53015	45.70	53015-C8	52.50	53015-C4	57.40
.4 mm	.0157		<b>.05 mm</b>	.60 mm (1.5x)	3	4 mm	50 mm	986209	40.50	986209-C8	47.60		
.4 mm	.0157		<b>.05 mm</b>	1.20 mm (3x)	3	4 mm	50 mm	973509	40.50	973509-C8	47.60		
.5 mm	.0196		<b>.05 mm</b>	.75 mm (1.5x)	3	4 mm	50 mm	986211	35.80	986211-C8	42.90		
.5 mm	.0196		<b>.05 mm</b>	1.50 mm (3x)	3	4 mm	50 mm	973511	35.80	973511-C8	42.90		
.020	.0200		<b>.002</b>	.030 (1.5x)	3	1/8	1-1/2	61720	33.00	61720-C8	39.80		
.020	.0200		<b>.002</b>	.060 (3x)	3	1/8	1-1/2	50020	33.00	50020-C8	39.80	50020-C4	44.70
.020	.0200		<b>.002</b>	.100 (5x)	3	1/8	2-1/2	53020	40.30	53020-C8	47.10	53020-C4	52.00
.6 mm	.0236		<b>.05 mm</b>	.90 mm (1.5x)	3	4 mm	50 mm	986213	34.40	986213-C8	41.50		
.6 mm	.0236		<b>.05 mm</b>	1.80 mm (3x)	3	4 mm	50 mm	973513	34.40	973513-C8	41.50		
.025	.0250		<b>.002</b>	.038 (1.5x)	3	1/8	1-1/2	61725	31.80	61725-C8	38.60		
.025	.0250		<b>.002</b>	.075 (3x)	3	1/8	1-1/2	50025	31.80	50025-C8	38.60	50025-C4	43.50
.025	.0250		<b>.002</b>	.125 (5x)	3	1/8	2-1/2	53025	39.10	53025-C8	45.90	53025-C4	50.80
.7 mm	.0275		<b>.08 mm</b>	2.10 mm (3x)	3	4 mm	50 mm	973515	34.40	973515-C8	41.50		
.031 (1/32)	.0310		<b>.003</b>	.047 (1.5x)	3	1/8	1-1/2	61731	26.40	61731-C8	33.20		
.031 (1/32)	.0310		<b>.003</b>	.093 (3x)	3	1/8	1-1/2	50031	26.40	50031-C8	33.20	50031-C4	38.10
.031 (1/32)	.0310		<b>.003</b>	.156 (5x)	3	1/8	2-1/2	53031	33.30	53031-C8	40.10	53031-C4	45.00
.031 (1/32)	.0310		<b>.005</b>	.093 (3x)	3	1/8	1-1/2	901531	26.00	901531-C8	32.80		
.031 (1/32)	.0310		<b>.010</b>	.093 (3x)	3	1/8	1-1/2	904631	26.00	904631-C8	32.80		
.8 mm	.0314		<b>.08 mm</b>	1.20 mm (1.5x)	3	4 mm	50 mm	986218	29.00	986218-C8	36.10		
.8 mm	.0314		<b>.08 mm</b>	2.40 mm (3x)	3	4 mm	50 mm	973518	29.00	973518-C8	36.10		
.035	.0350		<b>.003</b>	.053 (1.5x)	3	1/8	1-1/2	61735	26.40	61735-C8	33.20		
.035	.0350		<b>.003</b>	.105 (3x)	3	1/8	1-1/2	50035	26.20	50035-C8	33.00		
.9 mm	.0354		<b>.08 mm</b>	2.7 mm (3x)	3	4 mm	50 mm	973520	29.00	973520-C8	36.10		
1.0 mm	.0393		<b>.08 mm</b>	1.50 mm (1.5x)	3	4 mm	50 mm	986222	29.00	986222-C8	36.10		
1.0 mm	.0393		<b>.08 mm</b>	3.00 mm (3x)	3	4 mm	50 mm	973522	29.00	973522-C8	36.10		

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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Corner Radius (cont.)

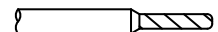


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CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
D <sub>1</sub>			R	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
+ .0005" - .0005"	+ .00mm - .02mm	decimal equivalent	+ .001" - .001" + .025mm - .025mm	+ .010" - .000" + .25mm - .00mm									
.040	.0400		.003	.060 (1.5x)	3	1/8	1-1/2	61740	26.40	61740-C8	33.20		
.040	.0400		.003	.120 (3x)	3	1/8	1-1/2	50040	26.40	50040-C8	33.20		
.040	.0400		.003	.203 (5x)	3	1/8	2-1/2	53040	33.30	53040-C8	40.10		
	1.1 mm	.0433	.08 mm	3.00 mm (3x)	3	4 mm	50 mm	973524	29.00	973524-C8	36.10		
.045	.0450		.003	.135 (3x)	3	1/8	1-1/2	50045	26.40	50045-C8	33.20		
.047 (3/64)	.0470		.003	.070 (1.5x)	3	1/8	1-1/2	61747	26.40	61747-C8	33.20		
.047 (3/64)	.0470		.003	.141 (3x)	3	1/8	1-1/2	50047	26.20	50047-C8	33.00	50047-C4	37.90
.047 (3/64)	.0470		.003	.250 (5x)	3	1/8	2-1/2	53047	33.30	53047-C8	40.10	53047-C4	45.00
.047 (3/64)	.0470		.005	.141 (3x)	3	1/8	1-1/2	901547	26.00	901547-C8	32.80		
.047 (3/64)	.0470		.010	.141 (3x)	3	1/8	1-1/2	904647	26.00	904647-C8	32.80		
.047 (3/64)	.0470		.015	.141 (3x)	3	1/8	1-1/2	912347	26.00	912347-C8	32.80		
	1.2 mm	.0472	.08 mm	1.80 mm (1.5x)	3	4 mm	50 mm	986227	29.00	986227-C8	36.10		
	1.2 mm	.0472	.08 mm	3.50 mm (3x)	3	4 mm	50 mm	973527	29.00	973527-C8	36.10		
.050	.0500		.003	.075 (1.5x)	3	1/8	1-1/2	61750	26.20	61750-C8	33.00		
.050	.0500		.003	.150 (3x)	3	1/8	1-1/2	50050	26.20	50050-C8	33.00		
.050	.0500		.003	.250 (5x)	3	1/8	2-1/2	53050	33.30	53050-C8	40.10		
	1.3 mm	.0511	.08 mm	4.00 mm (3x)	3	4 mm	50 mm	973529	29.00	973529-C8	36.10		
.055	.0550		.003	.083 (1.5x)	3	1/8	1-1/2	61755	26.20	61755-C8	33.00		
.055	.0550		.003	.165 (3x)	3	1/8	1-1/2	50055	26.20	50055-C8	33.00		
.055	.0550		.003	.275 (5x)	3	1/8	2-1/2	53055	33.30	53055-C8	40.10		
	1.4 mm	.0551	.08 mm	2.10 mm (1.5x)	3	4 mm	50 mm	986231	29.00	986231-C8	36.10		
	1.4 mm	.0551	.08 mm	4.00 mm (3x)	3	4 mm	50 mm	973531	29.00	973531-C8	36.10		
	1.5 mm	.0590	.10 mm	2.20 mm (1.5x)	3	4 mm	50 mm	986233	26.90	986233-C8	34.00		
	1.5 mm	.0590	.10 mm	4.50 mm (3x)	3	4 mm	50 mm	973533	26.90	973533-C8	34.00		
.060	.0600		.005	.090 (1.5x)	3	1/8	1-1/2	61760	26.20	61760-C8	33.00		
.060	.0600		.005	.180 (3x)	3	1/8	1-1/2	50060	26.20	50060-C8	33.00		
.060	.0600		.005	.312 (5x)	3	1/8	2-1/2	53060	33.30	53060-C8	40.10		
.060	.0600		.010	.180 (3x)	3	1/8	1-1/2	904660	33.30	904660-C8	40.10		
.062 (1/16)	.0620		.005	.093 (1.5x)	3	1/8	1-1/2	61762	24.30	61762-C8	31.10	61762-C4	36.00
.062 (1/16)	.0620		.005	.186 (3x)	3	1/8	1-1/2	50062	24.20	50062-C8	31.00	50062-C4	35.90
.062 (1/16)	.0620		.005	.312 (5x)	3	1/8	2-1/2	53062	31.60	53062-C8	38.40	53062-C4	43.30
.062 (1/16)	.0620		.010	.093 (1.5x)	3	1/8	1-1/2	878562	24.30	878562-C8	31.10		
.062 (1/16)	.0620		.010	.186 (3x)	3	1/8	1-1/2	904662	24.20	904662-C8	31.00		
.062 (1/16)	.0620		.015	.186 (3x)	3	1/8	1-1/2	912362	24.20	912362-C8	31.00		
.062 (1/16)	.0620		.020	.186 (3x)	3	1/8	1-1/2	925862	24.20	925862-C8	31.00		
	1.6 mm	.0629	.10 mm	2.40 mm (1.5x)	3	4 mm	50 mm	986236	26.90	986236-C8	34.00		
	1.6 mm	.0629	.10 mm	5.00 mm (3x)	3	4 mm	50 mm	973536	26.90	973536-C8	34.00		
	1.7 mm	.0669	.10 mm	5.00 mm (3x)	3	4 mm	50 mm	973538	26.90	973538-C8	34.00		
.070	.0700		.005	.210 (3x)	3	1/8	1-1/2	50070	24.80	50070-C8	31.60		
	1.8 mm	.0708	.10 mm	2.70 mm (1.5x)	3	4 mm	50 mm	986240	26.90	986240-C8	34.00		
	1.8 mm	.0708	.10 mm	5.50 mm (3x)	3	4 mm	50 mm	973540	26.90	973540-C8	34.00		
	1.9 mm	.0748	.10 mm	5.50 mm (3x)	3	4 mm	50 mm	973542	26.90	973542-C8	34.00		
.078 (5/64)	.0780		.005	.117 (1.5x)	3	1/8	1-1/2	61778	24.30	61778-C8	31.10	61778-C4	36.00
.078 (5/64)	.0780		.005	.234 (3x)	3	1/8	1-1/2	50078	24.20	50078-C8	31.00	50078-C4	35.90
.078 (5/64)	.0780		.005	.406 (5x)	3	1/8	2-1/2	53078	31.60	53078-C8	38.40	53078-C4	43.30
.078 (5/64)	.0780		.010	.117 (1.5x)	3	1/8	1-1/2	878578	24.30	878578-C8	31.10		

ALUMINUM ALLOYS

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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Corner Radius (cont.)

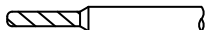
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ALUMINUM ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
D <sub>1</sub>		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									
.078 (5/64)		.0780	.010	.234 (3x)	3	1/8	1-1/2	904678	24.20	904678-C8	31.00		
.078 (5/64)		.0780	.015	.234 (3x)	3	1/8	1-1/2	912378	24.20	912378-C8	31.00		
.078 (5/64)		.0780	.020	.234 (3x)	3	1/8	1-1/2	925878	24.20	925878-C8	31.00		
	2.0 mm	.0787	.10 mm	3.00 mm (1.5x)	3	4 mm	50 mm	986245	26.90	986245-C8	34.00		
	2.0 mm	.0787	.10 mm	6.00 mm (3x)	3	4 mm	50 mm	973545	26.90	973545-C8	34.00		
.080		.0800	.005	.240 (3x)	3	1/8	1-1/2	50080	24.80	50080-C8	31.60		
.090		.0900	.005	.270 (3x)	3	1/8	1-1/2	50090	24.80	50090-C8	31.60		
.093 (3/32)		.0930	.005	.139 (1.5x)	3	1/8	1-1/2	61793	24.30	61793-C8	31.10	61793-C4	36.00
.093 (3/32)		.0930	.005	.279 (3x)	3	1/8	1-1/2	50093	24.20	50093-C8	31.00	50093-C4	35.90
.093 (3/32)		.0930	.005	.500 (5x)	3	1/8	2-1/2	53093	31.60	53093-C8	38.40	53093-C4	43.30
.093 (3/32)		.0930	.010	.139 (1.5x)	3	1/8	1-1/2	878593	24.30	878593-C8	31.10		
.093 (3/32)		.0930	.010	.279 (3x)	3	1/8	1-1/2	904693	24.20	904693-C8	31.00		
.093 (3/32)		.0930	.015	.279 (3x)	3	1/8	1-1/2	912393	24.20	912393-C8	31.00		
.093 (3/32)		.0930	.020	.139 (1.5x)	3	1/8	1-1/2	889493	24.30	889493-C8	31.10		
.093 (3/32)		.0930	.020	.279 (3x)	3	1/8	1-1/2	925893	24.20	925893-C8	31.00		
.093 (3/32)		.0930	.030	.139 (1.5x)	3	1/8	1-1/2	893893	24.30	893893-C8	31.10		
.093 (3/32)		.0930	.030	.279 (3x)	3	1/8	1-1/2	904193	24.20	904193-C8	31.00		
	2.5 mm	.0984	.10 mm	7.50 mm (3x)	3	4 mm	50 mm	973551	26.90	973551-C8	34.00		
.100		.1000	.005	.150 (1.5x)	3	1/8	1-1/2	61800	24.30	61800-C8	31.10		
.100		.1000	.005	.300 (3x)	3	1/8	1-1/2	50100	24.30	50100-C8	31.10		
	3.0 mm	.1181	.10 mm	9.00 mm (3x)	3	4 mm	50 mm	973557	26.90	973557-C8	34.00		

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
+ .000" - .002"			+ .001" - .001"	+ .030" - .000"									
.125 (1/8)		.1250	.005	.187 (1.5x)	3	1/8	1-1/2	61808	24.20	61808-C8	31.00	61808-C4	35.90
.125 (1/8)		.1250	.005	.375 (3x)	3	1/8	1-1/2	50108	24.20	50108-C8	31.00	50108-C4	35.90
.125 (1/8)		.1250	.005	.625 (5x)	3	1/8	2-1/2	53108	31.60	53108-C8	38.40	53108-C4	43.30
.125 (1/8)		.1250	.010	.187 (1.5x)	3	1/8	1-1/2	878608	23.90	878608-C8	30.70		
.125 (1/8)		.1250	.010	.375 (3x)	3	1/8	1-1/2	904708	23.20	904708-C8	30.00	904708-C4	34.90
.125 (1/8)		.1250	.010	.625 (5x)	3	1/8	2-1/2	840808	30.80	840808-C8	37.60		
.125 (1/8)		.1250	.015	.187 (1.5x)	3	1/8	1-1/2	831208	23.20	831208-C8	30.00		
.125 (1/8)		.1250	.015	.375 (3x)	3	1/8	1-1/2	912408	23.20	912408-C8	30.00	912408-C4	34.90
.125 (1/8)		.1250	.015	.625 (5x)	3	1/8	2-1/2	852408	30.80	852408-C8	37.60		
.125 (1/8)		.1250	.020	.187 (1.5x)	3	1/8	1-1/2	889508	26.30	889508-C8	33.10		
.125 (1/8)		.1250	.020	.375 (3x)	3	1/8	1-1/2	925908	23.20	925908-C8	30.00	925908-C4	34.90
.125 (1/8)		.1250	.020	.625 (5x)	3	1/8	2-1/2	838308	30.80	838308-C8	37.60		
.125 (1/8)		.1250	.030	.187 (1.5x)	3	1/8	1-1/2	893908	26.30	893908-C8	33.10		
.125 (1/8)		.1250	.030	.375 (3x)	3	1/8	1-1/2	904208	23.20	904208-C8	30.00	904208-C4	34.90
.125 (1/8)		.1250	.030	.625 (5x)	3	1/8	2-1/2	829708	30.80	829708-C8	37.60		
.125 (1/8)		.1250	.040	.375 (3x)	3	1/8	1-1/2	892808	27.40	892808-C8	34.20		
.156 (5/32)		.1562	.005	.235 (1.5x)	3	3/16	2	61810	25.20	61810-C8	32.00		
.156 (5/32)		.1562	.005	.470 (3x)	3	3/16	2	50110	25.20	50110-C8	32.00	50110-C4	41.30
.156 (5/32)		.1562	.005	.750 (5x)	3	3/16	3	53110	34.80	53110-C8	41.60		
.156 (5/32)		.1562	.020	.470 (3x)	3	3/16	2	925910	25.20	925910-C8	32.00		NEW
.156 (5/32)		.1562	.030	.470 (3x)	3	3/16	2	904210	25.20	904210-C8	32.00		NEW
.187 (3/16)		.1875	.005	.285 (1.5x)	3	3/16	2	61812	25.20	61812-C8	32.00	61812-C4	41.30
.187 (3/16)		.1875	.005	.562 (3x)	3	3/16	2	50112	25.20	50112-C8	32.00	50112-C4	41.30

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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Corner Radius (cont.)



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NEW	CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	FLUTES	SHANK DIA.		UNCOATED		TiB <sub>2</sub> COATED		AMORPHOUS DIAMOND	
					D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
	D <sub>1</sub> $\pm .000$ " -.002"	decimal equivalent	R $\pm .001$ " -.001"	L <sub>2</sub> $\pm .030$ " -.000"								
	.187 (3/16)	.1875	.005	1.000 (5x)	3	3/16	3	53112	34.80	53112-C8	41.60	53112-C4 48.60
	.187 (3/16)	.1875	.010	.562 (3x)	3	3/16	2	904712	36.00	904712-C8	42.80	
	.187 (3/16)	.1875	.015	.562 (3x)	3	3/16	2	912412	36.00	912412-C8	42.80	
NEW	.187 (3/16)	.1875	.020	.285 (1.5x)	3	3/16	2	889512	36.00	889512-C8	42.80	
NEW	.187 (3/16)	.1875	.020	.562 (3x)	3	3/16	2	925912	36.00	925912-C8	42.80	
	.187 (3/16)	.1875	.030	.285 (1.5x)	3	3/16	2	893912	36.00	893912-C8	42.80	
	.187 (3/16)	.1875	.030	.562 (3x)	3	3/16	2	904212	36.00	904212-C8	42.80	
	.187 (3/16)	.1875	.060	.562 (3x)	3	3/16	2	834812	36.00	834812-C8	42.80	
	.250 (1/4)	.2500	.005	.750 (3x)	3	1/4	2-1/2	901616	33.20	901616-C8	40.50	
	.250 (1/4)	.2500	.010	.375 (1.5x)	3	1/4	2-1/2	61816	30.10	61816-C8	37.40	61816-C4 48.40
	.250 (1/4)	.2500	.010	.750 (3x)	3	1/4	2-1/2	50116	30.10	50116-C8	37.40	50116-C4 48.40
	.250 (1/4)	.2500	.010	1.250 (5x)	3	1/4	4	53116	42.50	53116-C8	50.70	53116-C4 60.80
	.250 (1/4)	.2500	.015	.750 (3x)	3	1/4	2-1/2	912416	31.90	912416-C8	39.20	
	.250 (1/4)	.2500	.020	.750 (3x)	3	1/4	2-1/2	925916	31.90	925916-C8	39.20	
NEW	.250 (1/4)	.2500	.030	.375 (1.5x)	3	1/4	2-1/2	893916	31.90	893916-C8	39.20	
	.250 (1/4)	.2500	.030	.750 (3x)	3	1/4	2-1/2	904216	31.90	904216-C8	39.20	
	.250 (1/4)	.2500	.060	.750 (3x)	3	1/4	2-1/2	834816	31.90	834816-C8	39.20	

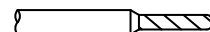
ALUMINUM ALLOYS

## 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 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 complete speeds and feeds charts, please see [www.harveytool.com](http://www.harveytool.com)

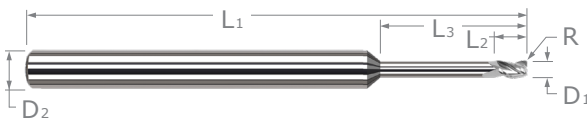
Cutter Series	Material	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter									
			.015	.031	.047	.062	.078	.093	.125	.187	.250	
Uncoated	<b>Aluminum Alloys:</b> Casting (2xx, 5xx, 7xx, 8xx)	750	Slotting	.0020	.0041	.0062	.0082	.0103	.0123	.0165	.0247	.0330
	Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1000	Roughing	.0023	.0048	.0072	.0095	.0120	.0143	.0193	.0288	.0385
	<b>Magnesium Alloys:</b> All alloys	1500	Finishing	.0025	.0051	.0078	.0102	.0129	.0153	.0206	.0309	.0413
	<b>Zinc Alloys:</b> All alloys	800	Max	.0026	.0055	.0083	.0109	.0137	.0164	.0220	.0329	.0440
	<b>Copper Alloys:</b> High Coppers - 90%+ (C1xxxx)	225	Slotting	.0016	.0033	.0050	.0065	.0082	.0098	.0132	.0197	.0264
	Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx)	500	Roughing	.0018	.0038	.0058	.0076	.0096	.0115	.0154	.0230	.0308
	Phosphor Bronzes (Copper Tin alloys, C5xxxx)	225	Finishing	.0020	.0041	.0062	.0082	.0103	.0123	.0165	.0247	.0330
	Aluminum Bronzes (Copper Aluminum alloys, C6060-C6420)	500	Max	.0021	.0044	.0066	.0087	.0110	.0131	.0176	.0263	.0352
	Silicon Bronzes (Copper Silicon alloys, C6470-C6610)	500	<b>Radial Depth of Cut*:</b>		<b>Axial Depth of Cut*:</b>							
	Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	225	Slotting: 1x Dia		Slotting: 5x Dia							
Cast Copper Alloys (C8330-C8620, C8640-C8790, C9220-C9580, C9730-C9780, C9940-C9970)	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	.0026	.0053	.0081	.0106	.0134	.0160	.0215	.0321	.0429
	Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1400	Roughing	.0030	.0062	.0094	.0124	.0156	.0186	.0250	.0374	.0501
	<b>Magnesium Alloys:</b> All alloys	2000	Finishing	.0032	.0066	.0101	.0133	.0167	.0199	.0268	.0401	.0536
	<b>Zinc Alloys:</b> All alloys	1100	Max	.0034	.0071	.0108	.0142	.0178	.0213	.0286	.0428	.0572
			<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	.0022	.0045	.0068	.0090	.0113	.0135	.0182	.0272	.0363
	Casting - 5% - 8% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	2000	Roughing	.0025	.0053	.0080	.0105	.0132	.0158	.0212	.0317	.0424
	Casting - 8% - 12% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	1500	Finishing	.0027	.0056	.0085	.0113	.0142	.0169	.0227	.0339	.0454
	Casting - 12% - 16% Si (3xx, A3xx, C3xx, 4xx, A4xx, B4xx)	1000	Max	.0029	.0060	.0091	.0120	.0151	.0180	.0242	.0362	.0484
	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: 4x 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	.0017	.0036	.0055	.0072	.0091	.0108	.0145	.0217	.0290
	Aluminum Bronzes (Copper Aluminum alloys, C6060-C6420)	1000	Roughing	.0020	.0042	.0064	.0084	.0106	.0126	.0169	.0253	.0339
Silicon Bronzes (Copper Silicon alloys, C6470-C6610)	1000	Finishing	.0022	.0045	.0068	.0090	.0113	.0135	.0182	.0272	.0363	
Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	800	Max	.0023	.0048	.0073	.0096	.0121	.0144	.0194	.0290	.0387	
Cast Copper Alloys (C8010-C8280, C86300, C90200-C91700, C96200-C96600, C99300)	150	<b>Radial Depth of Cut*:</b>		<b>Axial Depth of Cut*:</b>								
Cast Copper Alloys (C8330-C8620, C8640-C8790, C9220-C9580, C9730-C9780, C9940-C9970)	750	Slotting: 1x Dia		Slotting: 4x Dia								
		Roughing: 4x 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

## Corner Radius – Long Reach, Stub Flute



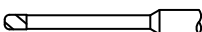
- ↻ Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- ↻ Long reach design for deep cavities    ↻ Reduced neck diameter to avoid heeling
- ↻ Variable helix design (approx. 42°) reduces chatter and harmonics and increases material removal rates
- ↻ 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

**mm & in**

ALUMINUM ALLOYS

CUTTER DIAMETER			CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIA.	OAL	UNCOATED		TiB <sub>2</sub> COATED	
D <sub>1</sub>			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"	+ .00mm	decimal	+ .001"	+ .010"	+ .010"							
- .0005"	- .02mm	equivalent	- .001"	- .000"	- .000"							
			+ .025mm	+ .25mm	+ .25mm							
			- .025mm	- .00mm	- .00mm							
.015 (1/64)		.0150	<b>.002</b>	.023	.078 (5x)	3	1/8	2-1/2	956515	50.00	956515-C8	56.80
.015 (1/64)		.0150	<b>.002</b>	.023	.125 (8x)	3	1/8	2-1/2	961315	51.20	961315-C8	58.00
.020		.0200	<b>.002</b>	.030	.100 (5x)	3	1/8	2-1/2	956520	47.50	956520-C8	54.30
.025		.0250	<b>.002</b>	.038	.125 (5x)	3	1/8	2-1/2	956525	46.20	956525-C8	53.00
.031 (1/32)		.0310	<b>.003</b>	.047	.156 (5x)	3	1/8	2-1/2	956531	43.20	956531-C8	50.00
.031 (1/32)		.0310	<b>.003</b>	.047	.250 (8x)	3	1/8	2-1/2	961331	44.30	961331-C8	51.10
.031 (1/32)		.0310	<b>.003</b>	.047	.312 (10x)	3	1/8	2-1/2	861031	47.20	861031-C8	54.00
.031 (1/32)		.0310	<b>.003</b>	.047	.375 (12x)	3	1/8	2-1/2	949631	48.40	949631-C8	55.20
.031 (1/32)		.0310	<b>.010</b>	.047	.250 (8x)	3	1/8	2-1/2	876231	44.30	876231-C8	51.10
1.0 mm		.0393	<b>.08 mm</b>	1.50 mm	5.0 mm (5x)	3	4 mm	50 mm	907622	47.20	907622-C8	54.30
.040		.0400	<b>.003</b>	.060	.203 (5x)	3	1/8	2-1/2	956540	43.50	956540-C8	50.30
.040		.0400	<b>.003</b>	.060	.325 (8x)	3	1/8	2-1/2	961340	44.30	961340-C8	51.10
.047 (3/64)		.0470	<b>.003</b>	.071	.250 (5x)	3	1/8	2-1/2	956547	43.20	956547-C8	50.00
.047 (3/64)		.0470	<b>.003</b>	.071	.375 (8x)	3	1/8	2-1/2	961347	44.30	961347-C8	51.10
.047 (3/64)		.0470	<b>.003</b>	.071	.570 (12x)	3	1/8	2-1/2	949647	48.40	949647-C8	55.20
.047 (3/64)		.0470	<b>.010</b>	.071	.375 (8x)	3	1/8	2-1/2	876247	44.30	876247-C8	51.10
.062 (1/16)		.0620	<b>.005</b>	.093	.312 (5x)	3	1/8	2-1/2	956562	43.20	956562-C8	50.00
.062 (1/16)		.0620	<b>.005</b>	.093	.500 (8x)	3	1/8	2-1/2	961362	44.30	961362-C8	51.10
.062 (1/16)		.0620	<b>.005</b>	.093	.625 (10x)	3	1/8	2-1/2	861062	47.20	861062-C8	54.00
.062 (1/16)		.0620	<b>.005</b>	.093	.750 (12x)	3	1/8	2-1/2	949662	48.40	949662-C8	55.20
.062 (1/16)		.0620	<b>.005</b>	.093	.950 (15x)	3	1/8	2-1/2	886862	48.40	886862-C8	55.20
.062 (1/16)		.0620	<b>.010</b>	.093	.500 (8x)	3	1/8	2-1/2	876262	44.30	876262-C8	51.10
.078 (5/64)		.0780	<b>.005</b>	.118	.406 (5x)	3	1/8	2-1/2	956578	43.20	956578-C8	50.00
.078 (5/64)		.0780	<b>.005</b>	.118	.625 (8x)	3	1/8	2-1/2	961378	44.30	961378-C8	51.10
.078 (5/64)		.0780	<b>.005</b>	.118	.940 (12x)	3	1/8	2-1/2	949678	48.40	949678-C8	55.20
.078 (5/64)		.0780	<b>.010</b>	.118	.625 (8x)	3	1/8	2-1/2	876278	44.30	876278-C8	51.10
2.0 mm		.0787	<b>.10 mm</b>	3.00 mm	10.0 mm (5x)	3	4 mm	50 mm	907645	47.20	907645-C8	54.30
.093 (3/32)		.0930	<b>.005</b>	.140	.500 (5x)	3	1/8	2-1/2	956593	43.20	956593-C8	50.00
.093 (3/32)		.0930	<b>.005</b>	.140	.750 (8x)	3	1/8	2-1/2	961393	44.30	961393-C8	51.10
.093 (3/32)		.0930	<b>.005</b>	.140	.950 (10x)	3	1/8	2-1/2	861093	47.20	861093-C8	54.00
.093 (3/32)		.0930	<b>.005</b>	.140	1.125 (12x)	3	1/8	2-1/2	949693	48.40	949693-C8	55.20
.093 (3/32)		.0930	<b>.005</b>	.140	1.400 (15x)	3	1/8	3	886893	50.90	886893-C8	57.70
.093 (3/32)		.0930	<b>.010</b>	.140	.750 (8x)	3	1/8	2-1/2	876293	44.30	876293-C8	51.10
.093 (3/32)		.0930	<b>.030</b>	.140	.750 (8x)	3	1/8	2-1/2	891893	44.30	891893-C8	51.10
3.0 mm		.1181	<b>.10 mm</b>	4.50 mm	15.0 mm (5x)	3	4 mm	50 mm	907657	44.50	907657-C8	51.60

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# 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>+0.00"</sup> / <sub>-.002"</sub> decimal equivalent	R <sup>+0.01"</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)	.005	.187	.625 (5x)	3	1/8	2-1/2	956608	42.50	956608-C8	49.30
.125 (1/8)	.005	.187	1.000 (8x)	3	1/8	2-1/2	961408	43.50	961408-C8	50.30
.125 (1/8)	.005	.187	1.250 (10x)	3	1/8	2-1/2	861108	45.90	861108-C8	52.70
.125 (1/8)	.005	.187	1.500 (12x)	3	1/8	3	949708	47.00	949708-C8	53.80
.125 (1/8)	.005	.187	1.875 (15x)	3	1/8	3	886908	49.50	886908-C8	56.30
.125 (1/8)	.010	.187	1.000 (8x)	3	1/8	2-1/2	876308	43.50	876308-C8	50.30
.125 (1/8)	.030	.187	1.000 (8x)	3	1/8	2-1/2	891908	43.50	891908-C8	50.30
.156 (5/32)	.005	.235	.750 (5x)	3	3/16	3	956610	47.80	956610-C8	54.60
.156 (5/32)	.005	.235	1.250 (8x)	3	3/16	3	961410	49.10	961410-C8	55.90
.187 (3/16)	.005	.285	1.000 (5x)	3	3/16	3	956612	47.80	956612-C8	54.60
.187 (3/16)	.005	.285	1.500 (8x)	3	3/16	3	961412	49.10	961412-C8	55.90
.187 (3/16)	.005	.285	2.250 (12x)	3	3/16	4	949712	61.20	949712-C8	68.50
.250 (1/4)	.010	.375	1.250 (5x)	3	1/4	4	956616	50.00	956616-C8	58.20
.250 (1/4)	.010	.375	2.000 (8x)	3	1/4	4	961416	51.00	961416-C8	59.20
.250 (1/4)	.010	.375	3.000 (12x)	3	1/4	6	949716	64.30	949716-C8	76.00

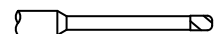
ALUMINUM ALLOYS

## 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.harveytol.com](http://www.harveytol.com).

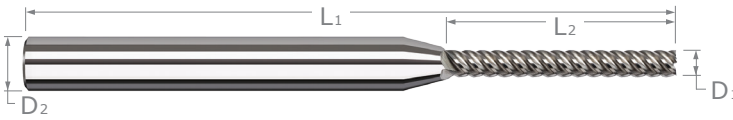
Cutter Series	Material	SFM	Chip Load Per Tooth (IPT) By Cutter Diameter										
			.015	.031	.047	.062	.078	.093	.125	.187	.250		
Uncoated	<b>Aluminum Alloys:</b> Casting (2xx, 5xx, 7xx, 8xx)	750	Slotting	.00016	.00033	.00050	.00065	.00082	.00098	.00132	.00197	.00264	
	Wrought (1xxx, 2xxx, 3xxx, 5xxx, 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>		<b>Slotting:</b> 1x Dia		<b>Axial Depth of Cut*:</b>		<b>Slotting:</b> 4x Dia				
	Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	225	<b>Roughing:</b> 4x Dia		<b>Roughing:</b> .5x - 1x Dia		<b>Finishing:</b> .5x - 1x Dia						
Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	550	<b>Finishing:</b> .1x Dia		<b>Finishing:</b> .1x Dia									
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>		<b>Slotting:</b> 1x Dia		<b>Axial Depth of Cut*:</b>		<b>Slotting:</b> 4x Dia				
			<b>Roughing:</b> 4x Dia		<b>Roughing:</b> .5x - 1x Dia		<b>Finishing:</b> .5x - 1x Dia						
			<b>Finishing:</b> .1x Dia		<b>Finishing:</b> .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	<b>Radial Depth of Cut*:</b>		<b>Slotting:</b> 1x Dia		<b>Axial Depth of Cut*:</b>		<b>Slotting:</b> 3x Dia				
Wrought - 8% - 12% Si (4xxx)		1700	<b>Roughing:</b> 4x Dia		<b>Roughing:</b> .3x - .8x Dia		<b>Finishing:</b> .5x - 1x Dia						
<b>Copper Alloys:</b> High Coppers - 90%+ (C1xxxx)		800	<b>Finishing:</b> .1x Dia		<b>Finishing:</b> .1x Dia								
Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx, C66400-C69800)		1500	Slotting	.00014	.00029	.00044	.00058	.00072	.00086	.00116	.00174	.00232	
Phosphor Bronzes (Copper Tin alloys, C5xxxx)		800	Roughing	.00016	.00034	.00051	.00067	.00085	.00101	.00136	.00203	.00271	
Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)		1000	Finishing	.00017	.00036	.00055	.00072	.00091	.00108	.00145	.00217	.00290	
Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	1000	Max	.00019	.00038	.00058	.00077	.00097	.00115	.00155	.00232	.00310		
Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	800	<b>Radial Depth of Cut*:</b>		<b>Slotting:</b> 1x Dia		<b>Axial Depth of Cut*:</b>		<b>Slotting:</b> 3x Dia					
Cast Copper Alloys (C80100-C82800, C86300, C90200-C91700, C96200-C96600, C99300)	150	<b>Roughing:</b> 4x Dia		<b>Roughing:</b> .3x - .8x Dia		<b>Finishing:</b> .5x - 1x Dia							
Cast Copper Alloys (C83300-C86200, C86400-C87900, C92200-C95800, C97300-C97800, C99400-C99700)	750	<b>Finishing:</b> .1x Dia		<b>Finishing:</b> .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

## Finishers – Square

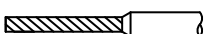


- Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- Variable helix design (approx. 50°) reduces chatter and harmonics, improving finish
- High helix for effective chip evacuation ➤ h6 shank tolerance for high precision tool holders
- End cutting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

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>	TOOL #
.015 (1/64)		.0150	<b>.078</b> (5x)	4	1/8	2-1/2	66715	45.10	66715-C8	51.90
.015 (1/64)		.0150	<b>.125</b> (8x)	4	1/8	2-1/2	67115	45.70	67115-C8	52.50
.020		.0200	<b>.100</b> (5x)	4	1/8	2-1/2	66720	43.90	66720-C8	50.70
.020		.0200	<b>.160</b> (8x)	4	1/8	2-1/2	67120	45.40	67120-C8	52.20
.025		.0250	<b>.125</b> (5x)	4	1/8	2-1/2	66725	42.70	66725-C8	49.50
.025		.0250	<b>.203</b> (8x)	4	1/8	2-1/2	67125	43.70	67125-C8	50.50
.031 (1/32)		.0310	<b>.093</b> (3x)	5	1/8	1-1/2	948831	29.10	948831-C8	35.90
.031 (1/32)		.0310	<b>.156</b> (5x)	5	1/8	2-1/2	66731	40.70	66731-C8	47.50
.031 (1/32)		.0310	<b>.250</b> (8x)	5	1/8	2-1/2	67131	41.90	67131-C8	48.70
.031 (1/32)		.0310	<b>.312</b> (10x)	5	1/8	2-1/2	917631	53.40	917631-C8	60.20
	1.0 mm	.0393	<b>5.00 mm</b> (5x)	5	4 mm	50 mm	915522	41.90	915522-C8	49.00
	1.0 mm	.0393	<b>8.00 mm</b> (8x)	5	4 mm	50 mm	907122	43.20	907122-C8	50.30
.040		.0400	<b>.203</b> (5x)	5	1/8	2-1/2	66740	40.70	66740-C8	47.50
.040		.0400	<b>.325</b> (8x)	5	1/8	2-1/2	67140	41.90	67140-C8	48.70
.047 (3/64)		.0470	<b>.141</b> (3x)	5	1/8	1-1/2	948847	29.10	948847-C8	35.90
.047 (3/64)		.0470	<b>.250</b> (5x)	5	1/8	2-1/2	66747	40.70	66747-C8	47.50
.047 (3/64)		.0470	<b>.375</b> (8x)	5	1/8	2-1/2	67147	41.90	67147-C8	48.70
.050		.0500	<b>.250</b> (5x)	5	1/8	2-1/2	66750	40.70	66750-C8	47.50
.050		.0500	<b>.400</b> (8x)	5	1/8	2-1/2	67150	41.90	67150-C8	48.70
.060		.0600	<b>.312</b> (5x)	5	1/8	2-1/2	66760	37.90	66760-C8	44.70
.060		.0600	<b>.500</b> (8x)	5	1/8	2-1/2	67160	39.00	67160-C8	45.80
.062 (1/16)		.0620	<b>.186</b> (3x)	5	1/8	1-1/2	948862	27.20	948862-C8	34.00
.062 (1/16)		.0620	<b>.312</b> (5x)	5	1/8	2-1/2	66762	37.90	66762-C8	44.70
.062 (1/16)		.0620	<b>.500</b> (8x)	5	1/8	2-1/2	67162	39.00	67162-C8	45.80
.062 (1/16)		.0620	<b>.625</b> (10x)	5	1/8	2-1/2	917662	57.30	917662-C8	64.10
.078 (5/64)		.0780	<b>.234</b> (3x)	5	1/8	1-1/2	948878	27.20	948878-C8	34.00
.078 (5/64)		.0780	<b>.406</b> (5x)	5	1/8	2-1/2	66778	37.90	66778-C8	44.70
.078 (5/64)		.0780	<b>.625</b> (8x)	5	1/8	2-1/2	67178	39.00	67178-C8	45.80
	2.0 mm	.0787	<b>10.00 mm</b> (5x)	5	4 mm	50 mm	915545	40.50	915545-C8	47.60
	2.0 mm	.0787	<b>16.00 mm</b> (8x)	5	4 mm	50 mm	907145	41.90	907145-C8	49.00
.093 (3/32)		.0930	<b>.279</b> (3x)	5	1/8	1-1/2	948893	27.20	948893-C8	34.00
.093 (3/32)		.0930	<b>.375</b> (4x)	5	1/8	2-1/2	829493	37.40	829493-C8	44.20
.093 (3/32)		.0930	<b>.500</b> (5x)	5	1/8	2-1/2	66793	37.90	66793-C8	44.70
.093 (3/32)		.0930	<b>.750</b> (8x)	5	1/8	2-1/2	67193	39.00	67193-C8	45.80
.093 (3/32)		.0930	<b>.950</b> (10x)	5	1/8	2-1/2	917693	57.30	917693-C8	64.10

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# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Finishers – Square (cont.)



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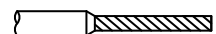
CUTTER DIAMETER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED	
D <sub>1</sub>		decimal equivalent	L <sub>2</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
+ .0005" - .0005"	+ .00mm - .02mm		+ .010" - .000" + .25mm - .00mm							
.100		.1000	<b>.500</b> (5x)	5	1/8	2-1/2	66800	37.90	66800-C8	44.70
.100		.1000	<b>.800</b> (8x)	5	1/8	2-1/2	67200	39.00	67200-C8	45.80
.109 (7/64)		.1090	<b>.570</b> (5x)	5	1/8	2-1/2	66802	37.90	66802-C8	44.70
.109 (7/64)		.1090	<b>.900</b> (8x)	5	1/8	2-1/2	67202	39.00	67202-C8	45.80
3.0 mm		.1181	<b>15.00 mm</b> (5x)	5	4 mm	50 mm	915557	40.50	915557-C8	47.60
3.0 mm		.1181	<b>24.00 mm</b> (8x)	5	4 mm	50 mm	907157	41.90	907157-C8	49.00

D <sub>1</sub>	decimal equivalent	L <sub>2</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE		
.125 (1/8)	.1250	+ .030" - .000"	<b>.187</b> (1.5x)	5	1/8	1-1/2	856908	25.20	856908-C8	32.00
.125 (1/8)	.1250		<b>.375</b> (3x)	5	1/8	1-1/2	948908	25.20	948908-C8	32.00
.125 (1/8)	.1250		<b>.500</b> (4x)	5	1/8	2-1/2	829508	36.40	829508-C8	43.20
.125 (1/8)	.1250		<b>.625</b> (5x)	5	1/8	2-1/2	66808	36.90	66808-C8	43.70
.125 (1/8)	.1250		<b>1.000</b> (8x)	5	1/8	2-1/2	67208	38.20	67208-C8	45.00
.125 (1/8)	.1250		<b>1.125</b> (10x)	5	1/8	2-1/2	917708	56.60	917708-C8	63.40
.156 (5/32)	.1562		<b>.750</b> (5x)	5	3/16	3	66810	39.50	66810-C8	46.30
.156 (5/32)	.1562		<b>1.250</b> (8x)	5	3/16	3	67210	41.10	67210-C8	47.90
.187 (3/16)	.1875		<b>.285</b> (1.5x)	5	3/16	2	856912	29.70	856912-C8	36.50
.187 (3/16)	.1875		<b>.570</b> (3x)	5	3/16	2	948912	29.70	948912-C8	36.50
.187 (3/16)	.1875		<b>1.000</b> (5x)	5	3/16	3	66812	39.50	66812-C8	46.30
.187 (3/16)	.1875		<b>1.500</b> (8x)	5	3/16	3	67212	41.10	67212-C8	47.90
.187 (3/16)	.1875		<b>1.875</b> (10x)	5	3/16	4	917712	57.50	917712-C8	64.80
.250 (1/4)	.2500		<b>.375</b> (1.5x)	5	1/4	2-1/2	856916	39.10	856916-C8	46.40
.250 (1/4)	.2500		<b>.750</b> (3x)	5	1/4	2-1/2	948916	39.10	948916-C8	46.40
.250 (1/4)	.2500		<b>1.250</b> (5x)	5	1/4	4	66816	48.10	66816-C8	56.30
.250 (1/4)	.2500		<b>2.000</b> (8x)	5	1/4	4	67216	49.40	67216-C8	57.60

ALUMINUM ALLOYS

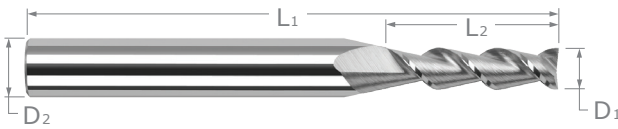
## SPEEDS & FEEDS (High Helix Finishers for Aluminum & Non-Ferrous Alloys)

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	Finishing (3x LOC)	.00027	.00056	.00085	.00112	.00140	.00167	.00225	.00337	.00450	.12x Dia	.5x - 3x Dia												
	Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1000																								
	<b>Magnesium Alloys:</b> All alloys	1500																								
	<b>Zinc Alloys:</b> All alloys	800	Finishing (4x LOC)	.00024	.00049	.00074	.00098	.00123	.00146	.00197	.00295	.00394	.10x Dia	.5x - 4x Dia												
	<b>Copper Alloys:</b> High Coppers - 90%+ (C1xxxx)	225																								
	Brass (Copper Zinc alloys, C2xxxx, C3xxxx, C4xxxx, C66400-C69800)	500																								
	Phosphor Bronzes (Copper Tin alloys, C5xxxx)	225																								
	Uncoated	Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)	500	Finishing (5x LOC)	.00020	.00042	.00063	.00084	.00105	.00126	.00169	.00252	.00338	.09x Dia	.5x - 5x Dia											
		Silicon Bronzes (Copper Silicon alloys, C64700-C66100)	500																							
		Copper Nickels, Nickel Silvers (Copper Nickel alloys, C7xxxx)	225	Finishing (8x LOC)	.00015	.00031	.00047	.00061	.00077	.00092	.00124	.00185	.00248	.07x Dia	.5x - 8x 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	Finishing (3x LOC)	.00035	.00073	.00110	.00145	.00183	.00218	.00293	.00438	.00585	.12x Dia	.5x - 3x Dia											
	Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	1400	Finishing (4x LOC)													.00031	.00063	.00096	.00127	.00160	.00190	.00256	.00383	.00512	.10x Dia	.5x - 4x Dia
		Finishing (5x LOC)																								
	<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"!

- ⚡ 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!**



ALUMINUM ALLOYS

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>-.0005"</sub>	L <sub>2</sub> <sup>+0.010"</sup> <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>						
.010	<b>.030</b> (3x)	1/8	1-1/2	24110	29.40			24110-C8	36.20
.015 (1/64)	<b>.045</b> (3x)	1/8	1-1/2	24115	28.60			24115-C8	35.40
.020	<b>.060</b> (3x)	1/8	1-1/2	24120	26.90			24120-C8	33.70
.025	<b>.075</b> (3x)	1/8	1-1/2	24125	25.00			24125-C8	31.80
.030	<b>.090</b> (3x)	1/8	1-1/2	24130	21.70			24130-C8	28.50
.031 (1/32)	<b>.047</b> (1.5x)	1/8	1-1/2	935531	21.70			935531-C8	28.50
.031 (1/32)	<b>.093</b> (3x)	1/8	1-1/2	24131	21.70	24131-C7	27.00	24131-C8	28.50
.031 (1/32)	<b>.156</b> (5x)	1/8	2-1/2	932031	27.90			932031-C8	34.70
.039 (1 mm)	<b>.117</b> (3x)	1/8	1-1/2	24139	21.70			24139-C8	28.50
.040	<b>.120</b> (3x)	1/8	1-1/2	24140	21.70	24140-C7	27.00	24140-C8	28.50
.040	<b>.203</b> (5x)	1/8	2-1/2	932040	27.90			932040-C8	34.70
.047 (3/64)	<b>.071</b> (1.5x)	1/8	1-1/2	935547	21.70			935547-C8	28.50
.047 (3/64)	<b>.141</b> (3x)	1/8	1-1/2	24147	21.70	24147-C7	27.00	24147-C8	28.50
.047 (3/64)	<b>.250</b> (5x)	1/8	2-1/2	932047	27.90			932047-C8	34.70
.050	<b>.150</b> (3x)	1/8	1-1/2	24150	21.70	24150-C7	27.00	24150-C8	28.50
.050	<b>.250</b> (5x)	1/8	2-1/2	932050	27.90			932050-C8	34.70
.060	<b>.180</b> (3x)	1/8	1-1/2	24160	21.70	24160-C7	27.00	24160-C8	28.50
.060	<b>.312</b> (5x)	1/8	2-1/2	932060	28.80			932060-C8	35.60
.062 (1/16)	<b>.093</b> (1.5x)	1/8	1-1/2	935562	19.00			935562-C8	25.80
.062 (1/16)	<b>.186</b> (3x)	1/8	1-1/2	24162	19.00	24162-C7	24.30	24162-C8	25.80
.062 (1/16)	<b>.312</b> (5x)	1/8	2-1/2	932062	28.80			932062-C8	35.60
.070	<b>.210</b> (3x)	1/8	1-1/2	24170	19.00	24170-C7	24.30	24170-C8	25.80
.078 (5/64)	<b>.117</b> (1.5x)	1/8	1-1/2	935578	19.00			935578-C8	25.80
.078 (5/64)	<b>.234</b> (3x)	1/8	1-1/2	24178	19.00	24178-C7	24.30	24178-C8	25.80
.078 (5/64)	<b>.406</b> (5x)	1/8	2-1/2	932078	28.80			932078-C8	35.60
.080	<b>.240</b> (3x)	1/8	1-1/2	24180	19.00	24180-C7	24.30	24180-C8	25.80
.090	<b>.270</b> (3x)	1/8	1-1/2	24190	19.00	24190-C7	24.30	24190-C8	25.80
.093 (3/32)	<b>.140</b> (1.5x)	1/8	1-1/2	935593	19.00			935593-C8	25.80
.093 (3/32)	<b>.279</b> (3x)	1/8	1-1/2	24193	19.00	24193-C7	24.30	24193-C8	25.80
.093 (3/32)	<b>.500</b> (5x)	1/8	2-1/2	932093	28.80			932093-C8	35.60
.100	<b>.300</b> (3x)	1/8	1-1/2	24199	19.00	24199-C7	24.30	24199-C8	25.80
.109 (7/64)	<b>.327</b> (3x)	1/8	1-1/2	24202	28.60			24202-C8	35.40
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	24205	28.40			24205-C8	35.20

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# HIGH HELIX END MILLS FOR ALUMINUM ALLOYS

45° Helix – Square (cont.)

continued from previous page

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>+0.000"</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)	.187 (1.5x)	1/8	1-1/2	935608	17.50			935608-C8	24.30
.125 (1/8)	.500 (4x)	1/8	1-1/2	24208	17.50	24208-C7	22.80	24208-C8	24.30
.125 (1/8)	.625 (5x)	1/8	2-1/2	932108	23.70			932108-C8	30.50
.140 (9/64)	.500 (3x)	3/16	2	24209	23.10			24209-C8	29.90
.156 (5/32)	.235 (1.5x)	3/16	2	935610	19.80			935610-C8	26.60
.156 (5/32)	.562 (3x)	3/16	2	24210	19.80			24210-C8	26.60
.156 (5/32)	.750 (5x)	3/16	3	932110	23.20			932110-C8	30.00
.187 (3/16)	.285 (1.5x)	3/16	2	935612	19.80			935612-C8	26.60
.187 (3/16)	.625 (3x)	3/16	2	24212	19.80	24212-C7	25.50	24212-C8	26.60
.187 (3/16)	1.000 (5x)	3/16	3	932112	23.20			932112-C8	30.00
.250 (1/4)	.375 (1.5x)	1/4	2-1/2	935616	24.40			935616-C8	31.70
.250 (1/4)	.750 (3x)	1/4	2-1/2	24216	24.40	24216-C7	32.50	24216-C8	31.70
.250 (1/4)	1.250 (5x)	1/4	4	932116	29.00			932116-C8	37.20

ALUMINUM ALLOYS

## SPEEDS & FEEDS (45° Helix – 2 Flutes)

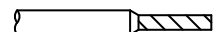
**Important Note:** Values in table are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cuts, table values of IPT must be increased (for 1.5x, increase to 110%). For longer lengths of cut, table values of IPT must be reduced (for 5x, reduce to 80%). For complete 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 Roughing Finishing	.00031 .00037 .00025	.00047 .00056 .00038	.00062 .00074 .00050	.00078 .00094 .00062	.00093 .00112 .00074	.00125 .00150 .00100	.00187 .00224 .00150	.00250 .00300 .00200	
	<b>Magnesium Alloys</b>	1500	Radial Depth of Cut*: Slotting: 1x Dia Roughing: 5x Dia Finishing: 1x Dia		Axial Depth of Cut*: Slotting: 5x Dia Roughing: 5x - 1x Dia Finishing: 1x - 3x Dia							
	<b>Zinc Alloys</b>	800										
	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 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 Roughing Finishing	.00039 .00042 .00031	.00059 .00063 .00047	.00078 .00084 .00062	.00098 .00105 .00078	.00116 .00126 .00093	.00156 .00169 .00125	.00234 .00252 .00187	.00313 .00338 .00250
		<b>Magnesium Alloys</b>	2000	Radial Depth of Cut*: Slotting: 1x Dia Roughing: 5x Dia Finishing: 1x Dia		Axial Depth of Cut*: Slotting: 5x Dia Roughing: 5x - 1x Dia Finishing: 1x - 3x Dia						
		<b>Zinc Alloys</b>	1100									
		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									



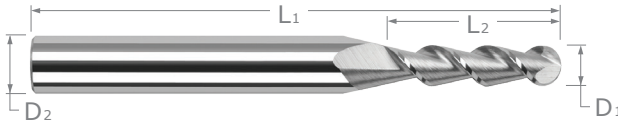
View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)



# 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!**



ALUMINUM ALLOYS

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>						
.015 (1/64)	<b>.045</b> (3x)	1/8	1-1/2	27815	32.30			27815-C8	39.10
.020	<b>.060</b> (3x)	1/8	1-1/2	27820	30.80			27820-C8	37.60
.031 (1/32)	<b>.047</b> (1.5x)	1/8	1-1/2	894831	25.00			894831-C8	31.80
.031 (1/32)	<b>.093</b> (3x)	1/8	1-1/2	27831	25.00	27831-C7	30.30	27831-C8	31.80
.031 (1/32)	<b>.156</b> (5x)	1/8	2-1/2	887631	30.90			887631-C8	37.70
.040	<b>.120</b> (3x)	1/8	1-1/2	27840	25.00	27840-C7	30.30	27840-C8	31.80
.047 (3/64)	<b>.141</b> (3x)	1/8	1-1/2	27847	25.00	27847-C7	30.30	27847-C8	31.80
.050	<b>.150</b> (3x)	1/8	1-1/2	27850	25.00	27850-C7	30.30	27850-C8	31.80
.060	<b>.180</b> (3x)	1/8	1-1/2	27860	25.00	27860-C7	30.30	27860-C8	31.80
.062 (1/16)	<b>.093</b> (1.5x)	1/8	1-1/2	894862	23.70			894862-C8	30.50
.062 (1/16)	<b>.186</b> (3x)	1/8	1-1/2	27862	23.70	27862-C7	29.00	27862-C8	30.50
.062 (1/16)	<b>.312</b> (5x)	1/8	2-1/2	887662	30.90			887662-C8	37.70
.070	<b>.210</b> (3x)	1/8	1-1/2	27870	23.70	27870-C7	29.00	27870-C8	30.50
.078 (5/64)	<b>.234</b> (3x)	1/8	1-1/2	27878	23.70	27878-C7	29.00	27878-C8	30.50
.080	<b>.240</b> (3x)	1/8	1-1/2	27880	23.70	27880-C7	29.00	27880-C8	30.50
.090	<b>.270</b> (3x)	1/8	1-1/2	27890	23.70	27890-C7	29.00	27890-C8	30.50
.093 (3/32)	<b>.140</b> (1.5x)	1/8	1-1/2	894893	23.70			894893-C8	30.50
.093 (3/32)	<b>.279</b> (3x)	1/8	1-1/2	27893	23.70	27893-C7	29.00	27893-C8	30.50
.093 (3/32)	<b>.500</b> (5x)	1/8	2-1/2	887693	30.90			887693-C8	37.70
.100	<b>.300</b> (3x)	1/8	1-1/2	27899	23.70	27899-C7	29.00	27899-C8	30.50
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	27905	32.10			27905-C8	38.90
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>						
.125 (1/8)	<b>.187</b> (1.5x)	1/8	1-1/2	894908	21.90			894908-C8	28.70
.125 (1/8)	<b>.500</b> (4x)	1/8	1-1/2	27908	21.90	27908-C7	27.20	27908-C8	28.70
.125 (1/8)	<b>.625</b> (5x)	1/8	2-1/2	887708	27.20			887708-C8	34.00
.156 (5/32)	<b>.562</b> (3x)	3/16	2	27910	23.70			27910-C8	30.50
.187 (3/16)	<b>.625</b> (3x)	3/16	2	27912	23.70	27912-C7	29.40	27912-C8	30.50
.250 (1/4)	<b>.750</b> (3x)	1/4	2-1/2	27916	26.80	27916-C7	34.90	27916-C8	34.30

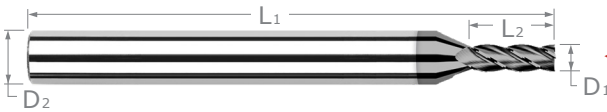
**PLEASE SEE SPEEDS & FEEDS ON PAGE 183**





# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

CVD Diamond – Square



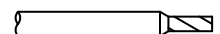
◀ **Outstanding in Graphite!**

- ⚡ 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
- ⚡ 4 flutes
- ⚡ h6 shank tolerance for high precision tool holders
- ⚡ Center cutting
- ⚡ CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND	
				4 FL	PRICE
$D_1 \begin{smallmatrix} +.0007 \\ -.0017 \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.0107 \\ -.0007 \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.015 (1/64)	<b>.023</b> (1.5x)	1/8	1-1/2	962715	83.40
.015 (1/64)	<b>.045</b> (3x)	1/8	1-1/2	995715	83.40
.015 (1/64)	<b>.078</b> (5x)	1/8	2-1/2	936615	94.30
.020	<b>.060</b> (3x)	1/8	1-1/2	995720	83.40
.020	<b>.100</b> (5x)	1/8	2-1/2	936620	94.30
.031 (1/32)	<b>.047</b> (1.5x)	1/8	1-1/2	962731	83.40
.031 (1/32)	<b>.093</b> (3x)	1/8	1-1/2	995731	83.40
.031 (1/32)	<b>.156</b> (5x)	1/8	2-1/2	936631	94.30
.039 (1 mm)	<b>.117</b> (3x)	1/8	1-1/2	995739	83.40
.040	<b>.120</b> (3x)	1/8	1-1/2	995740	83.40
.040	<b>.203</b> (5x)	1/8	2-1/2	936640	94.30
.047 (3/64)	<b>.071</b> (1.5x)	1/8	1-1/2	962747	83.40
.047 (3/64)	<b>.141</b> (3x)	1/8	1-1/2	995747	83.40
.047 (3/64)	<b>.250</b> (5x)	1/8	2-1/2	936647	94.30
.050	<b>.150</b> (3x)	1/8	1-1/2	995750	83.40
.050	<b>.250</b> (5x)	1/8	2-1/2	936650	94.30
.060	<b>.180</b> (3x)	1/8	1-1/2	995760	83.40
.060	<b>.312</b> (5x)	1/8	2-1/2	936660	94.30
.062 (1/16)	<b>.093</b> (1.5x)	1/8	1-1/2	962762	82.60
.062 (1/16)	<b>.186</b> (3x)	1/8	1-1/2	995762	82.60
.062 (1/16)	<b>.250</b> (4x)	1/8	2-1/2	871262	93.00
.062 (1/16)	<b>.312</b> (5x)	1/8	2-1/2	936662	93.90
.062 (1/16)	<b>.500</b> (8x)	1/8	2-1/2	891562	96.60
.078 (5/64)	<b>.118</b> (1.5x)	1/8	1-1/2	962778	82.60
.078 (5/64)	<b>.234</b> (3x)	1/8	1-1/2	995778	82.60
.078 (5/64)	<b>.406</b> (5x)	1/8	2-1/2	936678	93.90
.093 (3/32)	<b>.140</b> (1.5x)	1/8	1-1/2	962793	82.60
.093 (3/32)	<b>.279</b> (3x)	1/8	1-1/2	995793	82.60
.093 (3/32)	<b>.375</b> (4x)	1/8	2-1/2	871293	93.00
.093 (3/32)	<b>.500</b> (5x)	1/8	2-1/2	936693	93.90
.093 (3/32)	<b>.750</b> (8x)	1/8	2-1/2	891593	96.60
.100	<b>.300</b> (3x)	1/8	1-1/2	995800	82.60
.109 (7/64)	<b>.327</b> (3x)	1/8	1-1/2	995802	82.60
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	995805	82.60

DIAMOND TOOLING

continued on next page



## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

CVD Diamond – Square (cont.)

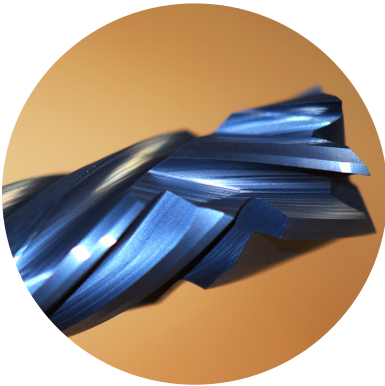
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CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND	
				4 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> -0.002"	L <sub>2</sub> <sup>+0.030"</sup> -0.000"	D <sub>2</sub> (h6)	L <sub>1</sub>		
.125 (1/8)	<b>.187</b> (1.5x)	1/8	1-1/2	962808	84.10
.125 (1/8)	<b>.375</b> (3x)	1/8	1-1/2	995808	84.10
.125 (1/8)	<b>.500</b> (4x)	1/8	2-1/2	871308	93.30
.125 (1/8)	<b>.625</b> (5x)	1/8	2-1/2	936708	94.30
.125 (1/8)	<b>1.000</b> (8x)	1/8	2-1/2	891608	97.00
.140 (9/64)	<b>.425</b> (3x)	3/16	2	995809	105.70
.156 (5/32)	<b>.235</b> (1.5x)	3/16	2	962810	105.70
.156 (5/32)	<b>.470</b> (3x)	3/16	2	995810	105.70
.187 (3/16)	<b>.285</b> (1.5x)	3/16	2	962812	105.70
.187 (3/16)	<b>.570</b> (3x)	3/16	2	995812	105.70
.187 (3/16)	<b>1.000</b> (5x)	3/16	3	936712	134.40
.250 (1/4)	<b>.375</b> (1.5x)	1/4	2-1/2	962816	140.80
.250 (1/4)	<b>.750</b> (3x)	1/4	2-1/2	995816	140.80
.250 (1/4)	<b>1.000</b> (4x)	1/4	4	871316	149.10
.250 (1/4)	<b>1.250</b> (5x)	1/4	4	936716	151.40
.312 (5/16)	<b>.470</b> (1.5x)	5/16	2-1/2	962820	156.50
.312 (5/16)	<b>1.000</b> (3x)	5/16	2-1/2	995820	156.50
.375 (3/8)	<b>.570</b> (1.5x)	3/8	2-1/2	962824	169.10
.375 (3/8)	<b>1.125</b> (3x)	3/8	2-1/2	995824	178.30
.375 (3/8)	<b>2.000</b> (5x)	3/8	4	936724	184.50
.500 (1/2)	<b>.750</b> (1.5x)	1/2	3	962832	272.40
.500 (1/2)	<b>1.500</b> (3x)	1/2	3	995832	280.50
.500 (1/2)	<b>2.625</b> (5x)	1/2	6	936732	289.80

DIAMOND TOOLING

NEW

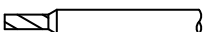
NEW



## Shining a Light on Diamond End Mills

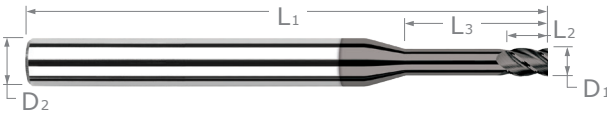
Learn the chemical makeup of our diamond coatings and how they're applied to our carbide tooling in our "In the Loupe" blog post **Shining a Light on Diamond End Mills**, a comprehensive look into the makeup and benefits of diamond end mills.

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

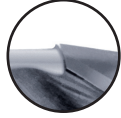


# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

CVD Diamond – Square – Long Reach, Stub Flute



◀ Outstanding in Graphite!



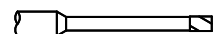
Reduced Neck Diameter to Avoid Heeling

- ⚡ 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	
					4 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.015 (1/64)	.023	<b>.078</b> (5x)	1/8	2-1/2	943015	122.60
.015 (1/64)	.023	<b>.125</b> (8x)	1/8	2-1/2	960215	122.60
.015 (1/64)	.023	<b>.187</b> (12x)	1/8	2-1/2	974615	125.60
.020	.030	<b>.100</b> (5x)	1/8	2-1/2	943020	122.60
.020	.030	<b>.160</b> (8x)	1/8	2-1/2	960220	122.60
.020	.030	<b>.250</b> (12x)	1/8	2-1/2	974620	125.60
.025	.038	<b>.125</b> (5x)	1/8	2-1/2	943025	122.60
.025	.038	<b>.203</b> (8x)	1/8	2-1/2	960225	122.60
.025	.038	<b>.312</b> (12x)	1/8	2-1/2	974625	125.60
.031 (1/32)	.047	<b>.156</b> (5x)	1/8	2-1/2	943031	122.60
.031 (1/32)	.047	<b>.250</b> (8x)	1/8	2-1/2	960231	122.60
.031 (1/32)	.047	<b>.375</b> (12x)	1/8	2-1/2	974631	125.60
.039 (1 mm)	.059	<b>.203</b> (5x)	1/8	2-1/2	943039	122.60
.039 (1 mm)	.059	<b>.325</b> (8x)	1/8	2-1/2	960239	122.60
.047 (3/64)	.071	<b>.250</b> (5x)	1/8	2-1/2	943047	122.60
.047 (3/64)	.071	<b>.375</b> (8x)	1/8	2-1/2	960247	122.60
.047 (3/64)	.071	<b>.570</b> (12x)	1/8	2-1/2	974647	125.60
.062 (1/16)	.093	<b>.312</b> (5x)	1/8	2-1/2	943062	111.70
.062 (1/16)	.093	<b>.500</b> (8x)	1/8	2-1/2	960262	111.70
.062 (1/16)	.093	<b>.750</b> (12x)	1/8	2-1/2	974662	115.00
.078 (5/64)	.117	<b>.406</b> (5x)	1/8	2-1/2	943078	111.70
.078 (5/64)	.117	<b>.625</b> (8x)	1/8	2-1/2	960278	111.70
.078 (5/64)	.117	<b>.940</b> (12x)	1/8	2-1/2	974678	115.00
.093 (3/32)	.140	<b>.500</b> (5x)	1/8	2-1/2	943093	111.70
.093 (3/32)	.140	<b>.750</b> (8x)	1/8	2-1/2	960293	111.70
.093 (3/32)	.140	<b>1.125</b> (12x)	1/8	2-1/2	974693	115.00
.118 (3 mm)	.177	<b>.625</b> (5x)	1/8	2-1/2	943105	111.70
.118 (3 mm)	.177	<b>.950</b> (8x)	1/8	2-1/2	960305	111.70

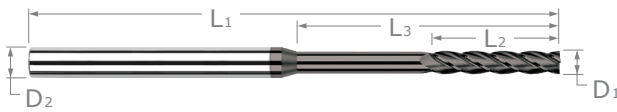
CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND	
					4 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.125 (1/8)	.187	<b>.625</b> (5x)	1/8	2-1/2	943108	114.00
.125 (1/8)	.187	<b>1.000</b> (8x)	1/8	2-1/2	960308	114.00
.125 (1/8)	.187	<b>1.500</b> (12x)	1/8	3	974708	117.20
.187 (3/16)	.285	<b>1.000</b> (5x)	3/16	3	943112	156.20
.187 (3/16)	.285	<b>1.500</b> (8x)	3/16	3	960312	156.20
.250 (1/4)	.375	<b>1.250</b> (5x)	1/4	4	943116	173.70
.250 (1/4)	.375	<b>2.000</b> (8x)	1/4	4	960316	173.70
.375 (3/8)	.570	<b>1.250</b> (3x)	3/8	2-1/2	977924	213.50
.500 (1/2)	.750	<b>1.500</b> (3x)	1/2	3	977932	320.00

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

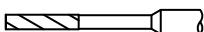
DIAMOND TOOLING

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND	
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$	<b>4 FL</b>	<b>PRICE</b>
.015 (1/64)	.078	<b>.156</b> (10x)	1/8	2-1/2	36315	140.50
.020	.100	<b>.200</b> (10x)	1/8	2-1/2	36320	140.50
.025	.125	<b>.250</b> (10x)	1/8	2-1/2	36325	140.50
.031 (1/32)	.156	<b>.312</b> (10x)	1/8	2-1/2	36331	140.50
.047 (3/64)	.250	<b>.480</b> (10x)	1/8	2-1/2	36347	140.50
.062 (1/16)	.312	<b>.625</b> (10x)	1/8	2-1/2	36362	128.60
.078 (5/64)	.406	<b>.800</b> (10x)	1/8	2-1/2	36378	128.60
.093 (3/32)	.500	<b>.950</b> (10x)	1/8	2-1/2	36393	128.60
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$	<b>4 FL</b>	<b>PRICE</b>
.125 (1/8)	.625	<b>1.250</b> (10x)	1/8	2-1/2	36408	137.30
.187 (3/16)	1.000	<b>1.875</b> (10x)	3/16	3	36412	181.10
.250 (1/4)	1.250	<b>2.500</b> (10x)	1/4	4	36416	201.20



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Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)



# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

CVD Diamond – Ball



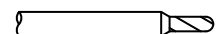
◀ **Outstanding in Graphite!**

- ⚡ 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 ⚡ 4 flutes ⚡ h6 shank tolerance for high precision tool holders
- ⚡ Center cutting ⚡ CNC ground in the USA 🇺🇸

	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND	
	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>	4 FL	PRICE
	.015 (1/64)	<b>.023</b> (1.5x)	1/8	1-1/2	914415	90.80
	.015 (1/64)	<b>.045</b> (3x)	1/8	1-1/2	999315	90.80
	.015 (1/64)	<b>.078</b> (5x)	1/8	2-1/2	940915	101.60
	.020	<b>.030</b> (1.5x)	1/8	1-1/2	914420	90.80
	.020	<b>.060</b> (3x)	1/8	1-1/2	999320	90.80
	.020	<b>.100</b> (5x)	1/8	2-1/2	940920	101.60
	.031 (1/32)	<b>.047</b> (1.5x)	1/8	1-1/2	914431	90.80
	.031 (1/32)	<b>.093</b> (3x)	1/8	1-1/2	999331	90.80
NEW	.031 (1/32)	<b>.125</b> (4x)	1/8	2-1/2	<b>818631</b>	100.70
	.031 (1/32)	<b>.156</b> (5x)	1/8	2-1/2	940931	101.60
	.039 (1 mm)	<b>.117</b> (3x)	1/8	1-1/2	999339	90.80
	.040	<b>.120</b> (3x)	1/8	1-1/2	999340	90.80
	.047 (3/64)	<b>.071</b> (1.5x)	1/8	1-1/2	914447	90.80
	.047 (3/64)	<b>.141</b> (3x)	1/8	1-1/2	999347	90.80
	.047 (3/64)	<b>.250</b> (5x)	1/8	2-1/2	940947	101.60
	.050	<b>.150</b> (3x)	1/8	1-1/2	999350	90.80
	.060	<b>.180</b> (3x)	1/8	1-1/2	999360	90.80
	.062 (1/16)	<b>.093</b> (1.5x)	1/8	1-1/2	914462	87.90
	.062 (1/16)	<b>.186</b> (3x)	1/8	1-1/2	999362	87.90
NEW	.062 (1/16)	<b>.250</b> (4x)	1/8	2-1/2	<b>818662</b>	98.10
	.062 (1/16)	<b>.312</b> (5x)	1/8	2-1/2	940962	99.00
	.078 (5/64)	<b>.118</b> (1.5x)	1/8	1-1/2	914478	87.90
	.078 (5/64)	<b>.234</b> (3x)	1/8	1-1/2	999378	87.90
	.078 (5/64)	<b>.406</b> (5x)	1/8	2-1/2	940978	99.00
	.093 (3/32)	<b>.140</b> (1.5x)	1/8	1-1/2	914493	87.90
	.093 (3/32)	<b>.279</b> (3x)	1/8	1-1/2	999393	87.90
	.093 (3/32)	<b>.500</b> (5x)	1/8	2-1/2	940993	99.00
	.100	<b>.300</b> (3x)	1/8	1-1/2	999400	87.90
	.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	999405	87.90

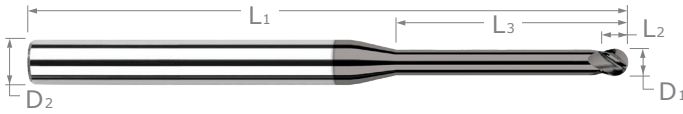
	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND	
	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub> (h6)	L <sub>1</sub>	4 FL	PRICE
	.125 (1/8)	<b>.187</b> (1.5x)	1/8	1-1/2	914508	89.30
	.125 (1/8)	<b>.375</b> (3x)	1/8	1-1/2	999408	89.30
NEW	.125 (1/8)	<b>.500</b> (4x)	1/8	2-1/2	<b>818708</b>	100.40
	.125 (1/8)	<b>.625</b> (5x)	1/8	2-1/2	941008	101.40
	.156 (5/32)	<b>.470</b> (3x)	3/16	2	999410	110.70
	.187 (3/16)	<b>.285</b> (1.5x)	3/16	2	914512	110.70
	.187 (3/16)	<b>.570</b> (3x)	3/16	2	999412	110.70
	.250 (1/4)	<b>.375</b> (1.5x)	1/4	2-1/2	914516	146.40
	.250 (1/4)	<b>.750</b> (3x)	1/4	2-1/2	999416	146.40
NEW	.250 (1/4)	<b>1.250</b> (5x)	1/4	4	<b>941016</b>	157.00
	.375 (3/8)	<b>.570</b> (1.5x)	3/8	2-1/2	914524	180.90
	.500 (1/2)	<b>.750</b> (1.5x)	1/2	3	914532	286.70

DIAMOND TOOLING



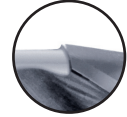
# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

## CVD Diamond – Ball – 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
- ↻ 4 flutes
- ↻ h6 shank tolerance for high precision tool holders
- ↻ Center cutting
- ↻ CNC ground in the USA

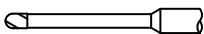


Reduced Neck Diameter to Avoid Heeling

DIAMOND TOOLING

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND	
					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>		
.015 (1/64)	.023	<b>.078</b> (5x)	1/8	2-1/2	61015	128.20
.015 (1/64)	.023	<b>.125</b> (8x)	1/8	2-1/2	62015	128.20
.015 (1/64)	.023	<b>.156</b> (10x)	1/8	2-1/2	939515	131.50
.015 (1/64)	.023	<b>.187</b> (12x)	1/8	2-1/2	65215	131.50
.015 (1/64)	.023	<b>.225</b> (15x)	1/8	2-1/2	76015	138.20
.015 (1/64)	.023	<b>.270</b> (18x)	1/8	2-1/2	841815	144.70
.020	.030	<b>.100</b> (5x)	1/8	2-1/2	61020	128.20
.020	.030	<b>.160</b> (8x)	1/8	2-1/2	62020	128.20
.020	.030	<b>.200</b> (10x)	1/8	2-1/2	939520	131.50
.020	.030	<b>.250</b> (12x)	1/8	2-1/2	65220	131.50
.020	.030	<b>.300</b> (15x)	1/8	2-1/2	76020	138.20
.020	.030	<b>.360</b> (18x)	1/8	2-1/2	841820	144.70
.025	.038	<b>.125</b> (5x)	1/8	2-1/2	61025	128.20
.025	.038	<b>.203</b> (8x)	1/8	2-1/2	62025	128.20
.025	.038	<b>.312</b> (12x)	1/8	2-1/2	65225	131.50
.025	.038	<b>.375</b> (15x)	1/8	2-1/2	76025	138.20
.030	.045	<b>.250</b> (8x)	1/8	2-1/2	62030	128.20
.031 (1/32)	.047	<b>.093</b> (3x)	1/8	1-1/2	922231	115.30
.031 (1/32)	.047	<b>.156</b> (5x)	1/8	2-1/2	61031	128.20
.031 (1/32)	.047	<b>.250</b> (8x)	1/8	2-1/2	62031	128.20
.031 (1/32)	.047	<b>.312</b> (10x)	1/8	2-1/2	939531	131.50
.031 (1/32)	.047	<b>.375</b> (12x)	1/8	2-1/2	65231	131.50
.031 (1/32)	.047	<b>.470</b> (15x)	1/8	2-1/2	76031	138.20
.031 (1/32)	.047	<b>.565</b> (18x)	1/8	2-1/2	841831	144.70
.039 (1 mm)	.059	<b>.203</b> (5x)	1/8	2-1/2	61039	128.20
.039 (1 mm)	.059	<b>.325</b> (8x)	1/8	2-1/2	62039	128.20
.040	.060	<b>.203</b> (5x)	1/8	2-1/2	61040	128.20
.040	.060	<b>.325</b> (8x)	1/8	2-1/2	62040	128.20
.047 (3/64)	.071	<b>.250</b> (5x)	1/8	2-1/2	61047	128.20
.047 (3/64)	.071	<b>.375</b> (8x)	1/8	2-1/2	62047	128.20
.047 (3/64)	.071	<b>.480</b> (10x)	1/8	2-1/2	939547	131.50
.047 (3/64)	.071	<b>.570</b> (12x)	1/8	2-1/2	65247	131.50
.047 (3/64)	.071	<b>.710</b> (15x)	1/8	2-1/2	76047	138.20
.047 (3/64)	.071	<b>.850</b> (18x)	1/8	2-1/2	841847	144.70
.050	.075	<b>.250</b> (5x)	1/8	2-1/2	61050	128.20
.050	.075	<b>.400</b> (8x)	1/8	2-1/2	62050	128.20

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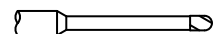
## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

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

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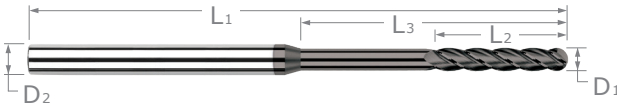
CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND	
					4 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	D <sub>2</sub> (h6)	L <sub>1</sub>		
.060	.090	<b>.312</b> (5x)	1/8	2-1/2	61060	128.20
.060	.090	<b>.500</b> (8x)	1/8	2-1/2	62060	128.20
.062 (1/16)	.093	<b>.186</b> (3x)	1/8	1-1/2	922262	101.80
.062 (1/16)	.093	<b>.312</b> (5x)	1/8	2-1/2	61062	115.00
.062 (1/16)	.093	<b>.500</b> (8x)	1/8	2-1/2	62062	115.00
.062 (1/16)	.093	<b>.625</b> (10x)	1/8	2-1/2	939562	118.40
.062 (1/16)	.093	<b>.750</b> (12x)	1/8	2-1/2	65262	118.40
.062 (1/16)	.093	<b>.950</b> (15x)	1/8	2-1/2	76062	124.60
.062 (1/16)	.093	<b>1.125</b> (18x)	1/8	2-1/2	841862	130.70
.078 (5/64)	.117	<b>.406</b> (5x)	1/8	2-1/2	61078	115.00
.078 (5/64)	.117	<b>.625</b> (8x)	1/8	2-1/2	62078	115.00
.078 (5/64)	.117	<b>.800</b> (10x)	1/8	2-1/2	939578	118.40
.078 (5/64)	.117	<b>.940</b> (12x)	1/8	2-1/2	65278	118.40
.078 (5/64)	.117	<b>1.187</b> (15x)	1/8	2-1/2	76078	124.60
.078 (5/64)	.117	<b>1.400</b> (18x)	1/8	2-1/2	841878	130.70
.093 (3/32)	.140	<b>.279</b> (3x)	1/8	1-1/2	922293	101.80
.093 (3/32)	.140	<b>.500</b> (5x)	1/8	2-1/2	61093	115.00
.093 (3/32)	.140	<b>.750</b> (8x)	1/8	2-1/2	62093	115.00
.093 (3/32)	.140	<b>.950</b> (10x)	1/8	2-1/2	939593	118.40
.093 (3/32)	.140	<b>1.125</b> (12x)	1/8	2-1/2	65293	118.40
.093 (3/32)	.140	<b>1.400</b> (15x)	1/8	2-1/2	76093	124.60
.093 (3/32)	.140	<b>1.675</b> (18x)	1/8	3	841893	130.70
.100	.150	<b>.800</b> (8x)	1/8	2-1/2	62100	115.00
.109 (7/64)	.164	<b>.900</b> (8x)	1/8	2-1/2	62102	115.00
.118 (3 mm)	.177	<b>.625</b> (5x)	1/8	2-1/2	61105	115.00
.118 (3 mm)	.177	<b>.950</b> (8x)	1/8	2-1/2	62105	115.00

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND	
					4 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 <sub>2</sub> (h6)	L <sub>1</sub>		
.125 (1/8)	.187	<b>.375</b> (3x)	1/8	1-1/2	64008	112.50
.125 (1/8)	.187	<b>.625</b> (5x)	1/8	2-1/2	61108	125.40
.125 (1/8)	.187	<b>1.000</b> (8x)	1/8	2-1/2	62108	125.40
.125 (1/8)	.187	<b>1.250</b> (10x)	1/8	2-1/2	939608	129.00
.125 (1/8)	.187	<b>1.500</b> (12x)	1/8	3	65308	129.00
.125 (1/8)	.187	<b>1.875</b> (15x)	1/8	3	944108	135.80
.125 (1/8)	.187	<b>2.250</b> (18x)	1/8	4	841908	143.90
.140 (9/64)	.220	<b>1.125</b> (8x)	3/16	3	62109	161.90
.156 (5/32)	.235	<b>.750</b> (5x)	3/16	3	61110	161.90
.156 (5/32)	.235	<b>1.250</b> (8x)	3/16	3	62110	161.90
.187 (3/16)	.285	<b>1.000</b> (5x)	3/16	3	61112	161.90
.187 (3/16)	.285	<b>1.500</b> (8x)	3/16	3	62112	161.90
.187 (3/16)	.285	<b>2.250</b> (12x)	3/16	4	65312	170.40
.250 (1/4)	.375	<b>1.250</b> (5x)	1/4	4	61116	179.80
.250 (1/4)	.375	<b>2.000</b> (8x)	1/4	4	62116	179.80
.250 (1/4)	.375	<b>3.000</b> (12x)	1/4	6	65316	187.70
.312 (5/16)	.470	<b>2.500</b> (8x)	5/16	4	62120	196.00
.375 (3/8)	.570	<b>1.250</b> (3x)	3/8	2-1/2	64024	225.90
.500 (1/2)	.750	<b>1.500</b> (3x)	1/2	3	64032	335.50



# 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

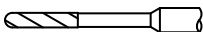
DIAMOND TOOLING

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND	
					4 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.015 (1/64)	.078	<b>.156</b> (10x)	1/8	2-1/2	36515	150.20
.020	.100	<b>.200</b> (10x)	1/8	2-1/2	36520	150.20
.025	.125	<b>.250</b> (10x)	1/8	2-1/2	36525	150.20
.031 (1/32)	.156	<b>.312</b> (10x)	1/8	2-1/2	36531	150.20
.047 (3/64)	.250	<b>.480</b> (10x)	1/8	2-1/2	36547	150.20
.062 (1/16)	.312	<b>.625</b> (10x)	1/8	2-1/2	36562	134.90
.078 (5/64)	.406	<b>.800</b> (10x)	1/8	2-1/2	36578	134.90
.093 (3/32)	.500	<b>.950</b> (10x)	1/8	2-1/2	36593	134.90
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.125 (1/8)	.625	<b>1.250</b> (10x)	1/8	2-1/2	36608	143.40
.187 (3/16)	1.000	<b>1.875</b> (10x)	3/16	3	36612	189.50
.250 (1/4)	1.250	<b>2.500</b> (10x)	1/4	4	36616	210.30



View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)





# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

CVD Diamond – Corner Radius

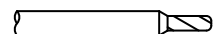


◀ **Outstanding in Graphite!**

- ⚡ 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

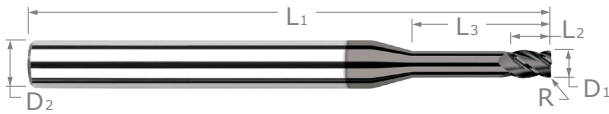
	CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND	
						4 FL	PRICE
	$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
	.015 (1/64)	<b>.003</b>	<b>.045</b> (3x)	1/8	1-1/2	942015	90.80
	.031 (1/32)	<b>.005</b>	<b>.093</b> (3x)	1/8	1-1/2	955431	90.80
NEW	.031 (1/32)	<b>.005</b>	<b>.156</b> (5x)	1/8	2-1/2	819331	101.60
	.047 (3/64)	<b>.005</b>	<b>.141</b> (3x)	1/8	1-1/2	955447	90.80
NEW	.062 (1/16)	<b>.005</b>	<b>.186</b> (3x)	1/8	1-1/2	955462	87.90
	.062 (1/16)	<b>.010</b>	<b>.186</b> (3x)	1/8	1-1/2	977162	87.90
NEW	.062 (1/16)	<b>.010</b>	<b>.312</b> (5x)	1/8	2-1/2	820462	99.00
	.078 (5/64)	<b>.010</b>	<b>.234</b> (3x)	1/8	1-1/2	977178	87.90
NEW	.093 (3/32)	<b>.005</b>	<b>.279</b> (3x)	1/8	1-1/2	955493	87.90
	.093 (3/32)	<b>.010</b>	<b>.279</b> (3x)	1/8	1-1/2	977193	87.90
	$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
NEW	.125 (1/8)	<b>.005</b>	<b>.375</b> (3x)	1/8	1-1/2	955508	89.30
NEW	.125 (1/8)	<b>.010</b>	<b>.375</b> (3x)	1/8	1-1/2	977208	89.30
	.125 (1/8)	<b>.015</b>	<b>.375</b> (3x)	1/8	1-1/2	938608	89.30
	.125 (1/8)	<b>.015</b>	<b>.625</b> (5x)	1/8	2-1/2	855208	99.60
	.187 (3/16)	<b>.030</b>	<b>.570</b> (3x)	3/16	2	906312	110.70
	.250 (1/4)	<b>.030</b>	<b>.750</b> (3x)	1/4	2-1/2	906316	146.40
	.250 (1/4)	<b>.030</b>	<b>1.250</b> (5x)	1/4	4	862116	157.00

DIAMOND TOOLING



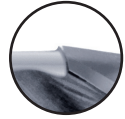
# DIAMOND END MILLS FOR NON-FERROUS MATERIALS

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



◀ Outstanding in Graphite!

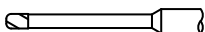
- ⚡ True crystalline CVD diamond on solid carbide substrate
- ⚡ Ideal for machining graphite and composites, green carbide, and green ceramics
- ⚡ Maximum abrasion resistance increases tool life
- ⚡ Reduced neck for clearance and maximum rigidity
- ⚡ Corner radius for improved strength
- ⚡ 4 flutes
-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



Reduced Neck Diameter to Avoid Heeling

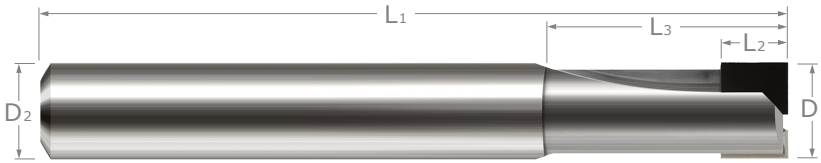
DIAMOND TOOLING

CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	CVD DIAMOND	
						4 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.015 (1/64)	.003	.023	.078 (5x)	1/8	2-1/2	61615	128.20
.015 (1/64)	.003	.023	.125 (8x)	1/8	2-1/2	61915	128.20
.015 (1/64)	.003	.023	.187 (12x)	1/8	2-1/2	62215	131.50
.020	.005	.030	.100 (5x)	1/8	2-1/2	62920	128.20
.020	.005	.030	.160 (8x)	1/8	2-1/2	63220	128.20
.020	.005	.030	.250 (12x)	1/8	2-1/2	64120	131.50
.025	.005	.038	.125 (5x)	1/8	2-1/2	62925	128.20
.025	.005	.038	.203 (8x)	1/8	2-1/2	63225	128.20
.025	.005	.038	.312 (12x)	1/8	2-1/2	64125	131.50
.031 (1/32)	.005	.047	.156 (5x)	1/8	2-1/2	62931	128.20
.031 (1/32)	.005	.047	.250 (8x)	1/8	2-1/2	63231	128.20
.031 (1/32)	.005	.047	.375 (12x)	1/8	2-1/2	64131	131.50
.039 (1 mm)	.005	.059	.203 (5x)	1/8	2-1/2	62939	128.20
.039 (1 mm)	.005	.059	.325 (8x)	1/8	2-1/2	63239	128.20
.047 (3/64)	.005	.071	.250 (5x)	1/8	2-1/2	62947	128.20
.047 (3/64)	.005	.071	.375 (8x)	1/8	2-1/2	63247	128.20
.047 (3/64)	.005	.071	.570 (12x)	1/8	2-1/2	64147	131.50
.062 (1/16)	.010	.093	.312 (5x)	1/8	2-1/2	65062	115.00
.062 (1/16)	.010	.093	.500 (8x)	1/8	2-1/2	66562	115.00
.062 (1/16)	.010	.093	.750 (12x)	1/8	2-1/2	65962	118.40
.078 (5/64)	.010	.117	.406 (5x)	1/8	2-1/2	65078	115.00
.078 (5/64)	.010	.117	.625 (8x)	1/8	2-1/2	66578	115.00
.078 (5/64)	.010	.117	.940 (12x)	1/8	2-1/2	65978	118.40
.093 (3/32)	.010	.140	.500 (5x)	1/8	2-1/2	65093	115.00
.093 (3/32)	.010	.140	.750 (8x)	1/8	2-1/2	66593	115.00
.093 (3/32)	.010	.140	1.125 (12x)	1/8	2-1/2	65993	118.40
.118 (3 mm)	.010	.177	.625 (5x)	1/8	2-1/2	916305	115.00
.118 (3 mm)	.010	.177	.950 (8x)	1/8	2-1/2	914705	115.00
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$ (h6)	$L_1$		
.125 (1/8)	.015	.187	.625 (5x)	1/8	2-1/2	66208	125.40
.125 (1/8)	.015	.187	1.000 (8x)	1/8	2-1/2	64708	125.40
.125 (1/8)	.015	.187	1.500 (12x)	1/8	3	66408	129.00
.187 (3/16)	.030	.285	1.000 (5x)	3/16	3	63312	161.90
.187 (3/16)	.030	.285	1.500 (8x)	3/16	3	65612	161.90
.250 (1/4)	.030	.375	1.250 (5x)	1/4	4	63316	179.80
.250 (1/4)	.030	.375	2.000 (8x)	1/4	4	65616	179.80



## 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
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$		
3/32	3/16	<b>3/8</b>	1	1/8	1-1/2	12106	237.80
3 mm	1/4	<b>1/2</b>	1	1/8	1-1/2	1213M	237.80
1/8	1/4	<b>1/2</b>	1	1/8	1-1/2	12108	237.80
5/32	1/4	<b>1/2</b>	1	3/16	2	12110	265.70
3/16	1/4	<b>5/8</b>	2	3/16	2	12112	265.70
1/4	1/4	<b>3/4</b>	2	1/4	2-1/2	12116	288.40
1/4	1/2	<b>1</b>	4	1/4	2-1/2	914116	464.40
5/16	1/4	<b>13/16</b>	2	5/16	2-1/2	12120	315.60
5/16	1/2	<b>1-1/16</b>	4	5/16	2-1/2	914120	513.30
3/8	1/4	<b>15/16</b>	2	3/8	2-1/2	12124	338.40
3/8	3/4	<b>1-7/16</b>	4	3/8	3	914124	586.90
1/2	1/4	<b>1</b>	2	1/2	3	12132	431.50
1/2	1	<b>1-3/4</b>	4	1/2	3	914132	692.20
5/8	3/8	<b>1</b>	2	5/8	3-1/2	12140	532.90
5/8	1	<b>1-3/4</b>	4	5/16	3-1/2	914140	811.20
3/4	3/8	<b>1-1/8</b>	2	3/4	4	12148	649.00
3/4	1-1/4	<b>2</b>	4	3/4	4	914148	948.10

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

**Single Flute** designed for smaller diameters



**4 Flute** ideal for finishing operations

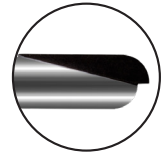
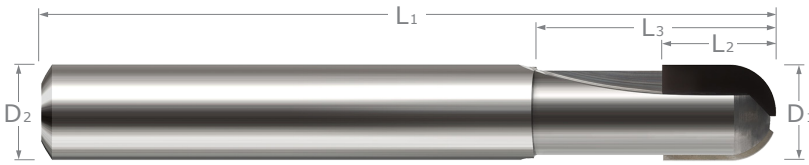


*For PCD High Performance Drills, see page 393.*



## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

### PCD Diamond – Ball



Also Stocked in Single Flute Style

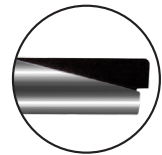
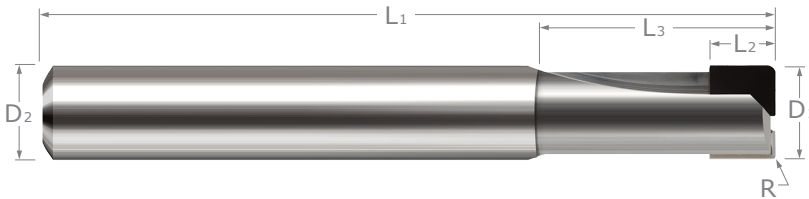
- PCD diamond brazed on solid carbide body allows for significant tool life improvement over carbide.
- Recommended work piece material: aluminum, copper, brass, bronze, plastics, graphite, carbon, carbon fiber materials, green carbide, gold, silver, magnesium, zinc, green ceramics
- Center cutting

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	PCD DIAMOND	
						TOOL #	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.050'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$		
3/32	3/16	<b>3/8</b>	1	1/8	1-1/2	12006	288.40
1/8	1/4	<b>1/2</b>	1	1/8	1-1/2	12008	288.40
3/16	1/4	<b>5/8</b>	2	3/16	2	12012	308.80
1/4	5/16	<b>3/4</b>	2	1/4	2-1/2	12016	324.00
3/8	7/16	<b>15/16</b>	2	3/8	2-1/2	12024	400.30
1/2	1/2	<b>1</b>	2	1/2	3	12032	464.20
5/8	1/2	<b>1</b>	2	5/8	3-1/2	12040	565.20
3/4	5/8	<b>1-1/8</b>	2	3/4	4	12048	681.20

DIAMOND TOOLING

## 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

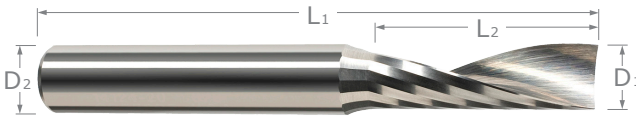
CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	CORNER RADIUS	FLUTES	SHANK DIAMETER	OVERALL LENGTH	PCD DIAMOND	
							TOOL #	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.050'' \\ -.000'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$		$D_2$	$L_1$		
3/32	3/16	<b>3/8</b>	<b>.010</b>	1	1/8	1-1/2	12206	288.40
1/8	1/4	<b>1/2</b>	<b>.015</b>	1	1/8	1-1/2	12208	288.40
3/16	1/4	<b>5/8</b>	<b>.015</b>	2	3/16	2	12212	308.80
1/4	1/4	<b>3/4</b>	<b>.010</b>	2	1/4	2-1/2	858916	324.00
1/4	1/4	<b>3/4</b>	<b>.030</b>	2	1/4	2-1/2	12216	324.00
1/4	1/4	<b>3/4</b>	<b>.060</b>	2	1/4	2-1/2	847316	324.00
3/8	1/4	<b>15/16</b>	<b>.030</b>	2	3/8	2-1/2	12224	400.30
1/2	1/4	<b>1</b>	<b>.030</b>	2	1/2	3	12232	464.20

For PCD High Performance Drills, see page 393.



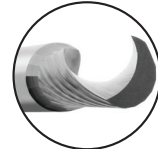
# END MILLS FOR PLASTICS

## Square Upcut – Single Flute



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

- ⚡ 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



Single Spiral  
Upcut Flute

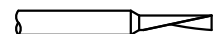
CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	SOFT PLASTICS		HARD PLASTICS		HARD PLASTICS AMORPHOUS DIAMOND	
				1 FL	PRICE	1 FL	PRICE	1 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>						
1/32	<b>3/32</b> (3x)	1/8	1-1/2			51431	33.40	51431-C4	45.10
1/32	<b>5/32</b> (5x)	1/8	1-1/2			52431	41.00		
3/64	<b>9/64</b> (3x)	1/8	1-1/2			51447	29.90	51447-C4	41.60
3/64	<b>1/4</b> (5x)	1/8	1-1/2			52447	34.60		

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>-0.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>						
1/16	<b>3/16</b> (3x)	1/8	1-1/2	51162	24.40	51462	24.40	51462-C4	36.10
1/16*	<b>1/4</b> (4x)	1/4*	2	14104-20	34.80	14204-20	34.80		
1/16	<b>5/16</b> (5x)	1/8	2	51862	28.80	52462	28.80	52462-C4	41.70
5/64	<b>15/64</b> (3x)	1/8	1-1/2	51178	24.40	51478	24.40	51478-C4	36.10
5/64*	<b>5/16</b> (4x)	1/4*	2	14105-20	34.80	14205-20	34.80		
5/64	<b>13/32</b> (5x)	1/8	2	51878	28.80	52478	28.80	52478-C4	41.70
3/32	<b>9/32</b> (3x)	1/8	1-1/2	51193	24.40	51493	24.40	51493-C4	36.10
3/32*	<b>3/8</b> (4x)	1/4*	2	14106-20	34.80	14206-20	34.80		
3/32	<b>1/2</b> (5x)	1/8	2	51893	28.80	52493	28.80	52493-C4	41.70
1/8*	<b>1/4</b> (2x)	1/4*	2	14108-10	33.10	14208-10	33.10	892026-C4	47.00
1/8	<b>3/8</b> (3x)	1/8	1-1/2	51208	24.40	51508	24.40	51508-C4	36.10
1/8*	<b>1/2</b> (4x)	1/4*	2	14108-20	33.10	14208-20	33.10	892028-C4	47.00
1/8	<b>5/8</b> (5x)	1/8	2	51908	28.80	52508	28.80	52508-C4	41.70
5/32*	<b>5/8</b> (4x)	1/4*	2	14110-20	33.10	14210-20	33.10		
5/32	<b>3/4</b> (5x)	3/16	3			52510	38.50		
3/16*	<b>3/8</b> (2x)	1/4*	2	14112-10	33.10	14212-10	33.10		
3/16	<b>9/16</b> (3x)	3/16	2	51212	31.30	51512	31.30	51512-C4	47.40
3/16*	<b>5/8</b> (3x)	1/4*	2	14112-20	33.10	14212-20	33.10		
3/16	<b>1</b> (5x)	3/16	3	51912	38.50	52512	38.50	52512-C4	54.60
1/4	<b>3/8</b> (1.5x)	1/4	2-1/2	883116	33.10	883816	33.10		
1/4	<b>3/4</b> (3x)	1/4	2-1/2	51216	33.10	51516	33.10	51516-C4	51.40
1/4	<b>1</b> (4x)	1/4	3	878316	42.80	897416	42.80		
1/4	<b>1-1/4</b> (5x)	1/4	3	51916	42.80	52516	42.80	52516-C4	61.10
3/8	<b>9/16</b> (1.5x)	3/8	2-1/2	883124	67.20	883824	67.20		
3/8	<b>1-1/8</b> (3x)	3/8	2-1/2	51224	67.20	51524	67.20	51524-C4	89.30
3/8	<b>2</b> (5x)	3/8	4	51924	74.50	52524	74.50		
1/2	<b>3/4</b> (1.5x)	1/2	3	883132	114.40	883832	114.40		
1/2	<b>1-1/2</b> (3x)	1/2	3	51232	114.40	51532	114.40	51532-C4	141.00
1/2	<b>2-5/8</b> (5x)	1/2	5	51932	189.00	52532	189.00		

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

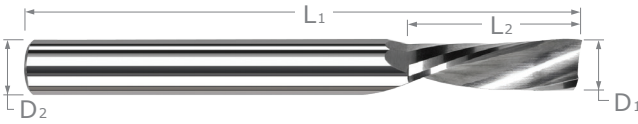
PLASTICS

**PLEASE SEE SPEEDS & FEEDS ON PAGE 198**



# 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

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>+0.10"</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	36.10		
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	36.10		
1/16	<b>1/4</b> (4x)	1/4	2			44862	38.00		
1/16	<b>5/16</b> (5x)	1/8	2			935362	37.10		
5/64	<b>5/16</b> (4x)	1/4	2			44878	38.00		
3/32	<b>3/8</b> (4x)	1/4	2			44893	38.00	44893-C4	56.30
1/8	<b>3/8</b> (3x)	1/8	1-1/2			929808	34.60		
1/8	<b>1/2</b> (4x)	1/4	2	855908	36.30	44908	36.30	44908-C4	54.60
1/8	<b>5/8</b> (5x)	1/8	2			935408	35.70		
5/32	<b>5/8</b> (4x)	1/4	2			44910	36.30		
3/16	<b>9/16</b> (3x)	3/16	2			929812	34.60		
3/16	<b>5/8</b> (3x)	1/4	2			44912	36.30		
1/4	<b>3/4</b> (3x)	1/4	2-1/2	855916	36.30	44916	36.30	44916-C4	54.60
1/4	<b>1-1/4</b> (5x)	1/4	3			935416	66.60		
3/8	<b>1-1/8</b> (3x)	3/8	3			44924	62.30		
3/8	<b>2</b> (5x)	3/8	4			935424	106.70		
1/2	<b>1-1/2</b> (3x)	1/2	4			44932	146.50		
1/2	<b>2-5/8</b> (5x)	1/2	5			935432	225.00		

### 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 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
Filled Plastics	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
Fiber Reinforced	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

## Ball Upcut – Single Flute



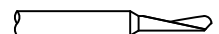
- ⚡ Design allows for maximum stock removal while maintaining excellent finish
- ⚡ High rake, high relief design produces sharper edge for improved shearing action while transferring heat into the chip
- ⚡ Large flute valley creates room for the chip and aids in chip evacuation
- ⚡ Slower helix reduces 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
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$		
1/16	<b>3/16</b> (3x)	1/8	1-1/2	869562	28.30
1/16	<b>5/16</b> (5x)	1/8	2	842262	34.50
3/32	<b>9/32</b> (3x)	1/8	1-1/2	869593	28.30
3/32	<b>1/2</b> (5x)	1/8	2	842293	34.50
1/8	<b>3/8</b> (3x)	1/8	1-1/2	869608	28.30
1/8	<b>5/8</b> (5x)	1/8	2	842308	34.50
3/16	<b>9/16</b> (3x)	3/16	2	869612	36.40
1/4	<b>3/4</b> (3x)	1/4	2-1/2	869616	39.90
3/8	<b>1-1/8</b> (3x)	3/8	2-1/2	869624	75.50



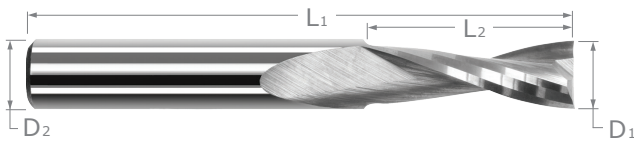
View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](https://www.harveytool.com).

Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](https://www.harveytool.com)



# END MILLS FOR PLASTICS

## Square Upcut – 2 Flute (Slow Helix)



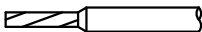
2 Flute Design Improves Bottom Finish and Accuracy

- 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

mm & in

CUTTER DIAMETER		LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
D1 <sup>+ .000"</sup> <sub>-.001"</sub>	decimal equivalent	L2 <sup>+ .010"</sup> <sub>-.000"</sub>	D2	L1	2 FL	PRICE	2 FL	PRICE
.008	.0080	<b>.024</b> (3x)	1/8	1-1/2	48608	59.60		
.008	.0080	<b>.040</b> (5x)	1/8	1-1/2	49808	60.10		
.010	.0110	<b>.030</b> (3x)	1/8	1-1/2	48610	56.80		
.010	.0110	<b>.050</b> (5x)	1/8	1-1/2	49810	64.60		
1/64	.0156	<b>.023</b> (1.5x)	1/8	1-1/2	957615	48.60		
1/64	.0156	<b>3/64</b> (3x)	1/8	1-1/2	48615	48.60		
1/64	.0156	<b>5/64</b> (5x)	1/8	1-1/2	49815	56.40		
1/64	.0156	<b>1/8</b> (8x)	1/8	1-1/2	60215	63.40		
.020	.0200	<b>.030</b> (1.5x)	1/8	1-1/2	957620	37.10		
.020	.0200	<b>.060</b> (3x)	1/8	1-1/2	48620	37.10	48620-C4	48.80
.020	.0200	<b>.100</b> (5x)	1/8	1-1/2	49820	45.10		
.020	.0200	<b>.160</b> (8x)	1/8	1-1/2	60220	52.00		
.020	.0200	<b>.200</b> (10x)	1/8	1-1/2	938920	52.00		
.025	.0250	<b>.038</b> (1.5x)	1/8	1-1/2	957625	37.10		
.025	.0250	<b>.075</b> (3x)	1/8	1-1/2	48625	37.10		
.025	.0250	<b>1/8</b> (5x)	1/8	1-1/2	49825	44.90	49825-C4	56.60
.025	.0250	<b>13/64</b> (8x)	1/8	1-1/2	60225	52.00		
.030	.0300	<b>.090</b> (3x)	1/8	1-1/2	48630	37.10		
.030	.0300	<b>.156</b> (5x)	1/8	1-1/2	49830	45.10		
1/32	.0312	<b>3/64</b> (1.5x)	1/8	1-1/2	957631	36.80		
1/32	.0312	<b>3/32</b> (3x)	1/8	1-1/2	48631	36.80	48631-C4	48.50
1/32	.0312	<b>3/32</b> (3x)	1/4	2	878731	45.60		
1/32	.0312	<b>5/32</b> (5x)	1/8	1-1/2	49831	44.90	49831-C4	56.60
1/32	.0312	<b>1/4</b> (8x)	1/8	1-1/2	60231	51.40	60231-C4	63.10
1/32	.0312	<b>5/16</b> (10x)	1/8	1-1/2	938931	51.40		
.035	.0350	<b>.105</b> (3x)	1/8	1-1/2	48635	37.10		
.039 (1 mm)	.0394	<b>.118</b> (3x)	1/8	1-1/2	48639	37.30		
.039 (1 mm)	.0394	<b>13/64</b> (5x)	1/8	1-1/2	49839	37.30		
.040	.0400	<b>.060</b> (1.5x)	1/8	1-1/2	957640	37.10		
.040	.0400	<b>.120</b> (3x)	1/8	1-1/2	48640	37.10		
.040	.0400	<b>13/64</b> (5x)	1/8	1-1/2	49840	45.10		
.040	.0400	<b>.325</b> (8x)	1/8	2	60240	52.00		
.045	.0450	<b>.135</b> (3x)	1/8	1-1/2	48645	37.10		
3/64	.0469	<b>.071</b> (1.5x)	1/8	1-1/2	957647	31.20		
3/64	.0469	<b>9/64</b> (3x)	1/8	1-1/2	48647	31.20	48647-C4	42.90
3/64	.0469	<b>1/4</b> (5x)	1/8	1-1/2	49847	36.20	49847-C4	47.90
3/64	.0469	<b>3/8</b> (8x)	1/8	2	60247	43.50		
.050	.0500	<b>.150</b> (3x)	1/8	1-1/2	48650	31.50		
.050	.0500	<b>.250</b> (5x)	1/8	1-1/2	49850	36.50		

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# END MILLS FOR PLASTICS

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

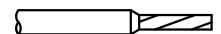


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CUTTER DIAMETER		LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
D <sub>1</sub> <sup>+ .000"</sup> <sub>-.001"</sub>	decimal equivalent	L <sub>2</sub> <sup>+ .010"</sup> <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
.055	.0550	.165 (3x)	1/8	1-1/2	48655	31.50		
.060	.0600	.180 (3x)	1/8	1-1/2	48660	31.50		
.060	.0600	5/16 (5x)	1/8	1-1/2	49860	36.50		
D <sub>1</sub> <sup>+ .000"</sup> <sub>-.002"</sub>	<sup>+ .00mm</sup> <sub>-.05mm</sub> decimal equivalent	L <sub>2</sub> <sup>+ .030"</sup> <sub>-.000"</sub> <sup>+ .75mm</sup> <sub>-.00mm</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
1/16	.0625	3/32 (1.5x)	1/8	1-1/2	957662	27.40		
1/16	.0625	3/16 (3x)	1/8	1-1/2	48662	27.40	48662-C4	39.10
1/16	.0625	3/16 (3x)	1/4	2	878762	36.10		
1/16	.0625	1/4 (4x)	1/8	2	874862	32.30		
1/16	.0625	5/16 (5x)	1/8	2	49862	32.30	49862-C4	45.20
1/16	.0625	1/2 (8x)	1/8	2	60262	39.90	60262-C4	53.10
1/16	.0625	5/8 (10x)	1/8	2	938962	39.90		
5/64	.0781	.117 (1.5x)	1/8	1-1/2	957678	27.40		
5/64	.0781	15/64 (3x)	1/8	1-1/2	48678	27.40	48678-C4	39.10
5/64	.0781	13/32 (5x)	1/8	2	49878	32.30	49878-C4	45.20
5/64	.0781	5/8 (8x)	1/8	2	60278	39.90		
5/64	.0781	.800 (10x)	1/8	3	938978	39.90		
3/32	.0937	9/64 (1.5x)	1/8	1-1/2	957693	27.40	957693-C4	39.10
3/32	.0937	9/32 (3x)	1/8	1-1/2	48693	27.40	48693-C4	39.10
3/32	.0937	9/32 (3x)	1/4	2	878793	36.10		
3/32	.0937	3/8 (4x)	1/8	2	874893	32.30		
3/32	.0937	1/2 (5x)	1/8	2	49893	32.30	49893-C4	45.20
3/32	.0937	3/4 (8x)	1/8	2	60293	39.90	60293-C4	53.10
3/32	.0937	.950 (10x)	1/8	2	938993	39.90		
.100	.1000	.150 (1.5x)	1/8	1-1/2	957700	27.50		
.100	.1000	.300 (3x)	1/8	1-1/2	48700	27.50		
.100	.1000	1/2 (5x)	1/8	2	49900	32.80		
.100	.1000	.800 (8x)	1/8	2	60300	40.30		
7/64	.1090	21/64 (3x)	1/8	1-1/2	48707	27.50		
.118 (3 mm)	.1181	.177 (1.5x)	1/8	1-1/2	957706	27.50		
.118 (3 mm)	.1181	.354 (3x)	1/8	1-1/2	48706	27.50		
.118 (3 mm)	.1181	.625 (5x)	1/8	2	49906	32.80		
.118 (3 mm)	.1181	.950 (8x)	1/8	2	60306	40.30		
1/8	.1250	3/16 (1.5x)	1/8	1-1/2	957708	27.40	957708-C4	39.10
1/8	.1250	3/8 (3x)	1/8	1-1/2	48708	27.40	48708-C4	39.10
1/8	.1250	3/8 (3x)	1/4	2	878808	36.10		
1/8	.1250	1/2 (4x)	1/8	2	874908	32.30		
1/8	.1250	5/8 (5x)	1/8	2	49908	32.30	49908-C4	45.20
1/8	.1250	1 (8x)	1/8	2	60308	39.90	60308-C4	51.60
1/8	.1250	1-1/4 (10x)	1/8	2-1/2	939008	39.90	939008-C4	51.60
9/64	.1406	27/64 (3x)	3/16	2	48709	36.20		
5/32	.1562	15/64 (1.5x)	3/16	2	957710	36.10		
5/32	.1562	15/32 (3x)	3/16	2	48710	36.10	48710-C4	52.20
5/32	.1562	3/4 (5x)	3/16	3	49910	44.50	49910-C4	60.60
5/32	.1562	1-1/4 (8x)	3/16	3	60310	48.90		

PLASTICS

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>			L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
+ .000" -.002"	+ .00mm -.05mm	decimal equivalent	+ .030" -.000" + .75mm -.00mm						
3/16		.1875	<b>9/32</b> (1.5x)	3/16	2	957712	36.10	957712-C4	52.20
3/16		.1875	<b>9/16</b> (3x)	3/16	2	48712	36.10	48712-C4	52.20
3/16		.1875	<b>9/16</b> (3x)	1/4	2	878812	44.90		
3/16		.1875	<b>3/4</b> (4x)	3/16	3	874912	44.50		
3/16		.1875	<b>1</b> (5x)	3/16	3	49912	44.50	49912-C4	60.60
3/16		.1875	<b>1-1/2</b> (8x)	3/16	3	60312	48.90		
3/16		.1875	<b>1-7/8</b> (10x)	3/16	3	939012	48.90		
1/4		.2500	<b>3/8</b> (1.5x)	1/4	2-1/2	957716	44.50	957716-C4	62.80
1/4		.2500	<b>3/4</b> (3x)	1/4	2-1/2	48716	44.50	48716-C4	62.80
1/4		.2500	<b>1</b> (4x)	1/4	3	874916	51.00		
1/4		.2500	<b>1-1/4</b> (5x)	1/4	3	49916	51.00	49916-C4	69.30
1/4		.2500	<b>2</b> (8x)	1/4	4	60316	63.80	60316-C4	82.10
1/4		.2500	<b>2-1/2</b> (10x)	1/4	4	939016	63.80		
6.0 mm		.2362	<b>18 mm</b> (3x)	6 mm	63 mm	886566	71.10		
5/16		.3125	<b>15/32</b> (1.5x)	5/16	2-1/2	957720	66.20		
5/16		.3125	<b>1</b> (3x)	5/16	2-1/2	48720	66.20		
5/16		.3125	<b>1-5/8</b> (5x)	5/16	4	49920	85.60		
8.0 mm		.3149	<b>24 mm</b> (3x)	8 mm	63 mm	886570	95.20		
3/8		.3750	<b>9/16</b> (1.5x)	3/8	3	957724	76.40	957724-C4	98.50
3/8		.3750	<b>1-1/8</b> (3x)	3/8	3	48724	76.40	48724-C4	98.50
3/8		.3750	<b>1-1/2</b> (4x)	3/8	4	874924	88.10		
3/8		.3750	<b>2</b> (5x)	3/8	4	49924	88.10		
3/8		.3750	<b>3</b> (8x)	3/8	6	60324	99.50		
10.0 mm		.3937	<b>30 mm</b> (3x)	10 mm	75 mm	886573	85.30		
12.0 mm		.4724	<b>36 mm</b> (3x)	12 mm	100 mm	886576	88.60		
1/2		.5000	<b>3/4</b> (1.5x)	1/2	4	957732	134.50	957732-C4	161.00
1/2		.5000	<b>1-1/2</b> (3x)	1/2	4	48732	134.50	48732-C4	161.00
1/2		.5000	<b>2-5/8</b> (5x)	1/2	5	49932	160.10	49932-C4	187.00
1/2		.5000	<b>4</b> (8x)	1/2	7	60332	184.30		
5/8		.6250	<b>15/16</b> (1.5x)	5/8	4	957740	194.40		
3/4		.7500	<b>1-1/8</b> (1.5x)	3/4	4	957748	253.10		
3/4		.7500	<b>2-1/4</b> (3x)	3/4	4	48748	253.10		

PLASTICS

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

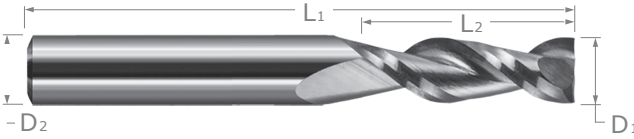
**Important Note:** Values are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cut, table values of IPT must be increased (for 1.5x, increase 115%). For longer lengths of cuts, table values of IPT must be reduced (for 4x, reduce to 95%; for 5x, reduce to 90%;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

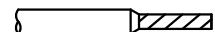
CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE
1/32	<b>3/32</b> (3x)	1/8	1-1/2	898131	46.90
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE
1/16	<b>3/16</b> (3x)	1/8	1-1/2	898162	34.50
1/16	<b>5/16</b> (5x)	1/8	2	866262	36.70
3/32	<b>9/32</b> (3x)	1/8	1-1/2	898193	34.50
1/8	<b>3/16</b> (1.5x)	1/8	1-1/2	827708	34.50
1/8	<b>3/8</b> (3x)	1/8	1-1/2	898208	34.50
1/8	<b>5/8</b> (5x)	1/8	2	866308	36.70
5/32	<b>15/32</b> (3x)	3/16	2	898210	48.90
3/16	<b>9/16</b> (3x)	3/16	2	898212	47.50
3/16	<b>1</b> (5x)	3/16	3	866312	50.80
1/4	<b>3/8</b> (1.5x)	1/4	2-1/2	827716	53.40
1/4	<b>3/4</b> (3x)	1/4	2-1/2	898216	53.40
1/4	<b>1-1/4</b> (5x)	1/4	3	866316	57.00
3/8	<b>1-1/8</b> (3x)	3/8	3	898224	80.90
3/8	<b>2</b> (5x)	3/8	4	866324	86.50
1/2	<b>1-1/2</b> (3x)	1/2	4	898232	139.50
1/2	<b>2-5/8</b> (5x)	1/2	5	866332	149.10

PLASTICS

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

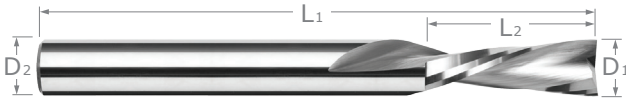
**Important Note:** Values are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cut, table values of IPT must be increased (for 1.5x, increase 115%). For longer lengths of cuts, table values of IPT must be reduced (for 5x, reduce to 90%). For complete speeds 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	.0012	.0018	.0024	.0030	.0036	.0048	.0072	.0097	.0102	.0123	.0164	.0205	.0246	1 x Dia	1 x Dia
			Profile	.0007	.0014	.0021	.0028	.0035	.0041	.0056	.0083	.0111	.0118	.0142	.0189	.0236	.0283	.35 x Dia	1 x Dia
Filled Plastics	Carbon/Glass Filled 5% < 20%	600-800	Slot - Rough	.0006	.0012	.0018	.0024	.0030	.0036	.0048	.0072	.0097	.0102	.0123	.0164	.0205	.0246	1 x Dia	1 x Dia
			Profile	.0007	.0014	.0021	.0028	.0035	.0041	.0056	.0083	.0111	.0118	.0142	.0189	.0236	.0283	.35 x Dia	1 x Dia
Filled Plastics	Carbon/Glass Filled 21% < 40%	500-700	Slot - Rough	.0005	.0010	.0015	.0020	.0025	.0029	.0039	.0059	.0079	.0084	.0101	.0134	.0168	.0201	1 x Dia	1 x Dia
			Profile	.0005	.0011	.0017	.0023	.0028	.0034	.0045	.0068	.0091	.0096	.0116	.0154	.0193	.0232	.35 x Dia	1 x Dia
Fiber Reinforced	Carbon/Glass Fiber 5% < 20%	500-700	Slot - Rough	.0006	.0012	.0018	.0024	.0030	.0036	.0048	.0072	.0097	.0102	.0123	.0164	.0205	.0246	1 x Dia	1 x Dia
			Profile	.0007	.0014	.0021	.0028	.0035	.0041	.0056	.0083	.0111	.0118	.0142	.0189	.0236	.0283	.35 x Dia	1 x Dia
Fiber Reinforced	Carbon/Glass Fiber 21% < 40%	300-400	Slot - Rough	.0005	.0010	.0015	.0020	.0025	.0029	.0039	.0059	.0079	.0084	.0101	.0134	.0168	.0201	1 x Dia	1 x Dia
			Profile	.0005	.0011	.0017	.0023	.0028	.0034	.0045	.0068	.0091	.0096	.0116	.0154	.0193	.0232	.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

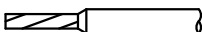
PLASTICS

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
				2 FL	PRICE	2 FL	PRICE
D1 <sup>+0.000"</sup> / <sub>-.001"</sub>	L2 <sup>+0.010"</sup> / <sub>-.000"</sub>	D2	L1	2 FL	PRICE	2 FL	PRICE
.010	.030 (3x)	1/8	1-1/2	998510	58.70		
1/64	.023 (1.5x)	1/8	1-1/2	966215	53.60		
1/64	3/64 (3x)	1/8	1-1/2	998515	53.60		
1/64	5/64 (5x)	1/8	1-1/2	999815	61.50		
.020	.030 (1.5x)	1/8	1-1/2	966220	41.90		
.020	.060 (3x)	1/8	1-1/2	998520	41.90		
.025	.075 (3x)	1/8	1-1/2	998525	41.90		
1/32	3/64 (1.5x)	1/8	1-1/2	966231	41.90		
1/32	3/32 (3x)	1/8	1-1/2	998531	41.90	998531-C4	53.60
1/32	5/32 (5x)	1/8	1-1/2	999831	49.80		
.040	.120 (3x)	1/8	1-1/2	998540	41.90		
3/64	.071 (1.5x)	1/8	1-1/2	966247	36.00		
3/64	9/64 (3x)	1/8	1-1/2	998547	36.00		
3/64	1/4 (5x)	1/8	1-1/2	999847	41.40		
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	3/32 (1.5x)	1/8	1-1/2	966262	32.30		
1/16	3/16 (3x)	1/8	1-1/2	998562	32.30	998562-C4	44.00
1/16	1/4 (4x)	1/8	2	827462	43.20		
1/16	5/16 (5x)	1/8	2	999862	43.20		
1/16	1/2 (8x)	1/8	2	978962	72.10		
5/64	.117 (1.5x)	1/8	1-1/2	966278	32.30		
5/64	15/64 (3x)	1/8	1-1/2	998578	32.30		
5/64	13/32 (5x)	1/8	2	999878	43.20		
5/64	5/8 (8x)	1/8	2	978978	72.10		

continued on next page



**Check Out All of Our Plastic Cutting Solutions!**



# END MILLS FOR PLASTICS

## Square Downtcut – 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>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>				
3/32	<b>9/64</b> (1.5x)	1/8	1-1/2	966293	32.30		
3/32	<b>9/32</b> (3x)	1/8	1-1/2	998593	32.30	998593-C4	44.00
3/32	<b>3/8</b> (4x)	1/8	2	827493	43.20		
3/32	<b>1/2</b> (5x)	1/8	2	999893	43.20		
3/32	<b>3/4</b> (8x)	1/8	2	978993	72.10		
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	998606	32.30		
1/8	<b>3/16</b> (1.5x)	1/8	1-1/2	966308	32.30	966308-C4	44.00
1/8	<b>3/8</b> (3x)	1/8	1-1/2	998608	32.30	998608-C4	44.00
1/8	<b>1/2</b> (4x)	1/8	2	827508	43.20		
1/8	<b>5/8</b> (5x)	1/8	2	999908	43.20		
1/8	<b>1</b> (8x)	1/8	2-1/2	979008	72.10		
5/32	<b>15/64</b> (1.5x)	3/16	2	966310	43.90		
5/32	<b>15/32</b> (3x)	3/16	2	998610	43.90		
5/32	<b>3/4</b> (5x)	3/16	3	999910	52.00		
3/16	<b>9/32</b> (1.5x)	3/16	2	966312	43.90		
3/16	<b>9/16</b> (3x)	3/16	2	998612	43.90	998612-C4	60.00
3/16	<b>1</b> (5x)	3/16	3	999912	52.00		
3/16	<b>1-1/2</b> (8x)	3/16	3	979012	77.30		
1/4	<b>3/8</b> (1.5x)	1/4	2-1/2	966316	52.00	966316-C4	70.30
1/4	<b>3/4</b> (3x)	1/4	2-1/2	998616	52.00	998616-C4	70.30
1/4	<b>1</b> (4x)	1/4	3	827516	56.80		
1/4	<b>1-1/4</b> (5x)	1/4	3	999916	56.80	999916-C4	75.10
1/4	<b>2</b> (8x)	1/4	4	979016	83.70		
5/16	<b>1</b> (3x)	5/16	2-1/2	998620	77.80		
3/8	<b>9/16</b> (1.5x)	3/8	3	966324	88.40		
3/8	<b>1-1/8</b> (3x)	3/8	3	998624	88.40	998624-C4	110.50
3/8	<b>2</b> (5x)	3/8	4	999924	103.70		
1/2	<b>3/4</b> (1.5x)	1/2	4	966332	159.30		
1/2	<b>1-1/2</b> (3x)	1/2	4	998632	159.30	998632-C4	185.80
1/2	<b>2-5/8</b> (5x)	1/2	5	999932	176.50		



PLASTICS

**PLEASE SEE SPEEDS & FEEDS ON PAGE 198**

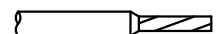
### Plastic Cutting End Mills vs. Metal Cutting End Mills

**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.

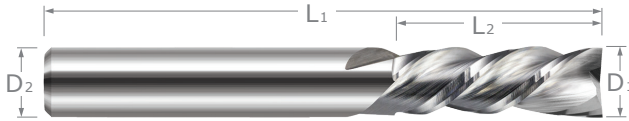
Feature	Typical Metal Working End Mills	Plastic Cutting End Mills
Flute Rake	8° – 12°	25° – 32°
Axial/End Gash Rake	2° – 4°	8° – 12°
OD Primary Relief	12° – 18°	18° – 26°
OD Secondary Relief	18° – 26°	35° – 45°
Core Diameter	56% – 60%	40% – 44%
Typical Cross Section	 <p>2 FLUTE STANDARD</p>	 <p>SINGLE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

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

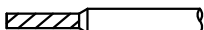
CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
				2 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$		
1/16	<b>5/16</b> (5x)	1/8	2	826362	43.20
1/8	<b>5/8</b> (5x)	1/8	2	826408	43.20
3/16	<b>1</b> (5x)	3/16	3	826412	52.00
1/4	<b>1-1/4</b> (5x)	1/4	3	826416	56.80
3/8	<b>2</b> (5x)	3/8	4	826424	103.70
1/2	<b>2-5/8</b> (5x)	1/2	5	826432	176.50

PLEASE SEE SPEEDS & FEEDS ON PAGE 203



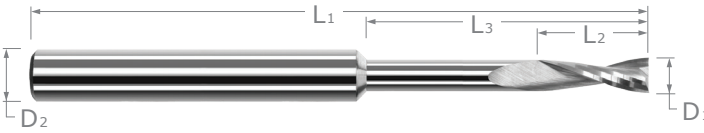
View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)



## END MILLS FOR PLASTICS

### Square Upcut – Long Reach – 2 Flute

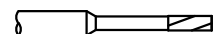


- ↻ High rake, high relief design with large flute valley maximizes chip removal and performance
- ↻ Center cutting design improves plunging and ramping
- ↻ Reduced neck diameter to avoid heeling
- ↻ Length of cut = 3x diameter
- ↻ Solid carbide
- ↻ CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
					2 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$		
1/64	3/64	<b>1/8</b> (8x)	1/8	1-1/2	989015	62.20
1/64	3/64	<b>3/16</b> (12x)	1/8	1-1/2	994115	65.40
.020	.060	<b>.160</b> (8x)	1/8	1-1/2	989020	50.50
.020	.060	<b>1/4</b> (12x)	1/8	1-1/2	994120	53.40
1/32	3/32	<b>5/32</b> (5x)	1/8	1-1/2	961531	49.10
1/32	3/32	<b>1/4</b> (8x)	1/8	1-1/2	989031	50.50
1/32	3/32	<b>3/8</b> (12x)	1/8	1-1/2	994131	53.40
1/32	3/32	<b>15/32</b> (15x)	1/8	1-1/2	979731	56.60
.040	.120	<b>.325</b> (8x)	1/8	1-1/2	989040	50.50
.040	.120	<b>.480</b> (12x)	1/8	1-1/2	994140	53.40
3/64	9/64	<b>3/8</b> (8x)	1/8	1-1/2	989047	44.90
3/64	9/64	<b>9/16</b> (12x)	1/8	1-1/2	994147	47.80

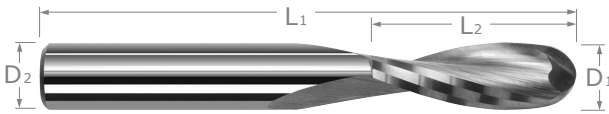
CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
					2 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$L_3 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$		
1/16	3/16	<b>5/16</b> (5x)	1/8	1-1/2	961562	40.10
1/16	3/16	<b>1/2</b> (8x)	1/8	1-1/2	989062	41.20
1/16	3/16	<b>3/4</b> (12x)	1/8	2	994162	44.00
1/16	3/16	<b>15/16</b> (15x)	1/8	2	979762	47.30
5/64	15/64	<b>5/8</b> (8x)	1/8	2	989078	41.20
5/64	15/64	<b>15/16</b> (12x)	1/8	2	994178	44.00
3/32	9/32	<b>1/2</b> (5x)	1/8	1-1/2	961593	40.10
3/32	9/32	<b>3/4</b> (8x)	1/8	2	989093	41.20
3/32	9/32	<b>1-1/8</b> (12x)	1/8	2	994193	44.00
3/32	9/32	<b>1-13/32</b> (15x)	1/8	2-1/2	979793	47.30
1/8	3/8	<b>5/8</b> (5x)	1/8	1-1/2	961608	40.10
1/8	3/8	<b>1</b> (8x)	1/8	2-1/2	989108	41.20
1/8	3/8	<b>1-1/2</b> (12x)	1/8	2-1/2	994208	44.00
1/8	3/8	<b>1-7/8</b> (15x)	1/8	3	979808	47.30
5/32	15/32	<b>1-1/4</b> (8x)	3/16	3	989110	49.70
5/32	15/32	<b>1-7/8</b> (12x)	3/16	4	994210	57.90
3/16	9/16	<b>1-1/2</b> (8x)	3/16	3	989112	49.70
3/16	9/16	<b>2-1/4</b> (12x)	3/16	4	994212	57.90
1/4	3/4	<b>2</b> (8x)	1/4	4	989116	59.00
1/4	3/4	<b>3</b> (12x)	1/4	6	994216	70.40

PLEASE SEE SPEEDS & FEEDS ON PAGE 209



# 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	54.20		
1/64	<b>5/64</b> (5x)	1/8	1-1/2	71315	63.90		
.020	<b>.060</b> (3x)	1/8	1-1/2	49520	42.50		
.020	<b>.100</b> (5x)	1/8	1-1/2	71320	52.00		
.025	<b>.075</b> (3x)	1/8	1-1/2	49525	42.50		
.025	<b>1/8</b> (5x)	1/8	1-1/2	71325	52.00		
1/32	<b>3/64</b> (1.5x)	1/8	1-1/2	962331	42.50		
1/32	<b>3/32</b> (3x)	1/8	1-1/2	49531	42.50	49531-C4	54.20
1/32	<b>5/32</b> (5x)	1/8	1-1/2	71331	51.40	71331-C4	63.10
1/32	<b>1/4</b> (8x)	1/8	1-1/2	955731	60.90		
.039 (1 mm)	<b>.118</b> (3x)	1/8	1-1/2	49539	43.00		
3/64	<b>9/64</b> (3x)	1/8	1-1/2	49547	36.00		
3/64	<b>1/4</b> (5x)	1/8	1-1/2	71347	44.70		

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	31.80		
1/16	<b>3/16</b> (3x)	1/8	1-1/2	49562	31.80	49562-C4	43.50
1/16	<b>5/16</b> (5x)	1/8	2	71362	38.70	71362-C4	55.90
1/16	<b>1/2</b> (8x)	1/8	2	955762	57.90		
5/64	<b>15/64</b> (3x)	1/8	1-1/2	49578	31.80		
5/64	<b>13/32</b> (5x)	1/8	2	71378	38.70		
3/32	<b>9/32</b> (3x)	1/8	1-1/2	49593	31.80	49593-C4	43.50
3/32	<b>1/2</b> (5x)	1/8	2	71393	38.70		
.118 (3 mm)	<b>.354</b> (3x)	1/8	1-1/2	49605	32.00		
1/8	<b>3/16</b> (1.5x)	1/8	1-1/2	962408	31.80		
1/8	<b>3/8</b> (3x)	1/8	1-1/2	49608	31.80	49608-C4	43.50
1/8	<b>5/8</b> (5x)	1/8	2	71408	38.70	71408-C4	55.90
1/8	<b>1</b> (8x)	1/8	2	955808	57.90		
5/32	<b>15/32</b> (3x)	3/16	2	49610	41.90		
3/16	<b>9/32</b> (1.5x)	3/16	2	962412	41.90		
3/16	<b>9/16</b> (3x)	3/16	2	49612	41.90	49612-C4	58.00
3/16	<b>1</b> (5x)	3/16	3	71412	50.80		
1/4	<b>3/8</b> (1.5x)	1/4	2-1/2	962416	53.60		
1/4	<b>3/4</b> (3x)	1/4	2-1/2	49616	53.60	49616-C4	71.90
1/4	<b>1-1/4</b> (5x)	1/4	3	71416	61.40	71416-C4	79.70
3/8	<b>9/16</b> (1.5x)	3/8	3	962424	85.80		
3/8	<b>1-1/8</b> (3x)	3/8	3	49624	85.80	49624-C4	107.90
3/8	<b>2</b> (5x)	3/8	4	71424	97.80		
1/2	<b>3/4</b> (1.5x)	1/2	4	962432	147.90		
1/2	<b>1-1/2</b> (3x)	1/2	4	49632	147.90	49632-C4	174.40
1/2	<b>2-5/8</b> (5x)	1/2	5	71432	175.50		

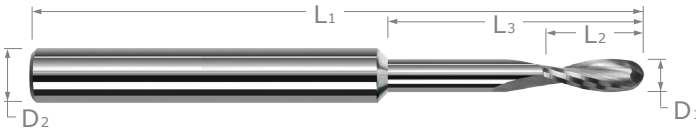
PLEASE SEE SPEEDS & FEEDS ON PAGE 202





# 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	
					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
1/32	3/32	5/32 (5x)	1/8	1-1/2	964531	54.40
1/32	3/32	1/4 (8x)	1/8	1-1/2	976231	56.10
3/64	9/64	1/4 (5x)	1/8	1-1/2	964547	48.30
3/64	9/64	3/8 (8x)	1/8	1-1/2	976247	49.50

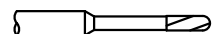
CUTTER DIAMETER	LENGTH OF CUT	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
					2 FL	PRICE
D1 <sup>+0.000"</sup> / <sub>-.002"</sub>	L2 <sup>+0.030"</sup> / <sub>-.000"</sub>	L3 <sup>+0.030"</sup> / <sub>-.000"</sub>	D2	L1	2 FL	PRICE
1/16	3/16	5/16 (5x)	1/8	1-1/2	964562	43.90
1/16	3/16	1/2 (8x)	1/8	1-1/2	976262	45.50
5/64	15/64	13/32 (5x)	1/8	1-1/2	964578	43.90
5/64	15/64	5/8 (8x)	1/8	2	976278	45.50
3/32	9/32	1/2 (5x)	1/8	1-1/2	964593	43.90
3/32	9/32	3/4 (8x)	1/8	2	976293	45.50
1/8	3/8	5/8 (5x)	1/8	1-1/2	964608	43.90
1/8	3/8	1 (8x)	1/8	2	976308	45.50
3/16	9/16	1 (5x)	3/16	2	964612	53.70
1/4	3/4	1-1/4 (5x)	1/4	2-1/2	964616	65.00

PLASTICS

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

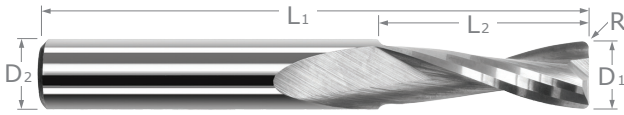
**Important Note:** Values in table are in inches and are based on reached (8x Dia) end mills. For shorter reaches, table values of IPT must be increased (for 5x, increase to 130%). For longer reaches, table values of IPT and DOC must be reduced (for 12x, reduce to 80%; for 15x, reduce to 67%). For complete 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	.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	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	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	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	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

PLASTICS

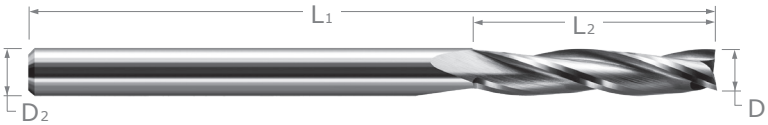
CUTTER DIAMETER	CORNER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
					2 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	R <sup>+0.001"</sup> / <sub>-0.001"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	D <sub>2</sub>	L <sub>1</sub>		
1/16	.005	<b>3/16</b> (3x)	1/8	1-1/2	54062	31.80
1/16	.010	<b>3/16</b> (3x)	1/8	1-1/2	55462	31.80
1/16	.010	<b>5/16</b> (5x)	1/8	2	861862	39.10
1/16	.015	<b>3/16</b> (3x)	1/8	1-1/2	69362	31.80
1/16	.015	<b>5/16</b> (5x)	1/8	2	862462	39.10
3/32	.005	<b>9/32</b> (3x)	1/8	1-1/2	54093	31.80
3/32	.010	<b>9/32</b> (3x)	1/8	1-1/2	55493	31.80
3/32	.010	<b>1/2</b> (5x)	1/8	2	861893	39.10
3/32	.015	<b>9/32</b> (3x)	1/8	1-1/2	69393	31.80
3/32	.015	<b>1/2</b> (5x)	1/8	2	862493	39.10
3/32	.020	<b>9/32</b> (3x)	1/8	1-1/2	69893	31.80
3/32	.030	<b>9/32</b> (3x)	1/8	1-1/2	70693	31.80
1/8	.005	<b>3/8</b> (3x)	1/8	1-1/2	54108	31.80
1/8	.010	<b>3/8</b> (3x)	1/8	1-1/2	55508	31.80
1/8	.010	<b>5/8</b> (5x)	1/8	2	861908	39.10
1/8	.015	<b>3/8</b> (3x)	1/8	1-1/2	56408	31.80
1/8	.015	<b>5/8</b> (5x)	1/8	2	862508	39.10
1/8	.020	<b>3/8</b> (3x)	1/8	1-1/2	69908	31.80
1/8	.030	<b>3/8</b> (3x)	1/8	1-1/2	70708	31.80
1/8	.030	<b>5/8</b> (5x)	1/8	2	863108	39.10
3/16	.005	<b>9/16</b> (3x)	3/16	2	54112	41.90
3/16	.010	<b>9/16</b> (3x)	3/16	2	55512	41.90
3/16	.015	<b>9/16</b> (3x)	3/16	2	56412	41.90
3/16	.020	<b>9/16</b> (3x)	3/16	2	69912	41.90
3/16	.030	<b>9/16</b> (3x)	3/16	2	70712	41.90
3/16	.030	<b>1</b> (5x)	3/16	3	863112	51.20
1/4	.010	<b>3/4</b> (3x)	1/4	2-1/2	55516	53.60
1/4	.015	<b>3/4</b> (3x)	1/4	2-1/2	56416	53.60
1/4	.020	<b>3/4</b> (3x)	1/4	2-1/2	69916	53.60
1/4	.030	<b>3/4</b> (3x)	1/4	2-1/2	70716	53.60
1/4	.030	<b>1-1/4</b> (5x)	1/4	4	863116	61.70
3/8	.015	<b>1-1/8</b> (3x)	3/8	3	56424	84.10
3/8	.030	<b>1-1/8</b> (3x)	3/8	3	70724	84.10
1/2	.015	<b>1-1/2</b> (3x)	1/2	4	56432	145.30
1/2	.030	<b>1-1/2</b> (3x)	1/2	4	70732	145.30

PLEASE SEE SPEEDS & FEEDS ON PAGE 202



# END MILLS FOR PLASTICS

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



Specialized Wiper Flat Geometry for Improved Finish

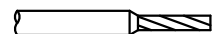
- 3 flute design strengthens rigidity and improves wall finish
- Specialized end geometry enhances bottom finish by reducing traditional circular marks
- Slower helix (approx. 22°) reduces lifting forces for fiber-reinforced applications and vacuum table setups
- Center cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	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)	1/8	1-1/2	915631	47.50		
1/32	<b>5/32</b> (5x)	1/8	1-1/2	986431	47.50		
1/32	<b>1/4</b> (8x)	1/8	1-1/2	992331	51.00		
3/64	<b>1/4</b> (5x)	1/8	1-1/2	986447	36.50		
3/64	<b>3/8</b> (8x)	1/8	2	992347	39.40		

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>3/16</b> (3x)	1/8	1-1/2	915662	30.00		
1/16	<b>5/16</b> (5x)	1/8	2	986462	35.20	986462-C4	52.40
1/16	<b>1/2</b> (8x)	1/8	2	992362	38.30		
1/16	<b>5/8</b> (10x)	1/8	2	871662	48.40		
5/64	<b>13/32</b> (5x)	1/8	2	986478	35.20		
5/64	<b>5/8</b> (8x)	1/8	2	992378	38.30		
3/32	<b>9/32</b> (3x)	1/8	1-1/2	915693	30.00		
3/32	<b>1/2</b> (5x)	1/8	2	986493	35.20	986493-C4	52.40
3/32	<b>3/4</b> (8x)	1/8	2	992393	38.30		
1/8	<b>3/8</b> (3x)	1/8	1-1/2	915708	30.00		
1/8	<b>5/8</b> (5x)	1/8	2	986508	35.20	986508-C4	52.40
1/8	<b>1</b> (8x)	1/8	2	992408	38.30		
1/8	<b>1-1/4</b> (10x)	1/8	2-1/2	871708	48.40		
5/32	<b>15/32</b> (3x)	3/16	2	915710	46.50		
5/32	<b>3/4</b> (5x)	3/16	3	986510	48.60		
3/16	<b>9/16</b> (3x)	3/16	2	915712	46.50		
3/16	<b>1</b> (5x)	3/16	3	986512	48.60	986512-C4	64.70
3/16	<b>1-1/2</b> (8x)	3/16	3	992412	57.50		
1/4	<b>3/8</b> (1.5x)	1/4	2-1/2	869316	46.40		
1/4	<b>3/4</b> (3x)	1/4	2-1/2	915716	48.60		
1/4	<b>1-1/4</b> (5x)	1/4	3	986516	55.00	986516-C4	73.30
1/4	<b>2</b> (8x)	1/4	4	992416	71.60		
3/8	<b>9/16</b> (1.5x)	3/8	3	869324	78.10		
3/8	<b>1-1/8</b> (3x)	3/8	3	915724	81.10		
3/8	<b>2</b> (5x)	3/8	4	986524	87.70		
1/2	<b>3/4</b> (1.5x)	1/2	4	869332	135.70		
1/2	<b>1-1/2</b> (3x)	1/2	4	915732	140.80		
1/2	<b>2-5/8</b> (5x)	1/2	5	986532	147.40		

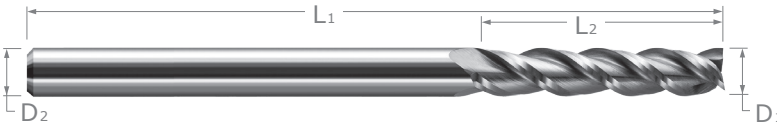
PLASTICS

PLEASE SEE SPEEDS & FEEDS ON PAGE 213



# END MILLS FOR PLASTICS

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



Specialized Wiper Flat Geometry for Improved Finish

- ⚡ 3 flute, higher helix (approx. 40°) design strengthens rigidity and increases cutting action to improve wall finish
- ⚡ Specialized end geometry enhances bottom finish by reducing traditional circular marks
- ⚡ Design is ideally suited for thin-walled applications and tightly secured workpieces
- ⚡ Center cutting
- ⚡ Solid carbide
- ⚡ CNC ground in the USA

PLASTICS

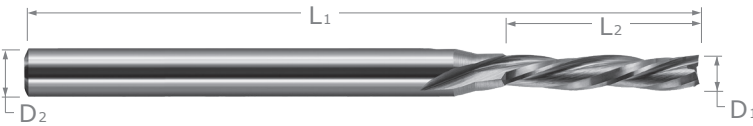
CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
				3 FL	PRICE	3 FL	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	3 FL	PRICE	3 FL	PRICE
1/32	<b>3/32</b> (3x)	1/8	1-1/2	902131	47.00		
1/32	<b>5/32</b> (5x)	1/8	1-1/2	941231	48.90		
1/32	<b>1/4</b> (8x)	1/8	1-1/2	900731	52.50		
3/64	<b>1/4</b> (5x)	1/8	1-1/2	941247	37.60		
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	3 FL	PRICE	3 FL	PRICE
1/16	<b>3/16</b> (3x)	1/8	1-1/2	902162	34.70		
1/16	<b>5/16</b> (5x)	1/8	2	941262	36.50	941262-C4	53.70
1/16	<b>1/2</b> (8x)	1/8	2	900762	39.40		
1/16	<b>5/8</b> (10x)	1/8	2	854662	41.70		
5/64	<b>13/32</b> (5x)	1/8	2	941278	36.50		
3/32	<b>9/32</b> (3x)	1/8	1-1/2	902193	34.70		
3/32	<b>1/2</b> (5x)	1/8	2	941293	36.50	941293-C4	53.70
3/32	<b>3/4</b> (8x)	1/8	2	900793	39.40		
1/8	<b>3/8</b> (3x)	1/8	1-1/2	902208	34.70		
1/8	<b>5/8</b> (5x)	1/8	2	941308	36.50	941308-C4	53.70
1/8	<b>1</b> (8x)	1/8	2	900808	39.40		
1/8	<b>1-1/4</b> (10x)	1/8	2-1/2	854708	41.70		
5/32	<b>15/32</b> (3x)	3/16	2	902210	46.80		
5/32	<b>3/4</b> (5x)	3/16	3	941310	48.60		
3/16	<b>9/16</b> (3x)	3/16	2	902212	46.80		
3/16	<b>1</b> (5x)	3/16	3	941312	48.60	941312-C4	64.70
3/16	<b>1-1/2</b> (8x)	3/16	3	900812	52.20		
1/4	<b>3/8</b> (1.5x)	1/4	2-1/2	852016	51.40		
1/4	<b>3/4</b> (3x)	1/4	2-1/2	902216	53.40		
1/4	<b>1-1/4</b> (5x)	1/4	3	941316	55.00	941316-C4	73.30
1/4	<b>2</b> (8x)	1/4	4	900816	71.60		
3/8	<b>9/16</b> (1.5x)	3/8	3	852024	79.10		
3/8	<b>1-1/8</b> (3x)	3/8	3	902224	81.10		
3/8	<b>2</b> (5x)	3/8	4	941324	87.70		
1/2	<b>3/4</b> (1.5x)	1/2	4	852032	134.60		
1/2	<b>1-1/2</b> (3x)	1/2	4	902232	139.60		
1/2	<b>2-5/8</b> (5x)	1/2	5	941332	147.40		

PLEASE SEE SPEEDS & FEEDS ON PAGE 214



# END MILLS FOR PLASTICS

## Finishers – Square Downcut – 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	
				3 FL	PRICE
D <sub>1</sub> <sup>+ .000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+ .010"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	3 FL	PRICE
1/32	5/32 (5x)	1/8	1-1/2	880431	47.50
D <sub>1</sub> <sup>+ .000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+ .030"</sup> / <sub>-.000"</sub>	D <sub>2</sub>	L <sub>1</sub>	3 FL	PRICE
1/16	5/16 (5x)	1/8	2	880462	38.30
3/32	1/2 (5x)	1/8	2	880493	38.30
1/8	5/8 (5x)	1/8	2	880508	38.30
3/16	1 (5x)	3/16	3	880512	50.40
1/4	1-1/4 (5x)	1/4	3	880516	56.90
3/8	1-1/8 (3x)	3/8	3	878124	83.00
1/2	1-1/2 (3x)	1/2	4	878132	140.50

PLASTICS

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

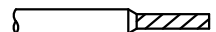
**Important Note:** Values in table are in inches and are based on standard (5x Dia) length of cut end mills. For shorter lengths of cuts, table values of IPT must be increased (for 1.5x, increase to 120%; for 3x, increase to 110%). For longer lengths of cut, table values of IPT must be reduced (for 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	
Un-filled	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
Fiber Reinforced 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



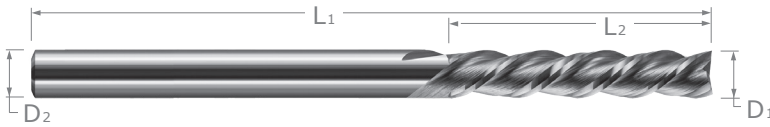
View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

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# 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

PLASTICS

CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED	
				3 FL	PRICE
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>		
1/32	<b>5/32</b> (5x)	1/8	1-1/2	864331	53.10
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>		
1/16	<b>5/16</b> (5x)	1/8	2	864362	43.00
3/32	<b>1/2</b> (5x)	1/8	2	864393	42.00
1/8	<b>3/8</b> (3x)	1/8	1-1/2	873808	33.60
1/8	<b>5/8</b> (5x)	1/8	2	864408	37.00
3/16	<b>9/16</b> (3x)	3/16	2	873812	45.30
3/16	<b>1</b> (5x)	3/16	3	864412	50.40
1/4	<b>3/4</b> (3x)	1/4	2-1/2	873816	51.50
1/4	<b>1-1/4</b> (5x)	1/4	3	864416	56.90
3/8	<b>1-1/8</b> (3x)	3/8	3	873824	83.00
1/2	<b>1-1/2</b> (3x)	1/2	4	873832	141.60

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

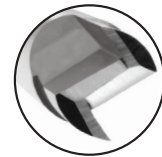
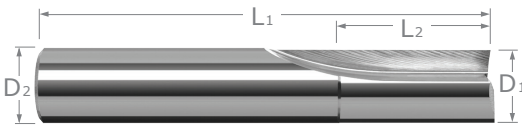
**Important Note:** Values are in inches and are based on standard (3x Dia) length of cut end mills. For shorter lengths of cut, table values of IPT must be increased (for 1.5x, increase 115%). For longer lengths of cuts, table values of IPT must be reduced (for 5x, reduce to 90%). For complete speeds 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
Un-filled	800-1200	Semi-Roughing	.00043	.00089	.00135	.00178	.00224	.00267	.00359	.00536	.00717	.00761	.00914	.01219	.01524	.01829	.35 x Dia	1 x Dia
		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	Semi-Roughing	.00043	.00089	.00135	.00178	.00224	.00267	.00359	.00536	.00717	.00761	.00914	.01219	.01524	.01829	.35 x Dia	1 x Dia
		Finishing	.00024	.00049	.00074	.00097	.00123	.00146	.00196	.00294	.00393	.00417	.00501	.00668	.00835	.01002	.10 x Dia	3 x Dia
Filled Plastics	500-700	Semi-Roughing	.00035	.00073	.00110	.00146	.00183	.00218	.00293	.00439	.00587	.00622	.00748	.00997	.01247	.01496	.35 x Dia	1 x Dia
		Finishing	.00019	.00040	.00060	.00080	.00100	.00120	.00161	.00240	.00321	.00341	.00410	.00546	.00683	.00820	.10 x Dia	3 x Dia
Fiber Reinforced	500-700	Semi-Roughing	.00043	.00089	.00135	.00178	.00224	.00267	.00359	.00536	.00717	.00761	.00914	.01219	.01524	.01829	.35 x Dia	1 x Dia
		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	Semi-Roughing	.00035	.00073	.00110	.00146	.00183	.00218	.00293	.00439	.00587	.00622	.00748	.00997	.01247	.01496	.35 x Dia	1 x Dia
		Finishing	.00019	.00040	.00060	.00080	.00100	.00120	.00161	.00240	.00321	.00341	.00410	.00546	.00683	.00820	.10 x Dia	3 x Dia



# 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

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>	2 FL	PRICE	2 FL	PRICE
1/32	<b>3/32</b> (3x)	1/8	1-1/2	69531	47.90	69531-C4	59.60
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>	2 FL	PRICE	2 FL	PRICE
1/16	<b>3/32</b> (1.5x)	1/8	1-1/2	825162	32.20	825162-C4	43.90
1/16	<b>1/8</b> (2x)	1/4*	2	14604	36.50	14604-C4	54.80
1/16	<b>3/16</b> (3x)	1/8	1-1/2	69562	32.20	69562-C4	43.90
1/16	<b>5/16</b> (5x)	1/8	2	70462	37.10	70462-C4	50.10
5/64*	<b>5/32</b> (2x)	1/4*	2	14605	36.50	14605-C4	54.80
5/64	<b>1/4</b> (3x)	1/8	1-1/2	69578	32.20	69578-C4	43.90
5/64	<b>13/32</b> (5x)	1/8	2	70478	37.10	70478-C4	50.10
3/32	<b>9/64</b> (1.5x)	1/8	1-1/2	825193	32.20	825193-C4	43.90
3/32*	<b>3/16</b> (2x)	1/4*	2	14606	36.50	14606-C4	54.80
3/32	<b>5/16</b> (3x)	1/8	1-1/2	69593	32.20	69593-C4	43.90
3/32	<b>1/2</b> (5x)	1/8	2	70493	37.10	70493-C4	50.10
1/8	<b>3/16</b> (1.5x)	1/8	1-1/2	825208	32.20	825208-C4	43.90
1/8*	<b>1/4</b> (2x)	1/4*	2	14608	36.50	14608-C4	54.80
1/8	<b>3/8</b> (3x)	1/8	1-1/2	69608	32.20	69608-C4	43.90
1/8	<b>5/8</b> (5x)	1/8	2	70508	37.10	70508-C4	50.10
5/32	<b>1/2</b> (3x)	3/16	2	69610	34.20	69610-C4	50.30
3/16	<b>5/8</b> (3x)	3/16	2	69612	34.20	69612-C4	50.30
3/16*	<b>5/8</b> (3x)	1/4*	2	14612	36.50	14612-C4	54.80
3/16	<b>1</b> (5x)	3/16	3	70512	40.30	70512-C4	56.40
1/4	<b>3/8</b> (1.5x)	1/4	2-1/2	825216	33.30	825216-C4	51.60
1/4*	<b>3/4</b> (3x)	1/4	2-1/2	14616	33.30	14616-C4	51.60
1/4	<b>1-1/4</b> (5x)	1/4	3	70516	46.20	70516-C4	64.50
5/16	<b>7/8</b> (3x)	5/16	2-1/2	14620	62.10	14620-C4	84.20
3/8*	<b>7/8</b> (2x)	3/8	2-1/2	14624	62.10	14624-C4	84.20
3/8	<b>2</b> (5x)	3/8	4	70524	76.40	70524-C4	98.50
1/2*	<b>1</b> (2x)	1/2	3	14632	98.60	14632-C4	125.20
1/2	<b>2-1/2</b> (5x)	1/2	4	70532	121.70		

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

### SPEEDS & FEEDS (2 Straight Flutes)

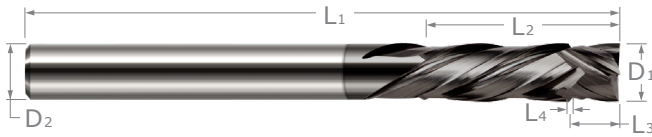
**Important Note:** Values in table are in inches and are based on standard (3x Dia) length of cut end mills. For longer lengths of cut, table values of IPT must be reduced (for 5x, reduce to 90%). For complete speeds and feeds charts, please see [www.harveyttool.com](http://www.harveyttool.com)

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

COMPOSITES

CUTTER DIAMETER	LENGTH OF CUT	OVERLAP CENTER	OVERLAP LENGTH	FLUTES	SHANK DIA.	OAL	UNCOATED		AMORPHOUS DIAMOND		CVD DIAMOND	
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>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
1/32	3/32	<b>1/32</b>	.006	2	1/8	1-1/2	994331	49.80	994331-C4	61.60	995031	112.50
3/64	9/64	<b>3/64</b>	.009	2	1/8	1-1/2	994347	49.80	994347-C4	61.60	995047	112.50
1/16	3/16	<b>1/16</b>	.013	2	1/8	1-1/2	994362	47.30	994362-C4	59.20	995062	109.90
5/64	1/4	<b>5/64</b>	.016	2	1/8	1-1/2	994378	47.30	994378-C4	59.20	995078	109.90
3/32	9/32	<b>3/32</b>	.019	2	1/8	1-1/2	994393	47.30	994393-C4	59.20	995093	109.90
1/8	3/8	<b>1/8</b>	.025	2	1/8	1-1/2	994408	45.90	994408-C4	57.70	995108	107.40
1/8	3/8	<b>1/8</b>	.028	4	1/8	1-1/2	993708	48.90	993708-C4	60.70	997708	112.10
3/16	9/16	<b>3/16</b>	.038	2	3/16	2	994412	51.20	994412-C4	67.50	995112	124.80
3/16	9/16	<b>3/16</b>	.041	4	3/16	2	993712	54.90	993712-C4	71.00	997712	131.60
1/4	3/4	<b>1/4</b>	.050	2	1/4	2-1/2	994416	61.20	994416-C4	79.50	995116	147.60
1/4	3/4	<b>1/4</b>	.055	4	1/4	2-1/2	993716	65.10	993716-C4	83.40	997716	154.20
5/16	1	<b>5/16</b>	.075	6	5/16	2-1/2	920120	77.90	920120-C4	100.10	918820	179.10
3/8	1-1/8	<b>3/8</b>	.090	6	3/8	2-1/2	920124	97.20	920124-C4	119.40	918824	237.10
1/2	1-1/2	<b>1/2</b>	.120	6	1/2	3	920132	173.90	920132-C4	200.70	918832	341.80

**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.

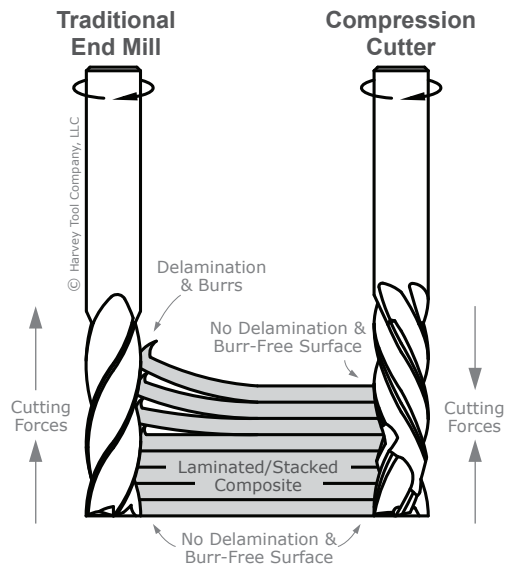
Thin coating maintains sharper edge.

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**CVD DIAMOND**

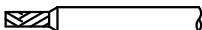
True Crystalline CVD diamond is grown directly into a carbide end mill. This dramatically improves hardness, which improves abrasion resistance and extends tool life up to 50x, allowing higher feed rates than uncoated carbide. Ideal for machining abrasive composite materials with high fiber or fill concentration (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.

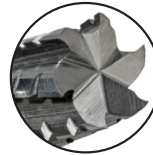
**Compression Cutters:** Counteracting cutting forces compress the material and stabilize the workpiece, creating a superior finish on the top and bottom of the part.



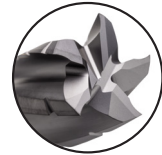


# END MILLS FOR COMPOSITES

## 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

NEW

NEW

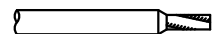
COMPOSITES

	CUTTER DIAMETER	LENGTH OF CUT	FLUTES	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND		CVD DIAMOND	
							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	47.90	969231-C4	59.60		
	3/64	<b>9/64</b> (3x)	4	I	1/8	1-1/2	969247	47.90	969247-C4	59.60		
NEW	1/16	<b>3/16</b> (3x)	3	II	1/8	1-1/2	801962	47.30			803762	109.90
	1/16	<b>3/16</b> (3x)	4	I	1/8	1-1/2	969262	45.90	969262-C4	57.60		
	5/64	<b>15/64</b> (3x)	4	I	1/8	1-1/2	969278	45.90	969278-C4	57.60		
NEW	3/32	<b>9/32</b> (3x)	3	II	1/8	1-1/2	801993	47.30			803793	109.90
	3/32	<b>9/32</b> (3x)	4	I	1/8	1-1/2	969293	45.90	969293-C4	57.60		
	$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
NEW	1/8	<b>3/8</b> (3x)	5	II	1/8	1-1/2	802008	45.60			803808	107.10
	1/8	<b>3/8</b> (3x)	6	I	1/8	1-1/2	969308	44.30	969308-C4	56.00		
NEW	1/8	<b>3/8</b> (5x)	5	II	1/8	1-1/2	818508	48.40			803008	109.90
	1/8	<b>5/8</b> (5x)	6	I	1/8	1-1/2	884908	47.00	884908-C4	58.70		
NEW	3/16	<b>9/16</b> (3x)	5	II	3/16	2	802012	50.40			803812	124.00
	3/16	<b>9/16</b> (3x)	6	I	3/16	2	969312	48.90	969312-C4	65.00		
NEW	3/16	<b>1</b> (5x)	5	II	3/16	2	818512	53.10			803012	126.70
	3/16	<b>1</b> (5x)	6	I	3/16	2	884912	51.60	884912-C4	67.70		
NEW	1/4	<b>3/4</b> (3x)	5	II	1/4	2-1/2	802016	60.30			803816	146.70
	1/4	<b>3/4</b> (3x)	6	I	1/4	2-1/2	969316	58.50	969316-C4	76.80		
NEW	1/4	<b>1-1/4</b> (5x)	5	II	1/4	2-1/2	818516	63.20			803016	152.30
	1/4	<b>1-1/4</b> (5x)	6	I	1/4	2-1/2	884916	61.40	884916-C4	79.70		
NEW	3/8	<b>1-1/8</b> (3x)	5	II	3/8	3	802024	99.00			803824	238.90
	3/8	<b>1-1/8</b> (3x)	8	I	3/8	3	969324	96.10	969324-C4	118.20		
NEW	1/2	<b>1-1/2</b> (3x)	5	II	1/2	4	802032	174.50			803832	342.40
	1/2	<b>1-1/2</b> (3x)	8	I	1/2	4	969332	169.40	969332-C4	195.90		



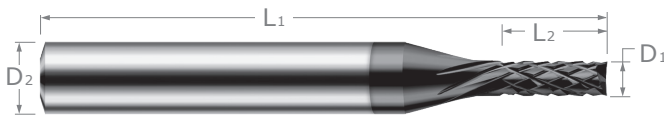
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# END MILLS FOR COMPOSITES

## 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

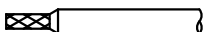
COMPOSITES

CUTTER DIAMETER	LENGTH OF CUT	RIGHT HAND TEETH	LEFT HAND TEETH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
						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	920962	38.10	920962-C4	49.80
.078 (5/64)	<b>.234</b> (3x)	7	9	1/8	1-1/2	920978	38.10	920978-C4	49.80
.093 (3/32)	<b>.279</b> (3x)	7	9	1/8	1-1/2	920993	38.10	920993-C4	49.80
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$				
.125 (1/8)	<b>.375</b> (3x)	8	10	1/8	1-1/2	921008	38.10	921008-C4	49.80
.125 (1/8)	<b>.625</b> (5x)	8	10	1/8	1-1/2	894508	41.20	894508-C4	52.90
.187 (3/16)	<b>.563</b> (3x)	9	11	3/16	2	921012	45.40	921012-C4	61.50
.187 (3/16)	<b>1.000</b> (5x)	9	11	3/16	2	894512	49.50	894512-C4	65.60
.250 (1/4)	<b>.750</b> (3x)	10	12	1/4	2-1/2	921016	62.70	921016-C4	81.00
.250 (1/4)	<b>1.250</b> (5x)	10	12	1/4	2-1/2	894516	68.10	894516-C4	86.40
.312 (5/16)	<b>1.000</b> (3x)	10	12	5/16	2-1/2	921020	81.30	921020-C4	103.40
.375 (3/8)	<b>1.125</b> (3x)	11	13	3/8	2-1/2	921024	98.40	921024-C4	120.50
.500 (1/2)	<b>1.500</b> (3x)	12	14	1/2	3	921032	166.70	921032-C4	193.30



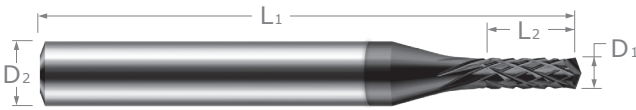
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# END MILLS FOR COMPOSITES

## Diamond Cut – Drill Mill Style



Drill Style

- ↪ 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	40.60	908062-C4	52.30
.078 (5/64)	<b>.234</b> (3X)	7	9	1/8	1-1/2	908078	40.60	908078-C4	52.30
.093 (3/32)	<b>.279</b> (3X)	7	9	1/8	1-1/2	908093	40.60	908093-C4	52.30
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$			$D_2$	$L_1$				
.125 (1/8)	<b>.375</b> (3X)	8	10	1/8	1-1/2	908108	40.60	908108-C4	52.30
.187 (3/16)	<b>.563</b> (3X)	9	11	3/16	2	908112	47.90	908112-C4	64.00
.250 (1/4)	<b>.750</b> (3X)	10	12	1/4	2-1/2	908116	65.90	908116-C4	84.20

COMPOSITES



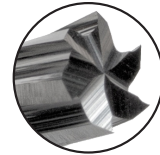
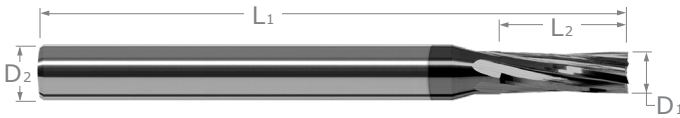
"Nothing like a fresh @harveytool when cutting carbon fiber!!!"

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# END MILLS FOR COMPOSITES

## Finisher



Bur-Style End

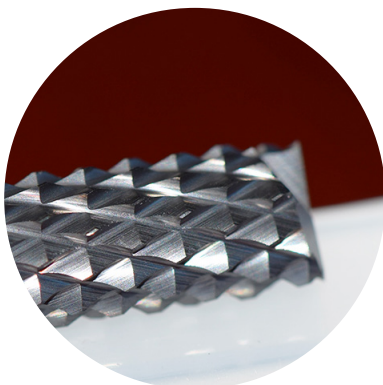
- Optimized geometry and high flute count for finishing in composite materials with high fiber or fill concentration
- Slow helix improves finish and minimizes fraying of fiber-reinforced and layered materials by reducing vertical forces on the workpiece
- Bur-style end allows for shallow ramping, not suited for plunge cutting
- Solid carbide
- CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
					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	1/8	1-1/2	944731	48.40	944731-C4	60.10
3/64	<b>9/64</b> (3x)	4	1/8	1-1/2	944747	48.40	944747-C4	60.10
1/16	<b>3/16</b> (3x)	6	1/8	1-1/2	944762	46.20	944762-C4	57.90
1/16	<b>5/16</b> (5x)	6	1/8	1-1/2	889262	48.40	889262-C4	60.10
5/64	<b>15/64</b> (3x)	6	1/8	1-1/2	944778	46.20	944778-C4	57.90
3/32	<b>9/32</b> (3x)	6	1/8	1-1/2	944793	46.20	944793-C4	57.90
3/32	<b>1/2</b> (5x)	6	1/8	1-1/2	889293	48.40	889293-C4	60.10

CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$				
1/8	<b>3/8</b> (3x)	8	1/8	1-1/2	944808	44.60	944808-C4	56.30
1/8	<b>5/8</b> (5x)	8	1/8	2	889208	46.80	889208-C4	58.70
3/16	<b>9/16</b> (3x)	8	3/16	2	944812	49.20	944812-C4	65.30
3/16	<b>1</b> (5x)	8	3/16	2-1/2	889212	51.60	889212-C4	67.70
1/4	<b>3/4</b> (3x)	8	1/4	2-1/2	944816	59.00	944816-C4	77.30
1/4	<b>1-1/4</b> (5x)	8	1/4	2-1/2	889216	71.80	889216-C4	90.10
3/8	<b>1-1/8</b> (3x)	10	3/8	3	944824	96.90	944824-C4	119.00
1/2	<b>1-1/2</b> (3x)	10	1/2	4	944832	170.50	944832-C4	197.00

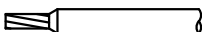
COMPOSITES



### Ideal Tooling for Machining Composites

Composites are a very beneficial, unique material group for their rewarding properties. But machining composites can lead to challenges if not done right. Learn why certain tools are capable of machining composites in our "In the Loupe" blog post **Ideal Tooling for Machining Composites**.

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




NEW

## 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	
	$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$	2 FL	PRICE	2 FL	PRICE
NEW	1/16	<b>.186</b> (3x)	1/4	2	809562	36.10	809562-C4	54.40
NEW	1/16	<b>.312</b> (5x)	1/4	2-1/2	809362	39.70	809362-C4	58.00
NEW	5/64	<b>.234</b> (3x)	1/4	2	809578	36.10	809578-C4	54.40
NEW	5/64	<b>.406</b> (5x)	1/4	2-1/2	809378	39.70	809378-C4	58.00
NEW	3/32	<b>.279</b> (3x)	1/4	2	809593	36.10	809593-C4	54.40
NEW	3/32	<b>.500</b> (5x)	1/4	2-1/2	809393	39.70	809393-C4	58.00
NEW	1/8	<b>.375</b> (3x)	1/4	2	809608	36.10	809608-C4	54.40
NEW	1/8	<b>.625</b> (5x)	1/4	2-1/2	809408	39.70	809408-C4	58.00
NEW	3/16	<b>.563</b> (3x)	1/4	2	809612	36.10	809612-C4	54.40
NEW	3/16	<b>1.000</b> (5x)	1/4	3	809412	42.60	809412-C4	60.90
NEW	1/4	<b>.750</b> (3x)	1/4	2-1/2	809616	44.50	809616-C4	62.80
NEW	1/4	<b>1.250</b> (5x)	1/4	3	809416	51.00	809416-C4	69.30
NEW	3/8	<b>1.125</b> (3x)	3/8	3	809624	76.40	809624-C4	98.50
NEW	3/8	<b>1.875</b> (5x)	3/8	4	809424	88.10	809424-C4	110.20
NEW	1/2	<b>1.500</b> (3x)	1/2	4	809632	134.50	809632-C4	161.00
NEW	1/2	<b>2.500</b> (5x)	1/2	5	809432	154.60	809432-C4	181.50

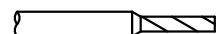
PLEASE SEE SPEEDS & FEEDS ON PAGE 222



View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)

WOOD



# 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

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>.186</b> (3x)	1/4	2	809162	42.50	809162-C4	60.80
1/16	<b>.312</b> (5x)	1/4	2-1/2	808962	46.70	808962-C4	65.00
5/64	<b>.234</b> (3x)	1/4	2	809178	42.50	809178-C4	60.80
5/64	<b>.406</b> (5x)	1/4	2-1/2	808978	46.70	808978-C4	65.00
3/32	<b>.279</b> (3x)	1/4	2	809193	42.50	809193-C4	60.80
3/32	<b>.500</b> (5x)	1/4	2-1/2	808993	46.70	808993-C4	65.00
1/8	<b>.375</b> (3x)	1/4	2	809208	42.50	809208-C4	60.80
1/8	<b>.625</b> (5x)	1/4	2-1/2	809008	46.70	809008-C4	65.00
3/16	<b>.563</b> (3x)	1/4	2	809212	42.50	809212-C4	60.80
3/16	<b>1.000</b> (5x)	1/4	3	809012	50.10	809012-C4	68.40
1/4	<b>.750</b> (3x)	1/4	2-1/2	809216	52.00	809216-C4	70.30
1/4	<b>1.250</b> (5x)	1/4	3	809016	56.80	809016-C4	75.10
3/8	<b>1.125</b> (3x)	3/8	3	809224	88.40	809224-C4	110.50
3/8	<b>1.875</b> (5x)	3/8	4	809024	103.70	809024-C4	125.80
1/2	<b>1.500</b> (3x)	1/2	4	809232	159.30	809232-C4	185.80
1/2	<b>2.500</b> (5x)	1/2	5	809032	176.50	809032-C4	203.40

### 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.harveyttool.com](http://www.harveyttool.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

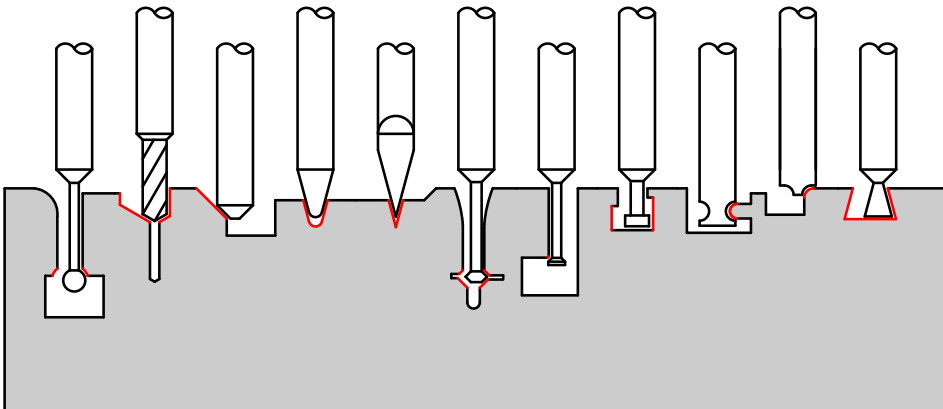


## SPECIALTY PROFILES

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> <i>New Sizes!</i> .....		224
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<b>Chamfer Cutters</b> <i>New Sizes!</i>  .....		249
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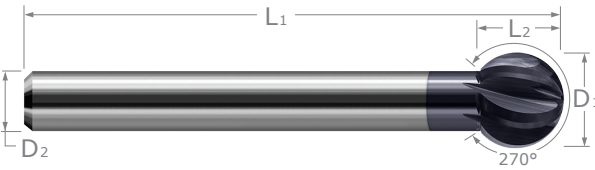
## Machine a Variety of Difficult Profiles!



# UNDERCUTTING END MILLS

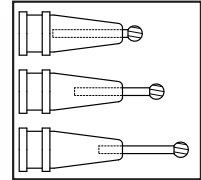
## 270° Reduced Shank

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 🇺🇸

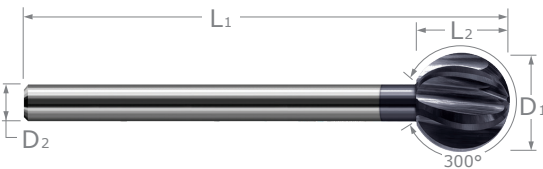
**Chuck at Any Depth!**



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	227.40	956116-C3	235.30
5/16	.273	6	3/16	3-1/2	956120	231.80	956120-C3	239.70
3/8	.324	6	6 mm	3-1/2	956124	234.20	956124-C3	243.20
1/2	.432	6	5/16	4	956132	246.10	956132-C3	259.50
5/8	.546	6	3/8	4	956140	282.10	956140-C3	296.60
3/4	.645	6	1/2	5	956148	405.80	956148-C3	412.80
1	.873	6	5/8	5	956164	574.20	956164-C3	598.50

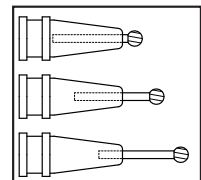
# UNDERCUTTING END MILLS

## 300° Reduced Shank

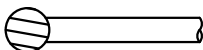


- ⚡ 300° spherical ball
- ⚡ Designed for undercutting, deburring, and multi-axis machining
- ⚡ Reduced straight shank allows any chucking depth
- ⚡ Center cutting
- ⚡ Solid carbide construction for maximum rigidity
- ⚡ 6 flutes
- ⚡ CNC ground in the USA 🇺🇸

**Chuck at Any Depth!**



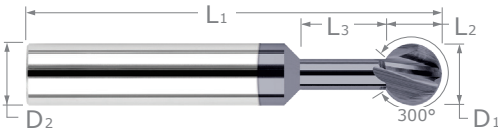
CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
					6 FL	PRICE	6 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>				
1/4	.232	6	3 mm	3-1/2	947416	243.70	947416-C3	251.60
3/8	.355	6	4 mm	3-1/2	947424	249.60	947424-C3	258.60
1/2	.472	6	3/16	4	947432	261.40	947432-C3	274.80
5/8	.589	6	1/4	4	947440	297.30	947440-C3	311.80
3/4	.706	6	5/16	5	947448	421.10	947448-C3	436.60
1	.939	6	7/16	5	947464	588.60	947464-C3	612.90




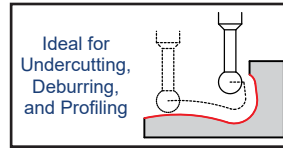


## UNDERCUTTING END MILLS

300°



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

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
D1 $\begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	L2 $\begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$		L3 $\begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		D2	L1	TOOL #	PRICE	TOOL #	PRICE
1/32	.028	.010	<b>.031</b>	2	1/8	1-1/2	983931	64.70	983931-C3	69.30
1/32	.028	.010	<b>.062</b>	2	1/8	1-1/2	979131	64.70	979131-C3	69.30
.0394 (1 mm)	.036	.014	<b>.047</b>	2	1/8	1-1/2	98391M	64.70	98391M-C3	69.30
.0394 (1 mm)	.036	.014	<b>.078</b>	2	1/8	1-1/2	97911M	64.70	97911M-C3	69.30
3/64	.043	.018	<b>.062</b>	2	1/8	1-1/2	983947	64.70	983947-C3	69.30
3/64	.043	.018	<b>.093</b>	2	1/8	1-1/2	979147	64.70	979147-C3	69.30
3/64	.043	.018	<b>.125</b>	2	1/8	1-1/2	940047	64.70	940047-C3	69.30
1/16	.057	.024	<b>.031</b>	2	1/8	1-1/2	989562	45.90	989562-C3	50.50
1/16	.057	.024	<b>.062</b>	2	1/8	1-1/2	875762	45.90	875762-C3	50.50
1/16	.057	.024	<b>.078</b>	2	1/8	1-1/2	983962	45.90	983962-C3	50.50
1/16	.057	.024	<b>.125</b>	2	1/8	1-1/2	979162	45.90	979162-C3	50.50
1/16	.057	.024	<b>.187</b>	2	1/8	1-1/2	940062	45.90	940062-C3	50.50
5/64	.072	.031	<b>.047</b>	2	1/8	1-1/2	989578	45.90	989578-C3	50.50
5/64	.072	.031	<b>.093</b>	2	1/8	1-1/2	983978	45.90	983978-C3	50.50
5/64	.072	.031	<b>.156</b>	2	1/8	1-1/2	979178	45.90	979178-C3	50.50
5/64	.072	.031	<b>.218</b>	2	1/8	1-1/2	940078	45.90	940078-C3	50.50
3/32	.086	.038	<b>.062</b>	2	1/8	1-1/2	989593	45.90	989593-C3	50.50
3/32	.086	.038	<b>.093</b>	2	1/8	1-1/2	875793	45.90	875793-C3	50.50
3/32	.086	.038	<b>.125</b>	2	1/8	1-1/2	983993	45.90	983993-C3	50.50
3/32	.086	.038	<b>.156</b>	2	1/8	1-1/2	926893	45.90	926893-C3	50.50
3/32	.086	.038	<b>.218</b>	2	1/8	1-1/2	979193	45.90	979193-C3	50.50
3/32	.086	.038	<b>.281</b>	2	1/8	1-1/2	940093	45.90	940093-C3	50.50
7/64	.101	.047	<b>.156</b>	2	1/8	1-1/2	984007	46.50	984007-C3	51.10
7/64	.101	.047	<b>.250</b>	2	1/8	1-1/2	979207	46.50	979207-C3	51.10
.1181 (3 mm)	.110	.051	<b>.078</b>	2	1/8	1-1/2	98953M	45.90	98953M-C3	50.50
.1181 (3 mm)	.110	.051	<b>.156</b>	2	1/8	1-1/2	98393M	45.90	98393M-C3	50.50
.1181 (3 mm)	.110	.051	<b>.218</b>	2	1/8	1-1/2	92683M	45.90	92683M-C3	50.50

D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L2 $\begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		L3 $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$		D2	L1	TOOL #	PRICE	TOOL #	PRICE
1/8	.116	.053	<b>.047</b>	4	1/8	1-1/2	943608	34.10	943608-C3	38.70
1/8	.116	.053	<b>.093</b>	4	1/8	1-1/2	990608	37.50	990608-C3	42.10
1/8	.116	.053	<b>.125</b>	4	1/8	1-1/2	933008	40.30	933008-C3	44.90
1/8	.116	.053	<b>.156</b>	4	1/8	1-1/2	875808	43.80	875808-C3	48.40
1/8	.116	.053	<b>.187</b>	4	1/8	1-1/2	984008	43.80	984008-C3	48.40
1/8	.116	.053	<b>.250</b>	4	1/8	1-1/2	843208	48.80	843208-C3	53.40
1/8	.116	.053	<b>.281</b>	4	1/8	1-1/2	979208	48.80	979208-C3	53.40

continued on next page



# UNDERCUTTING END MILLS

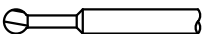
## 300° (cont.)

UNDERCUTTING END MILLS

continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	NECK DIA.	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
							TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> $\begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.020" \\ -.000" \end{smallmatrix}$		L <sub>3</sub> $\begin{smallmatrix} +.030" \\ -.000" \end{smallmatrix}$		D <sub>2</sub>	L <sub>1</sub>				
1/8	.116	.053	<b>.375</b>	4	1/8	1-1/2	940108	53.80	940108-C3	58.40
1/8	.116	.053	<b>.500</b>	4	1/8	1-1/2	952308	57.70	952308-C3	62.30
1/8	.116	.053	<b>.625</b>	4	1/8	2	911908	77.70	911908-C3	82.30
1/8	.116	.053	<b>.750</b>	4	1/8	3	877908	80.20	877908-C3	84.80
9/64	.130	.062	<b>.218</b>	4	3/16	2	984009	52.70	984009-C3	57.70
9/64	.130	.062	<b>.312</b>	4	3/16	2	979209	58.90	979209-C3	63.90
5/32	.145	.071	<b>.047</b>	4	3/16	2	943610	47.20	943610-C3	52.20
5/32	.145	.071	<b>.125</b>	4	3/16	2	990610	47.20	990610-C3	52.20
5/32	.145	.071	<b>.250</b>	4	3/16	2	984010	53.50	984010-C3	58.50
5/32	.145	.071	<b>.375</b>	4	3/16	2	979210	61.90	979210-C3	66.90
5/32	.145	.071	<b>.500</b>	4	3/16	2	940110	65.40	940110-C3	70.40
5/32	.145	.071	<b>.625</b>	4	3/16	2	952310	66.70	952310-C3	71.70
3/16	.174	.082	<b>.062</b>	4	3/16	2	943612	47.20	943612-C3	52.20
3/16	.174	.082	<b>.125</b>	4	3/16	2	990612	47.20	990612-C3	52.20
3/16	.174	.082	<b>.250</b>	4	3/16	2	984012	53.50	984012-C3	58.50
3/16	.174	.082	<b>.312</b>	4	3/16	2	926912	57.70	926912-C3	62.70
3/16	.174	.082	<b>.375</b>	4	3/16	2	843212	59.80	843212-C3	64.80
3/16	.174	.082	<b>.437</b>	4	3/16	2	979212	61.90	979212-C3	66.90
3/16	.174	.082	<b>.625</b>	4	3/16	2	940112	64.20	940112-C3	69.20
3/16	.174	.082	<b>.750</b>	4	3/16	2	952312	67.30	952312-C3	72.30
3/16	.174	.082	<b>.875</b>	4	3/16	2-1/2	834612	70.10	834612-C3	75.10
3/16	.174	.082	<b>1.000</b>	4	3/16	2-1/2	911912	71.60	911912-C3	76.60
.1969 (5 mm)	.182	.086	<b>.156</b>	4	1/4	2-1/2	99065M	65.30	99065M-C3	72.10
.1969 (5 mm)	.182	.086	<b>.250</b>	4	1/4	2-1/2	98405M	68.40	98405M-C3	75.20
7/32	.203	.098	<b>.156</b>	4	1/4	2-1/2	990614	65.30	990614-C3	72.10
7/32	.203	.098	<b>.312</b>	4	1/4	2-1/2	984014	72.60	984014-C3	79.40
.2362 (6 mm)	.220	.106	<b>.156</b>	4	1/4	2-1/2	99066M	64.50	99066M-C3	71.30
.2362 (6 mm)	.220	.106	<b>.312</b>	4	1/4	2-1/2	98406M	72.60	98406M-C3	79.40
.2362 (6 mm)	.220	.106	<b>.437</b>	4	1/4	2-1/2	92696M	75.10	92696M-C3	81.90
.2362 (6 mm)	.220	.106	<b>.562</b>	4	1/4	2-1/2	97926M	79.10	97926M-C3	85.90
1/4	.233	.112	<b>.093</b>	4	1/4	2-1/2	943616	63.30	943616-C3	70.10
1/4	.233	.112	<b>.187</b>	4	1/4	2-1/2	990616	63.30	990616-C3	70.10
1/4	.233	.112	<b>.250</b>	4	1/4	2-1/2	933016	66.70	933016-C3	73.50
1/4	.233	.112	<b>.375</b>	4	1/4	2-1/2	984016	69.70	984016-C3	76.50
1/4	.233	.112	<b>.500</b>	4	1/4	2-1/2	926916	76.90	926916-C3	83.70
1/4	.233	.112	<b>.625</b>	4	1/4	2-1/2	979216	84.40	979216-C3	91.20
1/4	.233	.112	<b>.750</b>	4	1/4	2-1/2	940116	89.90	940116-C3	96.70
1/4	.233	.112	<b>1.000</b>	4	1/4	2-1/2	952316	96.40	952316-C3	103.20
1/4	.233	.112	<b>1.250</b>	4	1/4	3	911916	104.10	911916-C3	110.90
1/4	.233	.112	<b>1.500</b>	4	1/4	4	877916	111.70	877916-C3	119.60
9/32	.262	.127	<b>.187</b>	4	5/16	2-1/2	990618	89.30	990618-C3	97.20
9/32	.262	.127	<b>.375</b>	4	5/16	2-1/2	984018	104.80	984018-C3	112.70

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## UNDERCUTTING END MILLS

300° (cont.)

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CUTTER DIAMETER	LENGTH OF CUT	NECK DIA.	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
							TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> $\begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.020" \\ -.000" \end{smallmatrix}$		L <sub>3</sub> $\begin{smallmatrix} +.030" \\ -.000" \end{smallmatrix}$		D <sub>2</sub>	L <sub>1</sub>				
5/16	.291	.143	<b>.250</b>	4	5/16	2-1/2	990620	86.40	990620-C3	94.30
5/16	.291	.143	<b>.437</b>	4	5/16	2-1/2	984020	102.60	984020-C3	110.50
5/16	.291	.143	<b>.750</b>	4	5/16	2-1/2	979220	115.30	979220-C3	123.20
5/16	.291	.143	<b>1.000</b>	4	5/16	2-1/2	940120	128.30	940120-C3	136.20
3/8	.349	.172	<b>.156</b>	4	3/8	2-1/2	943624	90.60	943624-C3	99.60
3/8	.349	.172	<b>.250</b>	4	3/8	2-1/2	990624	92.10	990624-C3	101.10
3/8	.349	.172	<b>.375</b>	4	3/8	2-1/2	933024	100.10	933024-C3	109.10
3/8	.349	.172	<b>.500</b>	4	3/8	2-1/2	984024	108.20	984024-C3	117.20
3/8	.349	.172	<b>.687</b>	4	3/8	2-1/2	926924	116.70	926924-C3	125.70
3/8	.349	.172	<b>.750</b>	4	3/8	2-1/2	843224	120.00	843224-C3	129.00
3/8	.349	.172	<b>1.000</b>	4	3/8	3	979224	125.60	979224-C3	134.60
3/8	.349	.172	<b>1.250</b>	4	3/8	3	940124	131.50	940124-C3	140.50
3/8	.349	.172	<b>1.500</b>	4	3/8	4	952324	152.60	952324-C3	164.90
.3937 (10 mm)	.366	.181	<b>.312</b>	4	7/16	2-3/4	990625	113.60	990625-C3	124.80
.3937 (10 mm)	.366	.181	<b>.562</b>	4	7/16	2-3/4	984025	135.20	984025-C3	146.40
1/2	.466	.230	<b>.187</b>	4	1/2	3	943632	139.50	943632-C3	152.90
1/2	.466	.230	<b>.312</b>	4	1/2	3	990632	140.50	990632-C3	153.90
1/2	.466	.230	<b>.750</b>	4	1/2	3	984032	159.60	984032-C3	173.00
1/2	.466	.230	<b>1.000</b>	4	1/2	3	926932	172.70	926932-C3	186.10
1/2	.466	.230	<b>1.250</b>	4	1/2	4	979232	193.80	979232-C3	207.20
1/2	.466	.230	<b>1.625</b>	4	1/2	4	940132	190.30	940132-C3	203.60
1/2	.466	.230	<b>2.000</b>	4	1/2	4	952332	212.80	952332-C3	226.20
3/4	.699	.355	<b>2.000</b>	4	3/4	6	979248	306.10	979248-C3	327.10

UNDERCUTTING END MILLS



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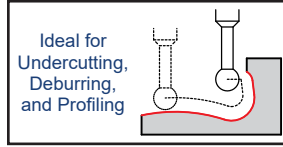
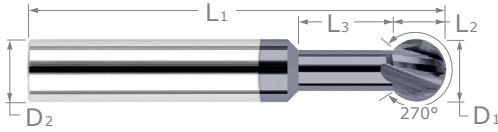
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# UNDERCUTTING END MILLS

270°

UNDERCUTTING END MILLS



Ideal for Undercutting, Deburring, and Profiling

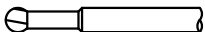
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- ⚡ Designed for undercutting, deburring, and multi-axis machining
- ⚡ Center cutting
- ⚡ Solid carbide
- ⚡ CNC ground in the USA

CUTTER DIAMETER	LENGTH OF CUT	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TIN COATED	
							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>				
.0200	.017	.012	<b>.016</b>	2	1/8	1-1/2	974220	68.40	974220-C3	73.00
.0200	.017	.012	<b>.031</b>	2	1/8	1-1/2	52820	68.40	52820-C3	73.00
.0200	.017	.012	<b>.047</b>	2	1/8	1-1/2	23200	72.80	23200-C3	77.40
.0200	.017	.012	<b>.062</b>	2	1/8	1-1/2	54620	75.10	54620-C3	79.70
.0250	.021	.014	<b>.031</b>	2	1/8	1-1/2	974225	60.30	974225-C3	64.90
.0250	.021	.014	<b>.047</b>	2	1/8	1-1/2	52825	60.30	52825-C3	64.90
.0250	.021	.014	<b>.062</b>	2	1/8	1-1/2	23201	64.80	23201-C3	69.40
.0250	.021	.014	<b>.078</b>	2	1/8	1-1/2	54625	67.10	54625-C3	71.70
1/32	.027	.016	<b>.015</b>	2	1/8	1-1/2	931502	55.30	931502-C3	59.90
1/32	.027	.016	<b>.031</b>	2	1/8	1-1/2	23102	55.30	23102-C3	59.90
1/32	.027	.016	<b>.047</b>	2	1/8	1-1/2	974231	55.30	974231-C3	59.90
1/32	.027	.016	<b>.062</b>	2	1/8	1-1/2	52831	55.30	52831-C3	59.90
1/32	.027	.016	<b>.078</b>	2	1/8	1-1/2	39731	55.30	39731-C3	59.90
1/32	.027	.016	<b>.093</b>	2	1/8	1-1/2	23202	56.80	23202-C3	61.40
1/32	.027	.016	<b>.125</b>	2	1/8	1-1/2	54631	64.80	54631-C3	69.40
1/32	.027	.016	<b>.187</b>	2	1/8	1-1/2	55202	64.80	55202-C3	69.40
.0394 (1 mm)	.033	.024	<b>.047</b>	2	1/8	1-1/2	2311M	55.30	2311M-C3	59.90
.0394 (1 mm)	.033	.024	<b>.062</b>	2	1/8	1-1/2	97421M	55.30	97421M-C3	59.90
.0394 (1 mm)	.033	.024	<b>.078</b>	2	1/8	1-1/2	5281M	55.30	5281M-C3	59.90
.0394 (1 mm)	.033	.024	<b>.093</b>	2	1/8	1-1/2	3971M	55.30	3971M-C3	59.90
.0394 (1 mm)	.033	.024	<b>.125</b>	2	1/8	1-1/2	2321M	63.20	2321M-C3	67.80
.0394 (1 mm)	.033	.024	<b>.187</b>	2	1/8	1-1/2	54639	64.80	54639-C3	69.40
.0394 (1 mm)	.033	.024	<b>.250</b>	2	1/8	1-1/2	5521M	71.70	5521M-C3	76.30
3/64	.040	.029	<b>.047</b>	2	1/8	1-1/2	23103	55.30	23103-C3	59.90
3/64	.040	.029	<b>.062</b>	2	1/8	1-1/2	974247	55.30	974247-C3	59.90
3/64	.040	.029	<b>.093</b>	2	1/8	1-1/2	52847	55.30	52847-C3	59.90
3/64	.040	.029	<b>.125</b>	2	1/8	1-1/2	39703	55.30	39703-C3	59.90
3/64	.040	.029	<b>.156</b>	2	1/8	1-1/2	23203	64.80	23203-C3	69.40
3/64	.040	.029	<b>.250</b>	2	1/8	1-1/2	54647	64.80	54647-C3	69.40
3/64	.040	.029	<b>.375</b>	2	1/8	1-1/2	55203	68.10	55203-C3	72.70
3/64	.040	.029	<b>.437</b>	2	1/8	2	867747	74.90	867747-C3	79.50
.0500	.042	.030	<b>.093</b>	2	1/8	1-1/2	52850	46.00	52850-C3	50.60
.0500	.042	.030	<b>.125</b>	2	1/8	1-1/2	39750	46.00	39750-C3	50.60
.0500	.042	.030	<b>.156</b>	2	1/8	1-1/2	23250	55.60	23250-C3	60.20
1/16	.053	.037	<b>.031</b>	2	1/8	1-1/2	931504	36.80	931504-C3	41.40
1/16	.053	.037	<b>.062</b>	2	1/8	1-1/2	23104	36.80	23104-C3	41.40
1/16	.053	.037	<b>.093</b>	2	1/8	1-1/2	52862	36.80	52862-C3	41.40
1/16	.053	.037	<b>.125</b>	2	1/8	1-1/2	39704	38.30	39704-C3	42.90
1/16	.053	.037	<b>.187</b>	2	1/8	1-1/2	23204	38.30	23204-C3	42.90
1/16	.053	.037	<b>.250</b>	2	1/8	1-1/2	54662	47.40	54662-C3	52.00

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## UNDERCUTTING END MILLS

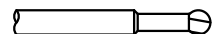
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CUTTER DIAMETER	LENGTH OF CUT	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIIIN COATED	
							TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
1/16	.053	.037	<b>.312</b>	2	1/8	1-1/2	909062	47.40	909062-C3	52.00
1/16	.053	.037	<b>.375</b>	2	1/8	1-1/2	55204	47.40	55204-C3	52.00
1/16	.053	.037	<b>.437</b>	2	1/8	2	867762	54.20	867762-C3	58.80
5/64	.067	.045	<b>.031</b>	2	1/8	1-1/2	931505	37.50	931505-C3	42.10
5/64	.067	.045	<b>.062</b>	2	1/8	1-1/2	23105	37.50	23105-C3	42.10
5/64	.067	.045	<b>.125</b>	2	1/8	1-1/2	52878	37.50	52878-C3	42.10
5/64	.067	.045	<b>.187</b>	2	1/8	1-1/2	39705	39.20	39705-C3	43.80
5/64	.067	.045	<b>.250</b>	2	1/8	1-1/2	23205	40.20	23205-C3	44.80
5/64	.067	.045	<b>.375</b>	2	1/8	2	54678	48.10	54678-C3	52.70
5/64	.067	.045	<b>.500</b>	2	1/8	2	55205	48.10	55205-C3	52.70
5/64	.067	.045	<b>.625</b>	2	1/8	2	867778	48.10	867778-C3	52.70
3/32	.079	.054	<b>.031</b>	2	1/8	1-1/2	931506	37.50	931506-C3	42.10
3/32	.079	.054	<b>.062</b>	2	1/8	1-1/2	23106	37.50	23106-C3	42.10
3/32	.079	.054	<b>.125</b>	2	1/8	1-1/2	974293	37.50	974293-C3	42.10
3/32	.079	.054	<b>.187</b>	2	1/8	1-1/2	905106	37.50	905106-C3	42.10
3/32	.079	.054	<b>.250</b>	2	1/8	1-1/2	52893	37.50	52893-C3	42.10
3/32	.079	.054	<b>.312</b>	2	1/8	1-1/2	39706	40.90	39706-C3	45.50
3/32	.079	.054	<b>.375</b>	2	1/8	1-1/2	23206	40.90	23206-C3	45.50
3/32	.079	.054	<b>.437</b>	2	1/8	2	41306	48.10	41306-C3	52.70
3/32	.079	.054	<b>.500</b>	2	1/8	2	54693	48.10	54693-C3	52.70
3/32	.079	.054	<b>.625</b>	2	1/8	2	55206	55.30	55206-C3	59.90
7/64	.093	.064	<b>.187</b>	2	1/8	1-1/2	905107	36.80	905107-C3	41.40
7/64	.093	.064	<b>.250</b>	2	1/8	1-1/2	52907	36.80	52907-C3	41.40
7/64	.093	.064	<b>.375</b>	2	1/8	1-1/2	39707	40.20	39707-C3	44.80
7/64	.093	.064	<b>.500</b>	2	1/8	2	23207	47.40	23207-C3	52.00
7/64	.093	.064	<b>1.000</b>	2	1/8	3	29507	54.20	29507-C3	58.80
.1181 (3 mm)	.100	.070	<b>.093</b>	2	1/8	1-1/2	2313M	36.80	2313M-C3	41.40
.1181 (3 mm)	.100	.070	<b>.187</b>	2	1/8	1-1/2	90513M	36.80	90513M-C3	41.40
.1181 (3 mm)	.100	.070	<b>.250</b>	2	1/8	1-1/2	5283M	36.80	5283M-C3	41.40
.1181 (3 mm)	.100	.070	<b>.375</b>	2	1/8	1-1/2	3973M	40.20	3973M-C3	44.80
.1181 (3 mm)	.100	.070	<b>.500</b>	2	1/8	2	2323M	47.40	2323M-C3	52.00

CUTTER DIAMETER	LENGTH OF CUT	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIIIN 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>	TOOL #	PRICE	TOOL #	PRICE
1/8	.107	.076	<b>.062</b>	4	1/8	1-1/2	931508	32.40	931508-C3	37.00
1/8	.107	.076	<b>.125</b>	4	1/8	1-1/2	23108	32.40	23108-C3	37.00
1/8	.107	.076	<b>.187</b>	4	1/8	1-1/2	974308	33.30	974308-C3	37.90
1/8	.107	.076	<b>.250</b>	4	1/8	1-1/2	52908	34.30	52908-C3	38.90
1/8	.107	.076	<b>.312</b>	4	1/8	1-1/2	828408	34.70	828408-C3	39.30
1/8	.107	.076	<b>.375</b>	4	1/8	1-1/2	39708	35.00	39708-C3	39.60
1/8	.107	.076	<b>.500</b>	4	1/8	1-1/2	23208	37.50	23208-C3	42.10
1/8	.107	.076	<b>.625</b>	4	1/8	2	922908	40.00	922908-C3	44.60
1/8	.107	.076	<b>.750</b>	4	1/8	2	41308	40.00	41308-C3	44.60
1/8	.107	.076	<b>.875</b>	4	1/8	3	846608	41.80	846608-C3	46.40
1/8	.107	.076	<b>1.000</b>	4	1/8	3	29508	43.50	29508-C3	48.10
1/8	.107	.076	<b>1.250</b>	4	1/8	3	960608	46.50	960608-C3	51.10
1/8	.107	.076	<b>1.500</b>	4	1/8	3	55208	49.60	55208-C3	54.20
1/8	.107	.076	<b>1.750</b>	4	1/8	3	929608	52.10	929608-C3	56.70
9/64	.119	.084	<b>.125</b>	4	3/16	2	23109	38.60	23109-C3	43.60
9/64	.119	.084	<b>.250</b>	4	3/16	2	52909	41.90	52909-C3	46.90
9/64	.119	.084	<b>.500</b>	4	3/16	2	23209	47.20	23209-C3	52.20
9/64	.119	.084	<b>.750</b>	4	3/16	2	41309	50.60	41309-C3	55.60

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# UNDERCUTTING END MILLS

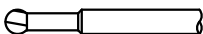
270° (cont.)

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UNDERCUTTING END MILLS

CUTTER DIAMETER	LENGTH OF CUT	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIIIN 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>				
5/32	.133	.098	<b>.078</b>	4	3/16	2	931510	38.60	931510-C3	43.60
5/32	.133	.098	<b>.125</b>	4	3/16	2	23110	38.60	23110-C3	43.60
5/32	.133	.098	<b>.250</b>	4	3/16	2	52910	41.90	52910-C3	46.90
5/32	.133	.098	<b>.375</b>	4	3/16	2	39710	44.00	39710-C3	49.00
5/32	.133	.098	<b>.500</b>	4	3/16	2	23210	47.20	23210-C3	52.20
5/32	.133	.098	<b>.750</b>	4	3/16	2	41310	50.60	41310-C3	55.60
5/32	.133	.098	<b>1.000</b>	4	3/16	3	29510	54.70	29510-C3	59.70
5/32	.133	.098	<b>1.500</b>	4	3/16	3	55210	57.00	55210-C3	62.00
3/16	.160	.117	<b>.078</b>	4	3/16	2	931512	38.60	931512-C3	43.60
3/16	.160	.117	<b>.125</b>	4	3/16	2	23112	38.60	23112-C3	43.60
3/16	.160	.117	<b>.250</b>	4	3/16	2	52912	41.90	52912-C3	46.90
3/16	.160	.117	<b>.375</b>	4	3/16	2	39712	44.00	39712-C3	49.00
3/16	.160	.117	<b>.500</b>	4	3/16	2	23212	45.70	23212-C3	50.70
3/16	.160	.117	<b>.625</b>	4	3/16	2	922912	48.20	922912-C3	53.20
3/16	.160	.117	<b>.750</b>	4	3/16	2	41312	50.60	41312-C3	55.60
3/16	.160	.117	<b>.875</b>	4	3/16	3	846612	52.70	846612-C3	57.70
3/16	.160	.117	<b>1.000</b>	4	3/16	3	29512	54.70	29512-C3	59.70
3/16	.160	.117	<b>1.250</b>	4	3/16	3	960612	56.90	960612-C3	61.90
3/16	.160	.117	<b>1.500</b>	4	3/16	3	55212	59.00	55212-C3	64.00
3/16	.160	.117	<b>1.750</b>	4	3/16	3	929612	69.70	929612-C3	74.70
.1969 (5 mm)	.167	.119	<b>.250</b>	4	1/4	2-1/2	5295M	54.00	5295M-C3	60.80
.1969 (5 mm)	.167	.119	<b>.500</b>	4	1/4	2-1/2	2325M	55.30	2325M-C3	62.10
.1969 (5 mm)	.167	.119	<b>1.000</b>	4	1/4	4	2955M	62.80	2955M-C3	70.70
7/32	.186	.138	<b>.250</b>	4	1/4	2-1/2	52914	58.00	52914-C3	64.80
7/32	.186	.138	<b>.500</b>	4	1/4	2-1/2	23214	60.30	23214-C3	67.10
7/32	.186	.138	<b>.750</b>	4	1/4	2-1/2	41314	63.00	41314-C3	69.80
.2362 (6 mm)	.201	.148	<b>.250</b>	4	1/4	2-1/2	97436M	53.60	97436M-C3	60.40
.2362 (6 mm)	.201	.148	<b>.375</b>	4	1/4	2-1/2	5296M	53.60	5296M-C3	60.40
.2362 (6 mm)	.201	.148	<b>.500</b>	4	1/4	2-1/2	3976M	56.40	3976M-C3	63.20
.2362 (6 mm)	.201	.148	<b>.750</b>	4	1/4	2-1/2	2326M	59.90	2326M-C3	66.70
.2362 (6 mm)	.201	.148	<b>1.250</b>	4	1/4	4	2956M	68.10	2956M-C3	76.00
.2362 (6 mm)	.201	.148	<b>2.000</b>	4	1/4	4	96066M	79.50	96066M-C3	87.40
1/4	.213	.158	<b>.078</b>	4	1/4	2-1/2	931516	51.50	931516-C3	58.30
1/4	.213	.158	<b>.125</b>	4	1/4	2-1/2	23116	51.50	23116-C3	58.30
1/4	.213	.158	<b>.250</b>	4	1/4	2-1/2	974316	54.00	974316-C3	60.80
1/4	.213	.158	<b>.375</b>	4	1/4	2-1/2	52916	54.70	52916-C3	61.50
1/4	.213	.158	<b>.500</b>	4	1/4	2-1/2	39716	56.40	39716-C3	63.20
1/4	.213	.158	<b>.625</b>	4	1/4	2-1/2	927616	56.90	927616-C3	63.70
1/4	.213	.158	<b>.750</b>	4	1/4	2-1/2	23216	59.90	23216-C3	66.70
1/4	.213	.158	<b>1.000</b>	4	1/4	2-1/2	922916	60.70	922916-C3	67.50
1/4	.213	.158	<b>1.125</b>	4	1/4	2-1/2	41316	62.40	41316-C3	69.20
1/4	.213	.158	<b>1.250</b>	4	1/4	4	846616	67.00	846616-C3	74.90
1/4	.213	.158	<b>1.500</b>	4	1/4	4	29516	69.30	29516-C3	77.20
1/4	.213	.158	<b>2.000</b>	4	1/4	4	960616	73.60	960616-C3	81.50
1/4	.213	.158	<b>2.250</b>	4	1/4	4	55216	78.00	55216-C3	85.90
1/4	.213	.158	<b>2.500</b>	4	1/4	4	929616	102.70	929616-C3	110.60
9/32	.240	.180	<b>.375</b>	4	5/16	2-1/2	52918	72.80	52918-C3	80.70
9/32	.240	.180	<b>.750</b>	4	5/16	2-1/2	23218	74.90	23218-C3	82.80

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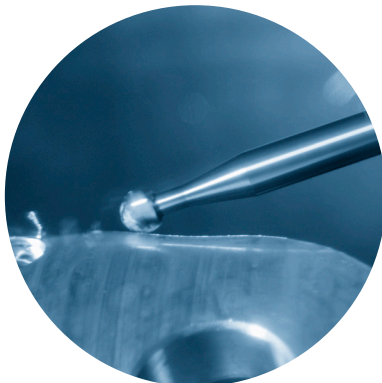


## UNDERCUTTING END MILLS

270° (cont.)

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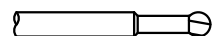
CUTTER DIAMETER	LENGTH OF CUT	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
							TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> $\begin{matrix} +.000'' \\ -.002'' \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.020'' \\ -.000'' \end{matrix}$		L <sub>3</sub> $\begin{matrix} +.030'' \\ -.000'' \end{matrix}$		D <sub>2</sub>	L <sub>1</sub>				
5/16	.266	.201	<b>.187</b>	4	5/16	2-1/2	23120	68.90	23120-C3	76.80
5/16	.266	.201	<b>.375</b>	4	5/16	2-1/2	52920	71.70	52920-C3	79.60
5/16	.266	.201	<b>.500</b>	4	5/16	2-1/2	39720	73.40	39720-C3	81.30
5/16	.266	.201	<b>.750</b>	4	5/16	2-1/2	23220	77.30	23220-C3	85.20
5/16	.266	.201	<b>1.125</b>	4	5/16	4	41320	87.70	41320-C3	97.20
5/16	.266	.201	<b>1.500</b>	4	5/16	4	29520	93.80	29520-C3	103.30
5/16	.266	.201	<b>2.000</b>	4	5/16	4	960620	99.50	960620-C3	109.00
5/16	.266	.201	<b>2.250</b>	4	5/16	4	55220	101.10	55220-C3	110.60
5/16	.266	.201	<b>2.500</b>	4	5/16	4	929620	101.10	929620-C3	110.60
3/8	.320	.241	<b>.093</b>	4	3/8	2-1/2	931524	74.30	931524-C3	83.30
3/8	.320	.241	<b>.187</b>	4	3/8	2-1/2	23124	74.30	23124-C3	83.30
3/8	.320	.241	<b>.375</b>	4	3/8	2-1/2	52924	76.10	52924-C3	85.10
3/8	.320	.241	<b>.500</b>	4	3/8	2-1/2	39724	76.10	39724-C3	85.10
3/8	.320	.241	<b>.750</b>	4	3/8	2-1/2	23224	77.30	23224-C3	86.30
3/8	.320	.241	<b>1.125</b>	4	3/8	4	41324	95.70	41324-C3	108.00
3/8	.320	.241	<b>1.500</b>	4	3/8	4	29524	98.30	29524-C3	110.60
3/8	.320	.241	<b>2.000</b>	4	3/8	4	960624	101.80	960624-C3	114.10
3/8	.320	.241	<b>2.250</b>	4	3/8	4	55224	104.50	55224-C3	116.80
3/8	.320	.241	<b>2.500</b>	4	3/8	4	929624	108.80	929624-C3	121.10
.3937 (10 mm)	.335	.252	<b>.375</b>	4	7/16	2-3/4	52925	107.50	52925-C3	118.70
.3937 (10 mm)	.335	.252	<b>.750</b>	4	7/16	2-3/4	23225	107.90	23225-C3	119.10
7/16	.373	.285	<b>.500</b>	4	7/16	2-3/4	52928	104.30	52928-C3	115.50
7/16	.373	.285	<b>1.000</b>	4	7/16	2-3/4	23228	107.90	23228-C3	119.10
.4724 (12 mm)	.403	.308	<b>.500</b>	4	1/2	3	52931	135.80	52931-C3	149.20
.4724 (12 mm)	.403	.308	<b>1.000</b>	4	1/2	3	23231	143.50	23231-C3	156.90
1/2	.427	.323	<b>.187</b>	4	1/2	3	23132	105.70	23132-C3	119.10
1/2	.427	.323	<b>.500</b>	4	1/2	3	52932	107.70	52932-C3	121.10
1/2	.427	.323	<b>.750</b>	4	1/2	3	39732	109.50	39732-C3	122.90
1/2	.427	.323	<b>1.000</b>	4	1/2	3	23232	111.20	23232-C3	124.60
1/2	.427	.323	<b>1.500</b>	4	1/2	6	41332	187.50	41332-C3	200.90
1/2	.427	.323	<b>2.000</b>	4	1/2	6	29532	191.80	29532-C3	205.20
1/2	.427	.323	<b>2.500</b>	4	1/2	6	960632	193.80	960632-C3	207.20
1/2	.427	.323	<b>3.000</b>	4	1/2	6	55232	204.90	55232-C3	218.30
1/2	.427	.323	<b>3.500</b>	4	1/2	6	929632	215.90	929632-C3	229.30
5/8	.533	.412	<b>1.000</b>	4	5/8	3-1/2	39740	223.40	39740-C3	236.80
5/8	.533	.412	<b>1.500</b>	4	5/8	3-1/2	23240	223.40	23240-C3	236.80
3/4	.640	.500	<b>1.500</b>	4	3/4	4	23248	307.60	23248-C3	322.10



## Contouring Considerations

Recent advances to CAM software has had tremendous benefits for machinists performing contouring applications. Learn how to properly contour a part, and the right tooling to use in our "In the Loupe" blog post [Contouring Considerations](#).

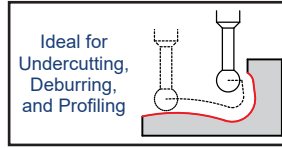
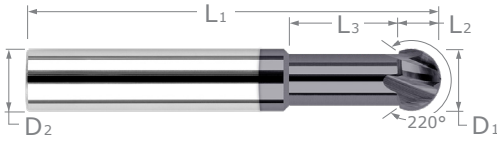
Read more on [harveypformance.com/in-the-loupe/](http://harveypformance.com/in-the-loupe/)



# UNDERCUTTING END MILLS

220°

UNDERCUTTING END MILLS



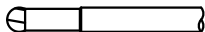
Stocked in Multiple Reach Lengths



- ✦ 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		A1TiN 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	TOOL #	PRICE
1/32	.021	.023	<b>.093</b>	2	1/8	1-1/2	22802	55.90	22802-C3	60.50
.0394 (1 mm)	.026	.030	<b>.125</b>	2	1/8	1-1/2	2281M	62.40	2281M-C3	67.00
3/64	.031	.035	<b>.156</b>	2	1/8	1-1/2	22803	55.90	22803-C3	60.50
1/16	.042	.047	<b>.062</b>	2	1/8	1-1/2	22704	38.00	22704-C3	42.60
1/16	.042	.047	<b>.187</b>	2	1/8	1-1/2	22804	39.70	22804-C3	44.30
5/64	.052	.059	<b>.062</b>	2	1/8	1-1/2	22705	38.00	22705-C3	42.60
5/64	.052	.059	<b>.250</b>	2	1/8	1-1/2	22805	39.70	22805-C3	44.30
3/32	.063	.070	<b>.062</b>	2	1/8	1-1/2	22706	38.00	22706-C3	42.60
3/32	.063	.070	<b>.375</b>	2	1/8	1-1/2	22806	40.20	22806-C3	44.80
.1181 (3 mm)	.079	.090	<b>.500</b>	2	1/8	2	2283M	40.90	2283M-C3	45.50

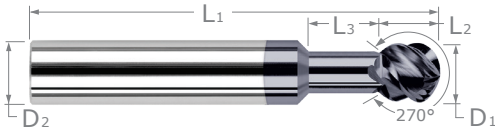
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		L <sub>3</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
1/8	.084	.094	<b>.125</b>	4	1/8	1-1/2	22708	32.80	22708-C3	37.40
1/8	.084	.094	<b>.250</b>	4	1/8	1-1/2	826708	34.30	826708-C3	38.90
1/8	.084	.094	<b>.500</b>	4	1/8	1-1/2	22808	37.00	22808-C3	41.60
1/8	.084	.094	<b>1.000</b>	4	1/8	3	22908	42.70	22908-C3	47.30
1/8	.084	.094	<b>1.500</b>	4	1/8	3	971608	52.10	971608-C3	56.70
5/32	.105	.125	<b>.500</b>	4	3/16	2	22810	46.30	22810-C3	51.30
3/16	.126	.141	<b>.125</b>	4	3/16	2	22712	39.00	22712-C3	44.00
3/16	.126	.141	<b>.250</b>	4	3/16	2	826712	41.40	826712-C3	46.40
3/16	.126	.141	<b>.500</b>	4	3/16	2	22812	46.30	22812-C3	51.30
3/16	.126	.141	<b>1.000</b>	4	3/16	3	22912	53.60	22912-C3	58.60
.2362 (6 mm)	.158	.172	<b>.750</b>	4	1/4	2-1/2	2286M	58.60	2286M-C3	65.40
1/4	.168	.188	<b>.125</b>	4	1/4	2-1/2	22716	52.30	22716-C3	59.10
1/4	.168	.188	<b>.375</b>	4	1/4	2-1/2	826716	54.30	826716-C3	61.10
1/4	.168	.188	<b>.750</b>	4	1/4	2-1/2	22816	58.60	22816-C3	65.40
1/4	.168	.188	<b>1.000</b>	4	1/4	2-1/2	833816	61.80	833816-C3	68.60
1/4	.168	.188	<b>1.500</b>	4	1/4	4	22916	68.10	22916-C3	76.00
1/4	.168	.188	<b>2.250</b>	4	1/4	4	971616	88.90	971616-C3	96.80
5/16	.210	.235	<b>.187</b>	4	5/16	2-1/2	22720	69.70	22720-C3	77.60
5/16	.210	.235	<b>.750</b>	4	5/16	2-1/2	22820	76.10	22820-C3	84.00
5/16	.210	.235	<b>1.500</b>	4	5/16	4	22920	91.90	22920-C3	101.40
3/8	.252	.281	<b>.187</b>	4	3/8	2-1/2	22724	74.90	22724-C3	83.90
3/8	.252	.281	<b>.750</b>	4	3/8	2-1/2	22824	79.80	22824-C3	88.80
3/8	.252	.281	<b>1.500</b>	4	3/8	4	22924	96.50	22924-C3	108.80
3/8	.252	.281	<b>2.250</b>	4	3/8	4	971624	133.90	971624-C3	146.20
1/2	.336	.375	<b>.187</b>	4	1/2	3	22732	107.10	22732-C3	120.50
1/2	.336	.375	<b>1.000</b>	4	1/2	3	22832	114.90	22832-C3	128.30
1/2	.336	.375	<b>2.000</b>	4	1/2	6	22932	188.50	22932-C3	201.90





# UNDERCUTTING END MILLS

270° High Helix



**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

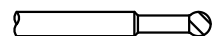
UNDERCUTTING END MILLS

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	62.60	951131-C3	67.20		
1/32	.027	.016	<b>.093</b>	2	1/8	1-1/2	966531	62.60	966531-C3	67.20		
.0394 (1 mm)	.033	.024	<b>.078</b>	2	1/8	1-1/2	95111M	62.60	95111M-C3	67.20		
.0394 (1 mm)	.033	.024	<b>.125</b>	2	1/8	1-1/2	96651M	62.60	96651M-C3	67.20		
3/64	.040	.029	<b>.093</b>	2	1/8	1-1/2	951147	62.60	951147-C3	67.20		
3/64	.040	.029	<b>.156</b>	2	1/8	1-1/2	966547	62.60	966547-C3	67.20		
1/16	.053	.037	<b>.093</b>	2	1/8	1-1/2	951162	45.30	951162-C3	49.90	951162-C8	52.10
1/16	.053	.037	<b>.187</b>	2	1/8	1-1/2	966562	46.80	966562-C3	51.40	966562-C8	53.60
1/16	.053	.037	<b>.250</b>	2	1/8	1-1/2	970462	57.20	970462-C3	61.80	970462-C8	64.00
5/64	.067	.045	<b>.125</b>	2	1/8	1-1/2	951178	45.30	951178-C3	49.90	951178-C8	52.10
5/64	.067	.045	<b>.250</b>	2	1/8	1-1/2	966578	46.80	966578-C3	51.40	966578-C8	53.60
5/64	.067	.045	<b>.375</b>	2	1/8	2	970478	57.20	970478-C3	61.80	970478-C8	64.00
3/32	.079	.054	<b>.125</b>	2	1/8	1-1/2	837393	43.30	837393-C3	47.90	837393-C8	50.10
3/32	.079	.054	<b>.250</b>	2	1/8	1-1/2	951193	45.30	951193-C3	49.90	951193-C8	52.10
3/32	.079	.054	<b>.375</b>	2	1/8	1-1/2	966593	49.60	966593-C3	54.20	966593-C8	56.40
3/32	.079	.054	<b>.500</b>	2	1/8	2	970493	57.20	970493-C3	61.80	970493-C8	64.00

NEW

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>-.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	.107	.076	<b>.125</b>	4	1/8	1-1/2	934108	39.70	934108-C3	44.30	934108-C8	46.50
1/8	.107	.076	<b>.187</b>	4	1/8	1-1/2	<b>808608</b>	40.50	<b>808608-C3</b>	45.10	<b>808608-C8</b>	47.30
1/8	.107	.076	<b>.250</b>	4	1/8	1-1/2	951208	41.40	951208-C3	46.00	951208-C8	48.20
1/8	.107	.076	<b>.375</b>	4	1/8	1-1/2	863708	43.40	863708-C3	48.00	863708-C8	50.20
1/8	.107	.076	<b>.500</b>	4	1/8	1-1/2	994708	45.30	994708-C3	49.90	994708-C8	52.10
1/8	.107	.076	<b>1.000</b>	4	1/8	3	997108	51.30	997108-C3	55.90	997108-C8	58.10
1/8	.107	.076	<b>1.500</b>	4	1/8	3	928808	54.70	928808-C3	59.30	928808-C8	61.50
5/32	.133	.098	<b>.250</b>	4	3/16	2	951210	53.60	951210-C3	58.60	951210-C8	60.40
5/32	.133	.098	<b>.500</b>	4	3/16	2	994710	57.70	994710-C3	62.70	994710-C8	64.50
5/32	.133	.098	<b>1.000</b>	4	3/16	3	997110	65.90	997110-C3	70.90	997110-C8	72.70
3/16	.160	.117	<b>.125</b>	4	3/16	2	934112	49.60	934112-C3	54.60	934112-C8	56.40
3/16	.160	.117	<b>.250</b>	4	3/16	2	951212	51.00	951212-C3	56.00	951212-C8	57.80
3/16	.160	.117	<b>.500</b>	4	3/16	2	994712	55.10	994712-C3	60.10	994712-C8	61.90
3/16	.160	.117	<b>.750</b>	4	3/16	2	897712	57.70	897712-C3	62.70	897712-C8	64.50
3/16	.160	.117	<b>1.000</b>	4	3/16	3	997112	65.90	997112-C3	70.90	997112-C8	72.70
3/16	.160	.117	<b>1.250</b>	4	3/16	3	893512	69.30	893512-C3	74.30	893512-C8	76.10

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## UNDERCUTTING END MILLS

270° High Helix (cont.)

UNDERCUTTING END MILLS

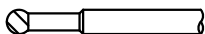
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CUTTER DIA.	LENGTH OF CUT	NECK DIA.	NECK LENGTH	FLUTES	SHANK DIA.	OAL	UNCOATED		AlTiN COATED		TiB <sub>2</sub> COATED	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> $\begin{matrix} +.000" \\ -.002" \end{matrix}$	L <sub>2</sub> $\begin{matrix} +.020" \\ -.000" \end{matrix}$		L <sub>3</sub> $\begin{matrix} +.030" \\ -.000" \end{matrix}$		D <sub>2</sub>	L <sub>1</sub>						
1/4	.213	.158	.125	4	1/4	2-1/2	934116	70.90	934116-C3	77.70	934116-C8	78.20
1/4	.213	.158	.250	4	1/4	2-1/2	808616	72.50	808616-C3	79.30	808616-C8	79.80
1/4	.213	.158	.375	4	1/4	2-1/2	951216	74.20	951216-C3	81.00	951216-C8	81.50
1/4	.213	.158	.500	4	1/4	2-1/2	863716	76.60	863716-C3	83.40	863716-C8	83.90
1/4	.213	.158	.750	4	1/4	2-1/2	994716	81.30	994716-C3	88.10	994716-C8	88.60
1/4	.213	.158	1.000	4	1/4	2-1/2	808516	82.50	808516-C3	89.30	808516-C8	89.80
1/4	.213	.158	1.125	4	1/4	2-1/2	897716	83.60	897716-C3	90.40	897716-C8	90.90
1/4	.213	.158	1.500	4	1/4	4	997116	89.50	997116-C3	97.40	997116-C8	97.70
1/4	.213	.158	2.250	4	1/4	4	928816	99.00	928816-C3	106.90	928816-C8	107.20
5/16	.266	.201	.750	4	5/16	2-1/2	994720	94.50	994720-C3	102.40	994720-C8	110.00
5/16	.266	.201	1.500	4	5/16	4	997120	112.20	997120-C3	121.70	997120-C8	131.00
3/8	.320	.241	.375	4	3/8	2-1/2	951224	106.00	951224-C3	115.00	951224-C8	124.80
3/8	.320	.241	.750	4	3/8	2-1/2	994724	107.20	994724-C3	116.20	994724-C8	126.00
3/8	.320	.241	1.125	4	3/8	4	897724	115.10	897724-C3	127.40	897724-C8	137.20
3/8	.320	.241	1.500	4	3/8	4	997124	118.10	997124-C3	130.40	997124-C8	140.20
1/2	.427	.323	.500	4	1/2	3	951232	151.30	951232-C3	164.70	951232-C8	173.40
1/2	.427	.323	1.000	4	1/2	3	994732	155.10	994732-C3	168.50	994732-C8	177.20
1/2	.427	.323	1.500	4	1/2	6	897732	223.20	897732-C3	236.60	897732-C8	262.80
1/2	.427	.323	2.000	4	1/2	6	997132	229.10	997132-C3	242.50	997132-C8	268.70
1/2	.427	.323	3.000	4	1/2	6	928832	255.50	928832-C3	268.90	928832-C8	295.10



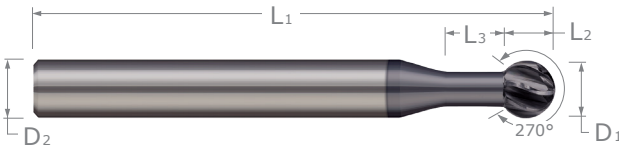
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Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)



## UNDERCUTTING END MILLS

270° for Hardened Steels



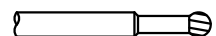
- ⚡ Optimized for hardened steels 45-68 Rc
- ⚡ Increased flute count for added strength and tool life
- ⚡ Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- ⚡ 270° spherical ball
- ⚡ Designed for undercutting, deburring, and multi-axis machining
- ⚡ Center cutting
- ⚡ 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	AITIN NANO COATED	
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$		$L_3 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$	TOOL #	PRICE
1/32	.027	.016	<b>.062</b>	4	1/8	1-1/2	823231-C6	62.90
1/32	.027	.016	<b>.078</b>	4	1/8	1-1/2	819831-C6	62.90
3/64	.040	.029	<b>.093</b>	4	1/8	1-1/2	823247-C6	62.90
3/64	.040	.029	<b>.125</b>	4	1/8	1-1/2	819847-C6	62.90
1/16	.053	.037	<b>.062</b>	4	1/8	1-1/2	831562-C6	43.40
1/16	.053	.037	<b>.093</b>	4	1/8	1-1/2	823262-C6	43.40
1/16	.053	.037	<b>.125</b>	4	1/8	1-1/2	819862-C6	45.10
5/64	.067	.045	<b>.125</b>	4	1/8	1-1/2	823278-C6	44.20
5/64	.067	.045	<b>.187</b>	4	1/8	1-1/2	819878-C6	45.90
3/32	.080	.054	<b>.062</b>	4	1/8	1-1/2	831593-C6	44.20
3/32	.080	.054	<b>.250</b>	4	1/8	1-1/2	823293-C6	44.20
3/32	.080	.054	<b>.312</b>	4	1/8	1-1/2	819893-C6	47.80

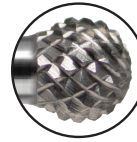
CUTTER DIAMETER	LENGTH OF CUT	NECK DIA.	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		$L_3 \begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$	TOOL #	PRICE
1/8	.107	.076	<b>.125</b>	6	1/8	1-1/2	831608-C6	38.80
1/8	.107	.076	<b>.250</b>	6	1/8	1-1/2	823308-C6	40.80
1/8	.107	.076	<b>.375</b>	6	1/8	1-1/2	819908-C6	41.60
3/16	.160	.117	<b>.125</b>	6	3/16	2	831612-C6	45.80
3/16	.160	.117	<b>.250</b>	6	3/16	2	823312-C6	49.20
3/16	.160	.117	<b>.375</b>	6	3/16	2	819912-C6	51.50
1/4	.213	.158	<b>.125</b>	6	1/4	2-1/2	831616-C6	61.30
1/4	.213	.158	<b>.375</b>	6	1/4	2-1/2	823316-C6	64.60
1/4	.213	.158	<b>.500</b>	6	1/4	2-1/2	819916-C6	66.40
3/8	.320	.241	<b>.375</b>	8	3/8	2-1/2	823324-C6	89.40
3/8	.320	.241	<b>.500</b>	8	3/8	2-1/2	819924-C6	89.40
1/2	.427	.323	<b>.500</b>	8	1/2	3	823332-C6	127.10
1/2	.427	.323	<b>.750</b>	8	1/2	3	819932-C6	129.00



# UNDERCUTTING END MILLS

## 270° Deburring Undercut

UNDERCUTTING END MILLS



High Number of Flutes

Stocked in Multiple Reach Lengths



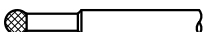
- ⚡ 270° spherical ball is ideal for deburring complex shapes and multi-axis machining
- ⚡ Deburr in your CNC machine with these high-precision burs held to end mill tolerances
- ⚡ Stop scrapping expensive parts due to handheld operator errors
- ⚡ High flute count allows for increased feeds which reduces 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		A1TIN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D1	L2 $\pm \frac{.010}{-.000}$ "		L3 $\pm \frac{.020}{-.000}$ "			D2	L1				
.031 (1/32)	.026	.014	<b>.031</b>	12	10	1/8	1-1/2	899631	64.80	899631-C3	69.40
.031 (1/32)	.026	.014	<b>.062</b>	12	10	1/8	1-1/2	980531	64.80	980531-C3	69.40
.031 (1/32)	.026	.014	<b>.093</b>	12	10	1/8	1-1/2	926431	66.80	926431-C3	71.40
.031 (1/32)	.026	.014	<b>.125</b>	12	10	1/8	1-1/2	883231	69.00	883231-C3	73.60
.039 (1 mm)	.033	.019	<b>.047</b>	12	10	1/8	1-1/2	89961M	64.80	89961M-C3	69.40
.039 (1 mm)	.033	.019	<b>.125</b>	12	10	1/8	1/1/2	92641M	69.00	92641M-C3	73.60
.047 (3/64)	.040	.024	<b>.093</b>	12	10	1/8	1-1/2	980547	64.80	980547-C3	69.40
.047 (3/64)	.040	.024	<b>.125</b>	12	10	1/8	1-1/2	890847	66.80	890847-C3	71.40
.047 (3/64)	.040	.024	<b>.156</b>	12	10	1/8	1-1/2	926447	66.80	926447-C3	71.40
.047 (3/64)	.040	.024	<b>.250</b>	12	10	1/8	1-1/2	883247	69.00	883247-C3	73.60
.062 (1/16)	.053	.032	<b>.062</b>	15	12	1/8	1-1/2	899662	48.70	899662-C3	53.30
.062 (1/16)	.053	.032	<b>.093</b>	15	12	1/8	1-1/2	980562	48.70	980562-C3	53.30
.062 (1/16)	.053	.032	<b>.125</b>	15	12	1/8	1-1/2	890862	50.30	890862-C3	54.90
.062 (1/16)	.053	.032	<b>.187</b>	15	12	1/8	1-1/2	926462	50.30	926462-C3	54.90
.062 (1/16)	.053	.032	<b>.250</b>	15	12	1/8	1-1/2	883262	52.10	883262-C3	56.70
.062 (1/16)	.053	.032	<b>.312</b>	15	12	1/8	1-1/2	808362	52.10	808362-C3	56.70
.078 (5/64)	.067	.035	<b>.062</b>	15	12	1/8	1-1/2	899678	48.70	899678-C3	53.30
.078 (5/64)	.067	.035	<b>.125</b>	15	12	1/8	1-1/2	980578	48.70	980578-C3	53.30
.078 (5/64)	.067	.035	<b>.250</b>	15	12	1/8	1-1/2	926478	50.30	926478-C3	54.90
.078 (5/64)	.067	.035	<b>.375</b>	15	12	1/8	2	883278	51.10	883278-C3	55.70
.093 (3/32)	.079	.038	<b>.062</b>	15	12	1/8	1-1/2	899693	51.70	899693-C3	56.30
.093 (3/32)	.079	.038	<b>.125</b>	15	12	1/8	1-1/2	895393	51.70	895393-C3	56.30
.093 (3/32)	.079	.038	<b>.187</b>	15	12	1/8	1-1/2	809693	51.70	809693-C3	56.30
.093 (3/32)	.079	.038	<b>.250</b>	15	12	1/8	1-1/2	980593	51.70	980593-C3	56.30
.093 (3/32)	.079	.038	<b>.375</b>	15	12	1/8	1-1/2	926493	53.10	926493-C3	57.70
.093 (3/32)	.079	.038	<b>.500</b>	15	12	1/8	2	883293	58.80	883293-C3	63.40
.118 (3 mm)	.101	.056	<b>.250</b>	15	12	1/8	1-1/2	98053M	53.90	98053M-C3	58.50
.118 (3 mm)	.101	.056	<b>.500</b>	15	12	1/8	2	92643M	57.20	92643M-C3	61.80

NEW

NEW

continued on next page



# UNDERCUTTING END MILLS

270° Deburring Undercut (cont.)

continued from previous page

NEW

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	49.90	899708-C3	54.50
.125 (1/8)	.107	.059	<b>.187</b>	16	13	1/8	1-1/2	809908	50.00	809908-C3	54.60
.125 (1/8)	.107	.059	<b>.250</b>	16	13	1/8	1-1/2	980608	51.70	980608-C3	56.30
.125 (1/8)	.107	.059	<b>.375</b>	16	13	1/8	1-1/2	890908	52.50	890908-C3	57.10
.125 (1/8)	.107	.059	<b>.500</b>	16	13	1/8	2	926508	53.60	926508-C3	58.20
.125 (1/8)	.107	.059	<b>.750</b>	16	13	1/8	2	886108	56.10	886108-C3	60.70
.125 (1/8)	.107	.059	<b>1.000</b>	16	13	1/8	3	883308	59.40	883308-C3	64.00
.187 (3/16)	.160	.097	<b>.125</b>	16	13	3/16	2	899712	53.10	899712-C3	58.10
.187 (3/16)	.160	.097	<b>.250</b>	16	13	3/16	2	980612	56.10	980612-C3	61.10
.187 (3/16)	.160	.097	<b>.375</b>	16	13	3/16	2	890912	58.00	890912-C3	63.00
.187 (3/16)	.160	.097	<b>.500</b>	16	13	3/16	2	926512	61.00	926512-C3	66.00
.187 (3/16)	.160	.097	<b>.750</b>	16	13	3/16	2	886112	65.90	886112-C3	70.90
.187 (3/16)	.160	.097	<b>1.000</b>	16	13	3/16	3	883312	69.30	883312-C3	74.30
.250 (1/4)	.213	.136	<b>.125</b>	16	13	1/4	2-1/2	899716	66.40	899716-C3	73.20
.250 (1/4)	.213	.136	<b>.375</b>	16	13	1/4	2-1/2	980616	67.10	980616-C3	73.90
.250 (1/4)	.213	.136	<b>.500</b>	16	13	1/4	2-1/2	890916	68.90	890916-C3	75.70
.250 (1/4)	.213	.136	<b>.750</b>	16	13	1/4	2-1/2	926516	72.10	926516-C3	78.90
.250 (1/4)	.213	.136	<b>1.125</b>	16	13	1/4	2-1/2	886116	74.40	886116-C3	81.20

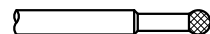
UNDERCUTTING END MILLS



## Undercutting End Mills: Well Rounded Tools That Offer Maximum Versatility

The versatility that Undercutting End Mills provide for your shop cannot be overstated. Learn how this one tool can perform several different machining operations in our "In the Loupe" blog post **Undercutting End Mills: Well-Rounded Tools That Offer Maximum Versatility**.

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



# DRILL / END MILLS

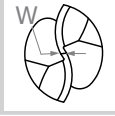
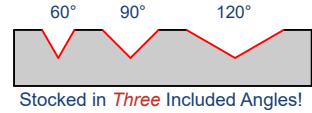
## Helical Tip – 2 Flute

DRILL / END MILLS

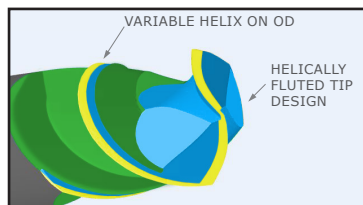


- Designed for chamfering, milling, and some spotting applications
- **Not** recommended for drilling
- 2 flutes
- Specialized helically fluted tip design for superior performance, surface finish and chip evacuation
- Variable helix design on OD (approx. 35°) reduces chatter and harmonics and increases 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

HELICICAL TIP	
Recommended For	
Chamfering	Yes
O.D. Milling	Yes
Drilling	No
Spotting	Light Duty

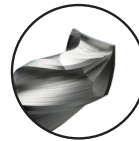
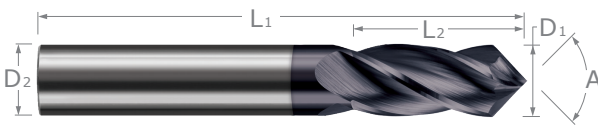



INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	AlTiN NANO COATED		TiB <sub>2</sub> COATED	
						2 FL	PRICE	2 FL	PRICE
A <sup>+1°</sup> / <sub>-1°</sub>	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.030"</sup> / <sub>-.000"</sub>	W	D <sub>2</sub> (h6)	L <sub>1</sub>				
<b>60°</b>	1/32	3/32	.003	1/8	1-1/2	872502-C6	47.90	872502-C8	46.10
	1/16	3/16	.005	1/8	1-1/2	872504-C6	47.90	872504-C8	46.10
	1/8	1/2	.008	1/8	1-1/2	872508-C6	47.90	872508-C8	47.90
	3/16	5/8	.009	3/16	2	872512-C6	52.90	872512-C8	52.90
	1/4	3/4	.009	1/4	2-1/2	872516-C6	67.30	872516-C8	67.30
	3/8	7/8	.012	3/8	2-1/2	872524-C6	83.20	872524-C8	83.20
	1/2	1	.012	1/2	3	872532-C6	106.30	872532-C8	106.30
<b>90°</b>	1/32	3/32	.003	1/8	1-1/2	859602-C6	43.50	859602-C8	41.90
	1/16	3/16	.005	1/8	1-1/2	859604-C6	43.50	859604-C8	41.90
	5/64	1/4	.006	1/8	1-1/2	859605-C6	45.60	859605-C8	43.90
	3/32	3/8	.007	1/8	1-1/2	859606-C6	45.60	859606-C8	43.90
	1/8	1/2	.008	1/8	1-1/2	859608-C6	47.90	859608-C8	47.90
	3/16	5/8	.009	3/16	2	859612-C6	52.90	859612-C8	52.90
	1/4	3/4	.009	1/4	2-1/2	859616-C6	67.30	859616-C8	67.30
	3/8	7/8	.012	3/8	2-1/2	859624-C6	83.20	859624-C8	83.20
1/2	1	.012	1/2	3	859632-C6	106.30	859632-C8	106.30	
<b>120°</b>	1/8	1/2	.008	1/8	1-1/2	847708-C6	47.90	847708-C8	47.90
	3/16	5/8	.009	3/16	2	847712-C6	52.90	847712-C8	52.90
	1/4	3/4	.009	1/4	2-1/2	847716-C6	67.30	847716-C8	67.30
	3/8	7/8	.012	3/8	2-1/2	847724-C6	83.20	847724-C8	83.20
	1/2	1	.012	1/2	3	847732-C6	106.30	847732-C8	106.30



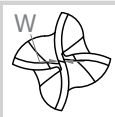
# DRILL / END MILLS


## Helical Tip – 4 Flute

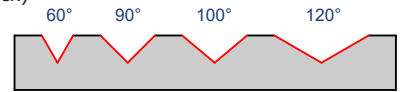


Specialized Helically Fluted Tip Design

HELICAL TIP	
Recommended For	
Chamfering	Yes
O.D. Milling	Yes
Drilling	No
Spotting	Light Duty



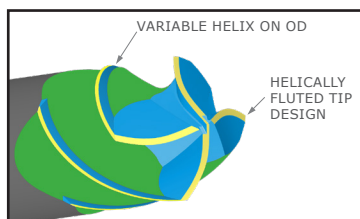
- Designed for chamfering, milling, and some spotting applications
- **Not** recommended for drilling ➤ 4 flutes (two flutes to center, two flutes cut back)
- Specialized helically fluted tip design for superior performance, surface finish and chip evacuation
- Variable helix design on OD (approx. 35°)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



Stocked in **Four** Included Angles!

DRILL / END MILLS

INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	AITIN NANO COATED	
						4 FL	PRICE
<b>60°</b>	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>		
	1/16	3/16	.005	1/8	1-1/2	899204-C6	50.40
	3/32	3/8	.007	1/8	1-1/2	899206-C6	50.40
	1/8	1/2	.008	1/8	1-1/2	899208-C6	50.40
	3/16	5/8	.009	3/16	2	899212-C6	55.80
	1/4	3/4	.009	1/4	2-1/2	899216-C6	70.80
	5/16	13/16	.010	5/16	2-1/2	899220-C6	78.00
	3/8	7/8	.012	3/8	2-1/2	899224-C6	87.50
1/2	1	.012	1/2	3	899232-C6	111.90	
<b>90°</b>	1/32	3/32	.003	1/8	1-1/2	881102-C6	46.00
	3/64	9/64	.004	1/8	1-1/2	881103-C6	46.00
	1/16	3/16	.005	1/8	1-1/2	881104-C6	46.00
	5/64	1/4	.006	1/8	1-1/2	881105-C6	48.10
	3/32	3/8	.007	1/8	1-1/2	881106-C6	48.10
	1/8	1/2	.008	1/8	1-1/2	881108-C6	50.40
	9/64	9/16	.009	3/16	2	<b>881109-C6</b>	55.80
	5/32	9/16	.009	3/16	2	881110-C6	55.80
	3/16	5/8	.009	3/16	2	881112-C6	55.80
	1/4	3/4	.009	1/4	2-1/2	881116-C6	70.80
	5/16	13/16	.010	5/16	2-1/2	881120-C6	78.00
	3/8	7/8	.012	3/8	2-1/2	881124-C6	87.50
1/2	1	.012	1/2	3	881132-C6	111.90	
<b>100°</b>	5/8	1-1/4	.014	5/8	3-1/2	<b>881140-C6</b>	148.60
	3/4	1-1/2	.015	3/4	4	881148-C6	185.80
	1/8	1/2	.008	1/8	1-1/2	826208-C6	50.40
	1/4	3/4	.009	1/4	2-1/2	826216-C6	70.80
<b>120°</b>	3/8	7/8	.012	3/8	2-1/2	826224-C6	87.50
	1/2	1	.012	1/2	3	826232-C6	111.90
	1/8	1/2	.008	1/8	1-1/2	865408-C6	50.40
	3/16	5/8	.009	3/16	2	865412-C6	55.80
	1/4	3/4	.009	1/4	2-1/2	865416-C6	70.80
	3/8	7/8	.012	3/8	2-1/2	865424-C6	87.50
	1/2	1	.012	1/2	3	865432-C6	111.90



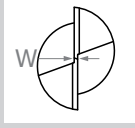
# DRILL / END MILLS

## Mill Style – 2 Flute

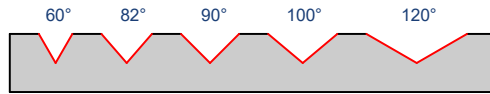


DRILL / END MILLS

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



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



Stocked in *Five* Included Angles!

**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
60°	D1 <sup>+0.000"</sup> / <sub>-.002"</sub>	L2 <sup>+0.030"</sup> / <sub>-.000"</sub>	W	D2	L1	2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
	1/32	3/32	.003	1/8	1-1/2	991702	29.90	991702-C3	34.50		
	1/16	3/16	.005	1/8	1-1/2	991704	29.90	991704-C3	34.50		
	3/32	3/8	.005	1/8	1-1/2	991706	29.90	991706-C3	34.50		
	1/8	1/2	.005	1/8	1-1/2	991708	29.90	991708-C3	34.50	991708-C8	36.70
	5/32	9/16	.006	3/16	2	991710	31.00	991710-C3	36.00		
	3/16	5/8	.006	3/16	2	991712	31.00	991712-C3	36.00		
	1/4	3/4	.006	1/4	2-1/2	991716	43.80	991716-C3	50.60	991716-C8	51.10
	5/16	13/16	.007	5/16	2-1/2	991720	46.00	991720-C3	53.90		
	3/8	7/8	.008	3/8	2-1/2	991724	55.10	991724-C3	64.10	991724-C8	73.90
1/2	1	.008	1/2	3	991732	87.30	991732-C3	100.70	991732-C8	109.40	
	5/8	1-1/4	.009	5/8	3-1/2	991740	133.40	991740-C3	146.80		
	3/4	1-1/2	.010	3/4	4	991748	202.20	991748-C3	216.70		
82°	1/16	3/16	.005	1/8	1-1/2	949404	31.80	949404-C3	36.40		
	3/32	3/8	.005	1/8	1-1/2	949406	31.80	949406-C3	36.40		
	1/8	1/2	.005	1/8	1-1/2	949408	31.80	949408-C3	36.40	949408-C8	38.60
	3/16	5/8	.006	3/16	2	949412	32.60	949412-C3	37.60		
	1/4	3/4	.006	1/4	2-1/2	949416	46.30	949416-C3	53.10	949416-C8	53.60
	5/16	13/16	.007	5/16	2-1/2	949420	48.30	949420-C3	56.20		
	3/8	7/8	.008	3/8	2-1/2	949424	58.30	949424-C3	67.30		
	1/2	1	.008	1/2	3	949432	92.10	949432-C3	105.50		
90°	1/64	3/64	.002	1/8	1-1/2	15301-2	29.90	72201-C3	34.50		
	1/32	3/32	.003	1/8	1-1/2	15302-2	29.90	72231-C3	34.50	72231-C8	36.70
	3/64	9/64	.004	1/8	1-1/2	15303-2	29.90	72247-C3	34.50		
	1/16	3/16	.005	1/8	1-1/2	15304-2	28.80	72262-C3	33.40	72262-C8	35.60
	5/64	1/4	.005	1/8	1-1/2	15305-2	28.80	72278-C3	33.40	72278-C8	35.60
	3/32	3/8	.005	1/8	1-1/2	15306-2	28.80	72293-C3	33.40	72293-C8	35.60
	7/64	3/8	.005	1/8	1-1/2	15307-2	29.90	72302-C3	34.50		
	3 mm	3/8	.005	1/8	1-1/2	1533M-2	29.90	72305-C3	34.50		

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# DRILL / END MILLS

Mill Style – 2 Flute (cont.)

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NEW

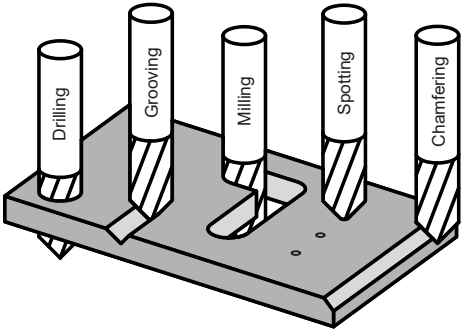
DRILL / END MILLS

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 $\pm 1^\circ$	D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	W	D <sub>2</sub>	L <sub>1</sub>						
90°	1/8	1/2	.005	1/8	1-1/2	15308-2	28.80	72308-C3	33.40	72308-C8	35.60
	9/64	9/16	.006	3/16	2	15309-2	31.00	72309-C3	36.00		
	5/32	9/16	.006	3/16	2	15310-2	31.00	72310-C3	36.00		
	3/16	5/8	.006	3/16	2	15312-2	29.80	72312-C3	34.80	72312-C8	36.60
	1/4	3/4	.006	1/4	2-1/2	15316-2	42.20	72316-C3	49.00	72316-C8	49.50
	5/16	13/16	.007	5/16	2-1/2	15320-2	44.20	72320-C3	52.10	72320-C8	59.70
	3/8	7/8	.008	3/8	2-1/2	15324-2	52.90	72324-C3	61.90	72324-C8	71.70
	1/2	1	.008	1/2	3	15332-2	83.90	72332-C3	97.30	72332-C8	106.00
	5/8	1-1/4	.009	5/8	3-1/2	15340-2	128.20	72340-C3	141.60		
	3/4	1-1/2	.010	3/4	4	15348-2	194.40	72348-C3	208.90		
100°	1/8	1/2	.005	1/8	1-1/2	928508	31.80	928508-C3	36.40	928508-C8	38.60
	3/16	5/8	.006	3/16	2	928512	32.60	928512-C3	37.60		
	1/4	3/4	.006	1/4	2-1/2	928516	46.30	928516-C3	53.10	928516-C8	53.60
	5/16	13/16	.007	5/16	2-1/2	928520	48.30	928520-C3	56.20		
	3/8	7/8	.008	3/8	2-1/2	928524	58.30	928524-C3	67.30		
	1/2	1	.008	1/2	3	928532	92.10	928532-C3	105.50		
120°	1/16	3/16	.005	1/8	1-1/2	985504	31.80	985504-C3	36.40		
	3/32	3/8	.005	1/8	1-1/2	985506	31.80	985506-C3	36.40		
	1/8	1/2	.005	1/8	1-1/2	985508	31.80	985508-C3	36.40	985508-C8	38.60
	3/16	5/8	.006	3/16	2	985512	32.70	985512-C3	37.70		
	1/4	3/4	.006	1/4	2-1/2	985516	45.90	985516-C3	52.70	985516-C8	53.20
	5/16	13/16	.007	5/16	2-1/2	985520	47.80	985520-C3	55.70		
	3/8	7/8	.008	3/8	2-1/2	985524	56.90	985524-C3	65.90		
	1/2	1	.008	1/2	3	985532	88.90	985532-C3	102.30		

### Drill / End Mills

Our extensive offering of Drill / End Mills are available in multiple point angles. They allow you to...

- Perform multiple operations with a single tool
- Free up space on your tool carousel
- Improve cycle time with fewer tool changes





View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)



# DRILL / END MILLS

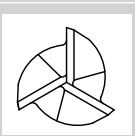
## Mill Style – 3 Flute



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

MILL STYLE	
Flat relief with end mill style and 3 flutes to center.	
<b>Recommended For</b>	<b>Included Angle</b>
	90°
Chamfering	Yes
O.D. Milling	Yes
Drilling	No
Spotting	Light Duty



INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI IN COATED	
					3 FL	PRICE	3 FL	PRICE
$A \begin{matrix} +1^\circ \\ -1^\circ \end{matrix}$	$D_1 \begin{matrix} +.000'' \\ -.002'' \end{matrix}$	$L_2 \begin{matrix} +.030'' \\ -.000'' \end{matrix}$	$D_2$	$L_1$				
<b>90°</b>	1/8	1/2	1/8	1-1/2	823808	28.80	823808-C3	35.60
	3/16	5/8	3/16	2	823812	29.80	823812-C3	34.40
	1/4	3/4	1/4	2-1/2	823816	42.20	823816-C3	47.20
	3/8	7/8	3/8	2-1/2	823824	52.90	823824-C3	61.90



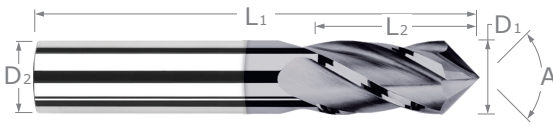
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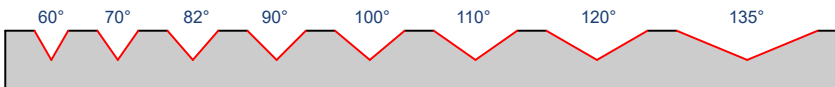
## DRILL / END MILLS

## 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

<b>MILL STYLE</b>		
Flat relief with end mill style gash to thin web.		
Recommended For	Included Angle	
	60°, 70°	82°, 90°, 100°, 110°, 120°
Chamfering	Yes	Yes
O.D. Milling	Yes	Yes
Drilling	No	Non-Ferrous Only
Spotting	No	Light Duty



Stocked in *Eight* 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
<b>60°</b>	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	.0030	1/8	1-1/2	15402	29.90			15402-C3	34.50
	3/64	9/64	.0040	1/8	1-1/2	15403	29.90			15403-C3	34.50
	1/16	3/16	.0050	1/8	1-1/2	15404	29.90			15404-C3	34.50
	5/64	1/4	.0050	1/8	1-1/2	15405	29.90			15405-C3	34.50
	3/32	3/8	.0050	1/8	1-1/2	15406	29.90			15406-C3	34.50
	7/64	3/8	.0050	1/8	1-1/2	15407	31.00			15407-C3	35.60
	3 mm	3/8	.0050	1/8	1-1/2	1543M	32.30			1543M-C3	36.90
	1/8	1/2	.0050	1/8	1-1/2	15408	29.90			15408-C3	34.50
	9/64	9/16	.0060	3/16	2	15409	31.00			15409-C3	36.00
	5/32	9/16	.0060	3/16	2	15410	31.00			15410-C3	36.00
	3/16	5/8	.0060	3/16	2	15412	31.00			15412-C3	36.00
	1/4	3/4	.0060	1/4	2-1/2	15416	43.80			15416-C3	50.60
	5/16	13/16	.0070	5/16	2-1/2	15420	46.00			15420-C3	53.90
	3/8	7/8	.0080	3/8	2-1/2	15424	55.10			15424-C3	64.10
	7/16	1	.0080	7/16	2-3/4	15428	85.30			15428-C3	96.50
	1/2	1	.0080	1/2	3	15432	87.30			15432-C3	100.70
5/8	1-1/4	.0090	5/8	3-1/2	15440	133.40			15440-C3	146.80	
3/4	1-1/2	.0100	3/4	4	15448	202.20			15448-C3	216.70	
1	2	.0100	1	4	15464	304.60			15464-C3	326.70	
<b>70°</b>	1/8	1/2	.0050	1/8	1-1/2	824608	33.40			824608-C3	38.00
	1/4	3/4	.0060	1/4	2-1/2	824616	48.20			824616-C3	55.00
	3/8	7/8	.0080	3/8	2-1/2	824624	60.20			824624-C3	69.20
	1/2	1	.0080	1/2	3	824632	94.00			824632-C3	107.40

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# DRILL / END MILLS

## Mill Style – 4 Flute (cont.)

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INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TIN COATED		AISI COATED	
						4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
A $+1^{\circ}$ $-1^{\circ}$	D <sub>1</sub> $+0.000$ $-0.002$ "	L <sub>2</sub> $+0.030$ $-0.000$ "	W	D <sub>2</sub>	L <sub>1</sub>	4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
82°	1/32	3/32	.0030	1/8	1-1/2	26502	33.40			26502-C3	38.00
	1/16	3/16	.0050	1/8	1-1/2	26504	33.40			26504-C3	38.00
	5/64	1/4	.0050	1/8	1-1/2	26505	33.40			26505-C3	38.00
	3/32	3/8	.0050	1/8	1-1/2	26506	33.40			26506-C3	38.00
	1/8	1/2	.0050	1/8	1-1/2	26508	33.40			26508-C3	38.00
	5/32	9/16	.0060	3/16	2	26510	34.60			26510-C3	39.60
	3/16	5/8	.0060	3/16	2	26512	34.60			26512-C3	39.60
	1/4	3/4	.0060	1/4	2-1/2	26516	48.20			26516-C3	55.00
	5/16	13/16	.0070	5/16	2-1/2	26520	50.30			26520-C3	58.20
	3/8	7/8	.0080	3/8	2-1/2	26524	60.20			26524-C3	69.20
	1/2	1	.0080	1/2	3	26532	94.00			26532-C3	107.40
	5/8	1-1/4	.0090	5/8	3-1/2	26540	142.30			26540-C3	155.70
	3/4	1-1/2	.0100	3/4	4	26548	215.20			26548-C3	229.70
90°	1/64	3/64	.0015	1/8	1-1/2	15301	29.90			15301-C3	34.50
	1/32	3/32	.0030	1/8	1-1/2	15302	29.90			15302-C3	34.50
	1 mm	1/8	.0030	1/8	1-1/2	1531M	32.30			1531M-C3	36.90
	3/64	9/64	.0040	1/8	1-1/2	15303	29.90			15303-C3	34.50
	1/16	3/16	.0050	1/8	1-1/2	15304	28.80	15304-C1	31.90	15304-C3	33.40
	1/16	5/16	.0050	1/8	2-1/2	823904	30.80			823904-C3	35.40
	5/64	1/4	.0050	1/8	1-1/2	15305	28.80	15305-C1	31.90	15305-C3	33.40
	3/32	3/8	.0050	1/8	1-1/2	15306	28.80	15306-C1	31.90	15306-C3	33.40
	7/64	3/8	.0050	1/8	1-1/2	15307	29.90			15307-C3	34.50
	3 mm	3/8	.0050	1/8	1-1/2	1533M	29.90			1533M-C3	34.50
	1/8	1/2	.0050	1/8	1-1/2	15308	28.80	15308-C1	31.90	15308-C3	33.40
	1/8	1/2	.0050	1/8	3	824208	31.90			824208-C3	38.70
	1/8	5/8	.0050	1/8	2-1/2	824008	30.80			824008-C3	35.40
	9/64	9/16	.0060	3/16	2	15309	31.00			15309-C3	36.00
	5/32	9/16	.0060	3/16	2	15310	31.00			15310-C3	36.00
	11/64	5/8	.0060	3/16	2	15311	31.00			15311-C3	36.00
	3/16	5/8	.0060	3/16	2	15312	29.80	15312-C1	33.30	15312-C3	34.80
	3/16	1	.0060	3/16	3	824012	32.30			824012-C3	37.30
	13/64	3/4	.0060	1/4	2-1/2	15313	45.70			15313-C3	52.50
	7/32	3/4	.0060	1/4	2-1/2	15314	45.70			15314-C3	52.50
	6 mm	3/4	.0060	1/4	2-1/2	1536M	46.20			1536M-C3	53.00
	1/4	3/4	.0060	1/4	2-1/2	15316	42.20	15316-C1	45.90	15316-C3	49.00
	1/4	3/4	.0060	1/4	4	824216	45.90			824216-C3	50.90
	1/4	1-1/4	.0060	1/4	4	824016	48.00			824016-C3	55.90
	5/16	13/16	.0070	5/16	2-1/2	15320	44.20	15320-C1	49.40	15320-C3	52.10
	3/8	7/8	.0080	3/8	2-1/2	15324	52.90	15324-C1	58.30	15324-C3	61.90
	3/8	2	.0080	3/8	4	824024	55.30			824024-C3	67.60
	7/16	1	.0080	7/16	2-3/4	15328	85.30			15328-C3	96.50
	1/2	1	.0080	1/2	3	15332	83.90	15332-C1	89.90	15332-C3	97.30
	5/8	1-1/4	.0090	5/8	3-1/2	15340	128.20	15340-C1	136.10	15340-C3	141.60
3/4	1-1/2	.0100	3/4	4	15348	194.40	15348-C1	203.40	15348-C3	208.90	
1	2	.0100	1	4	15364	304.60			15364-C3	326.70	

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## DRILL / END MILLS

Mill Style – 4 Flute (cont.)

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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	.0030	1/8	1-1/2	27402	33.40			27402-C3	38.00
	1/16	3/16	.0050	1/8	1-1/2	27404	33.40			27404-C3	38.00
	5/64	1/4	.0050	1/8	1-1/2	27405	33.40			27405-C3	38.00
	3/32	3/8	.0050	1/8	1-1/2	27406	33.40			27406-C3	38.00
	1/8	1/2	.0050	1/8	1-1/2	27408	33.40			27408-C3	38.00
	5/32	9/16	.0060	3/16	2	27410	34.60			27410-C3	39.60
	3/16	5/8	.0060	3/16	2	27412	34.60			27412-C3	39.60
	1/4	3/4	.0060	1/4	2-1/2	27416	48.20			27416-C3	55.00
	5/16	13/16	.0070	5/16	2-1/2	27420	50.30			27420-C3	58.20
	3/8	7/8	.0080	3/8	2-1/2	27424	60.20			27424-C3	69.20
	1/2	1	.0080	1/2	3	27432	94.00			27432-C3	107.40
	5/8	1-1/4	.0090	5/8	3-1/2	27440	142.30			27440-C3	155.70
	3/4	1-1/2	.0100	3/4	4	27448	215.20			27448-C3	229.70
110°	1/8	1/2	.0050	1/8	1-1/2	824408	33.40			824408-C3	38.00
	1/4	3/4	.0060	1/4	2-1/2	824416	48.20			824416-C3	55.00
	3/8	7/8	.0080	3/8	2-1/2	824424	60.20			824424-C3	69.20
	1/2	1	.0080	1/2	3	824432	94.00			824432-C3	107.40
120°	1/32	3/32	.0030	1/8	1-1/2	988102	31.80			988102-C3	36.40
	1/16	3/16	.0050	1/8	1-1/2	988104	31.80			988104-C3	36.40
	3/32	3/8	.0050	1/8	1-1/2	988106	31.80			988106-C3	36.40
	7/64	3/8	.0050	1/8	1-1/2	988107	31.00			988107-C3	35.60
	3 mm	3/8	.0050	1/8	1-1/2	98813M	32.30			98813M-C3	36.90
	1/8	1/2	.0050	1/8	1-1/2	988108	31.80			988108-C3	36.40
	9/64	9/16	.0060	3/16	2	988109	32.70			988109-C3	37.70
	5/32	9/16	.0060	3/16	2	988110	32.70			988110-C3	37.70
	3/16	5/8	.0060	3/16	2	988112	32.70			988112-C3	37.70
	1/4	3/4	.0060	1/4	2-1/2	988116	45.90			988116-C3	52.70
	5/16	13/16	.0070	5/16	2-1/2	988120	47.80			988120-C3	55.70
	3/8	7/8	.0080	3/8	2-1/2	988124	56.90			988124-C3	65.90
	1/2	1	.0080	1/2	3	988132	88.90			988132-C3	102.30
	5/8	1-1/4	.0090	5/8	3-1/2	988140	134.80			988140-C3	148.20
3/4	1-1/2	.0100	3/4	4	988148	203.70			988148-C3	218.20	
1	2	.0100	1	4	988164	306.10			988164-C3	328.20	
135°	1/8	1/2	.0050	1/8	1-1/2	870208	33.40			870208-C3	38.00
	3/16	5/8	.0060	3/16	2	870212	34.60			870212-C3	39.60
	1/4	3/4	.0060	1/4	2-1/2	870216	48.20			870216-C3	55.00
	3/8	7/8	.0080	3/8	2-1/2	870224	60.20			870224-C3	69.20
	1/2	1	.0080	1/2	3	870232	94.00			870232-C3	107.40

DRILL / END MILLS



# DRILL / END MILLS

## Drill Style – 2 Flute



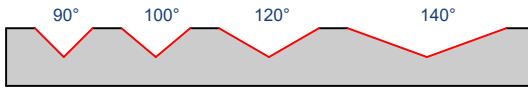
DRILL / END MILLS

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

**DRILL STYLE**

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

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



Stocked in *Four* Included Angles!

INCLUDED ANGLE	CUTTER DIAMETER	LENGTH OF CUT	WEB THICKNESS	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
						2 FL	PRICE	2 FL	PRICE
<b>90°</b>	D1 $\begin{matrix} +.000'' \\ -.002'' \end{matrix}$	L2 $\begin{matrix} +.030'' \\ -.000'' \end{matrix}$	W	D2	L1	<b>2 FL</b>	<b>PRICE</b>	<b>2 FL</b>	<b>PRICE</b>
	1/32	3/32	.003	1/8	1-1/2	46502	32.30	46502-C3	36.90
	1 mm	1/8	.003	1/8	1-1/2	4651M	34.80	4651M-C3	39.40
	3/64	9/64	.004	1/8	1-1/2	46503	32.30	46503-C3	36.90
	1/16	3/16	.005	1/8	1-1/2	46504	32.30	46504-C3	36.90
	5/64	1/4	.005	1/8	1-1/2	46505	32.30	46505-C3	36.90
	3/32	3/8	.005	1/8	1-1/2	46506	32.30	46506-C3	36.90
	7/64	3/8	.005	1/8	1-1/2	46507	32.30	46507-C3	36.90
	3 mm	3/8	.005	1/8	1-1/2	4653M	34.80	4653M-C3	39.40
	1/8	1/2	.005	1/8	1-1/2	46508	32.30	46508-C3	36.90
	9/64	9/16	.006	3/16	2	46509	32.70	46509-C3	37.70
	5/32	9/16	.006	3/16	2	46510	32.70	46510-C3	37.70
	3/16	5/8	.006	3/16	2	46512	32.70	46512-C3	37.70
	7/32	3/4	.006	1/4	2-1/2	46514	45.90	46514-C3	52.70
	1/4	3/4	.006	1/4	2-1/2	46516	45.90	46516-C3	52.70
	5/16	13/16	.007	5/16	2-1/2	46520	47.80	46520-C3	55.70
	3/8	7/8	.008	3/8	2-1/2	46524	56.90	46524-C3	65.90
	7/16	1	.008	7/16	2-3/4	46528	87.10	46528-C3	98.30
	1/2	1	.008	1/2	3	46532	88.90	46532-C3	102.30
	5/8	1-1/4	.010	5/8	3-1/2	46540	134.80	46540-C3	148.20
3/4	1-1/2	.012	3/4	4	46548	203.70	46548-C3	218.20	
1	2	.015	1	4	46564	301.50	46564-C3	323.60	
<b>100°</b>	1/8	1/2	.005	1/8	1-1/2	849108	33.40	849108-C3	38.00
	3/16	5/8	.006	3/16	2	849112	34.60	849112-C3	39.60
	1/4	3/4	.006	1/4	2-1/2	849116	48.20	849116-C3	55.00
	3/8	7/8	.008	3/8	2-1/2	849124	60.20	849124-C3	69.20

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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		A1TIN COATED	
						2 FL	PRICE	2 FL	PRICE
A $\begin{smallmatrix} +1^\circ \\ -1^\circ \end{smallmatrix}$	D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	W	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
120°	1/32	3/32	.003	1/8	1-1/2	12902	32.30	12902-C3	36.90
	1 mm	1/8	.003	1/8	1-1/2	1291M	34.80	1291M-C3	39.40
	3/64	9/64	.004	1/8	1-1/2	12903	32.30	12903-C3	36.90
	1/16	3/16	.005	1/8	1-1/2	12904	31.10	12904-C3	35.70
	5/64	1/4	.005	1/8	1-1/2	12905	31.10	12905-C3	35.70
	3/32	3/8	.005	1/8	1-1/2	12906	31.10	12906-C3	35.70
	3 mm	3/8	.005	1/8	1-1/2	1293M	34.80	1293M-C3	39.40
	1/8	1/2	.005	1/8	1-1/2	12908	31.10	12908-C3	35.70
	9/64	9/16	.006	3/16	2	12909	32.70	12909-C3	37.70
	5/32	9/16	.006	3/16	2	12910	32.70	12910-C3	37.70
	3/16	5/8	.006	3/16	2	12912	31.40	12912-C3	36.40
	7/32	3/4	.006	1/4	2-1/2	12914	45.90	12914-C3	52.70
	1/4	3/4	.006	1/4	2-1/2	12916	44.10	12916-C3	50.90
	5/16	13/16	.007	5/16	2-1/2	12920	46.00	12920-C3	53.90
	3/8	7/8	.008	3/8	2-1/2	12924	54.70	12924-C3	63.70
	7/16	1	.008	7/16	2-3/4	12928	87.10	12928-C3	98.30
	1/2	1	.008	1/2	3	12932	85.40	12932-C3	98.80
	5/8	1-1/4	.010	5/8	3-1/2	12940	129.60	12940-C3	143.00
3/4	1-1/2	.012	3/4	4	12948	195.90	12948-C3	210.40	
1	2	.015	1	4	12964	301.50	12964-C3	323.60	
140°	1/16	3/16	.005	1/8	1-1/2	950504	33.40	950504-C3	38.00
	5/64	1/4	.005	1/8	1-1/2	950505	33.40	950505-C3	38.00
	3/32	3/8	.005	1/8	1-1/2	950506	33.40	950506-C3	38.00
	1/8	1/2	.005	1/8	1-1/2	950508	33.40	950508-C3	38.00
	3/16	5/8	.006	3/16	2	950512	34.60	950512-C3	39.60
	1/4	3/4	.006	1/4	2-1/2	950516	48.20	950516-C3	55.00
	5/16	13/16	.007	5/16	2-1/2	950520	50.30	950520-C3	58.20
	3/8	7/8	.008	3/8	2-1/2	950524	60.20	950524-C3	69.20
	1/2	1	.008	1/2	3	950532	94.00	950532-C3	107.40
	5/8	1-1/4	.010	5/8	3-1/2	950540	142.30	950540-C3	155.70
	3/4	1-1/2	.012	3/4	4	950548	215.20	950548-C3	229.70

DRILL / END MILLS



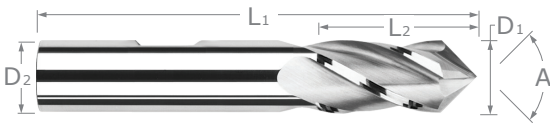
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# DRILL / END MILLS

## Cobalt – Mill Style – 2 & 4 Flute



MILL STYLE	
END VIEW:	<b>Recommended For</b>
	Chamfering Yes
	O.D. Milling Yes
Flat Relief with end mill style gash to thin web	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 $\begin{matrix} +1^\circ \\ -1^\circ \end{matrix}$	D1 $\begin{matrix} +.000'' \\ -.002'' \end{matrix}$	L2 $\begin{matrix} +.030'' \\ -.000'' \end{matrix}$		D2	L1		
<b>90°</b>	1/8	3/8	4	3/8	2-5/16	14308	60.90
	1/8	3/8	2	3/8	2-5/16	14308-2	60.90
	3/16	1/2	4	3/8	2-3/8	14312	60.90
	1/4	5/8	4	3/8	2-1/2	14316	60.90
	1/4	5/8	2	3/8	2-1/2	14316-2	60.90
	5/16	3/4	4	3/8	2-1/2	14320	60.90
	3/8	3/4	4	3/8	2-1/2	14324	60.90
	3/8	3/4	2	3/8	2-1/2	14324-2	60.90
	7/16	1	4	3/8	2-11/16	14328	71.80
	1/2	1-1/4	4	1/2	3-1/4	14332	71.80
	1/2	1-1/4	2	1/2	3-1/4	14332-2	71.80
	5/8	1-5/8	4	5/8	3-3/4	14340	105.00
	3/4	1-5/8	4	3/4	3-7/8	14348	123.40
	1	1-7/8	4	3/4	4-1/8	14364-A	179.80
1	2	4	1	4-1/2	14364	179.80	

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



View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

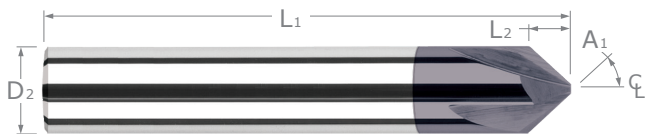
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# CHAMFER CUTTERS

Pointed & Flat End

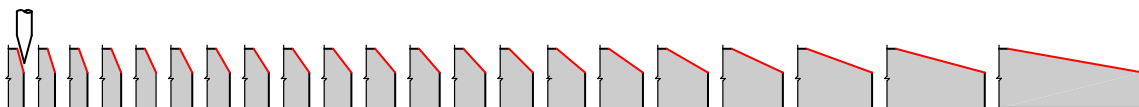


Available in  
2, 3, 4 & 6  
Flutes!

Choose from three styles:

- **Pointed:** 2 flute style for deburring and chamfering in narrow grooves, slots and small holes
- **Flat End:** (non-cutting) multi-flute design improves tool life and finish for profiling and chamfering larger features
- **End Cutting:** 4 flute center cutting geometry to blend the floor and a chamfered wall in a single pass

CNC ground in the USA



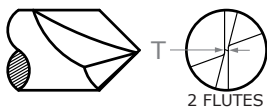
Stocked in 21 Angles Per Side, Ranging from 15°-80°!

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°	1/8	2	.010	I	.233		1-1/2	18715	18.10	18715-C3	22.70	18715-C8	24.90
	1/8	2	.010	I	.233		3	50615	22.30	50615-C3	26.90		
	1/8	3	.040	II	.159	.075	1-1/2	968615	18.80	968615-C3	23.40		
	1/8	4	.040	II	.159	.075	1-1/2	866115	19.80	866115-C3	24.40		
	3/16	2	.010	I	.350		2	72415	24.40	72415-C3	29.40		
	3/16	2	.010	I	.350		4	986915	35.80	986915-C3	42.60		
	3/16	3	.040	II	.275	.075	2	978115	27.90	978115-C3	32.90		
	3/16	4	.040	II	.275	.075	2	848715	29.20	848715-C3	34.20		
	1/4	2	.010	I	.448		2-1/2	47615	35.00	47615-C3	41.80	47615-C8	42.30
	1/4	3	.060	II	.355	.112	2-1/2	18515	33.70	18515-C3	40.50		
	1/4	3	.060	II	.355	.112	4	48515	44.40	48515-C3	48.60		
	1/4	4	.060	II	.355	.112	2-1/2	876415	36.70	876415-C3	43.50		
	5/16	3	.060	II	.471	.112	2-1/2	977015	41.20	977015-C3	49.10		
	3/8	2	.010	I	.700		2-1/2	72515	46.90	72515-C3	55.90		
	3/8	3	.060	II	.588	.112	2-1/2	18415	45.20	18415-C3	54.20		
	3/8	3	.060	II	.588	.112	4	981215	67.00	981215-C3	79.30		
	3/8	4	.060	II	.588	.112	2-1/2	895115	49.30	895115-C3	58.30		
	1/2	2	.010	I	.933		3	960415	78.90	960415-C3	92.30		
	1/2	4	.080	II	.784	.149	3	18315	67.00	18315-C3	80.40		
	1/2	6	.080	II	.784	.149	3	839215	73.20	839215-C3	86.60		
5/8	6	.080	II	1.017	.149	3-1/2	952815	114.90	952815-C3	128.30			
3/4	6	.100	II	1.213	.187	4	949315	172.00	949315-C3	186.50			

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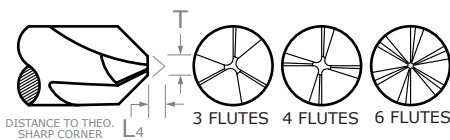
### TYPE I - POINTED

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



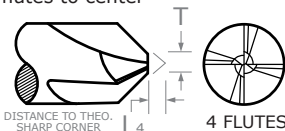
### TYPE II - FLAT END

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

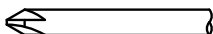
## Pointed & Flat End (cont.)

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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	
A <sub>1</sub> <sup>+0°30'</sup> -0°30'	D <sub>2</sub>		T <sub>(MAX.)</sub>		L <sub>2</sub>	L <sub>4</sub> (MAX.)	L <sub>1</sub>		TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
17.5°	1/8	2	.010	I	.198		1-1/2		18718	20.40	18718-C3	25.00		
	1/4	2	.010	I	.396		2-1/2		47618	37.10	47618-C3	43.90		
	1/4	3	.060	II	.301	.095	2-1/2		18518	37.10	18518-C3	43.90		
	1/2	4	.080	II	.666	.127	3		18318	74.00	18318-C3	87.40		
20°	1/8	2	.010	I	.172		1-1/2		18720	18.10	18720-C3	22.70	18720-C8	24.90
	1/8	2	.010	I	.172		3	LONG!	50620	22.30	50620-C3	26.90		
	1/8	3	.040	II	.117	.055	1-1/2		968620	18.80	968620-C3	23.40		
	1/8	4	.040	II	.117	.055	1-1/2		866120	19.80	866120-C3	24.40		
	3/16	2	.010	I	.258		2		72420	24.40	72420-C3	29.40		
	3/16	2	.010	I	.258		4	LONG!	986920	35.80	986920-C3	42.60		
	3/16	3	.040	II	.203	.055	2		978120	27.90	978120-C3	32.90		
	3/16	4	.040	II	.203	.055	2		848720	29.20	848720-C3	34.20		
	1/4	2	.010	I	.343		2-1/2		47620	35.00	47620-C3	41.80	47620-C8	42.30
	1/4	3	.060	II	.261	.082	2-1/2		18520	33.70	18520-C3	40.50	18520-C8	41.00
	1/4	3	.060	II	.261	.082	4	LONG!	48520	44.40	48520-C3	48.60		
	1/4	4	.060	II	.261	.082	2-1/2		876420	38.70	876420-C3	45.50		
	5/16	3	.060	II	.347	.082	2-1/2		977020	46.90	977020-C3	54.80		
	3/8	2	.010	I	.515		2-1/2		72520	46.90	72520-C3	55.90		
	3/8	3	.060	II	.433	.082	2-1/2		18420	45.20	18420-C3	54.20		
	3/8	3	.060	II	.433	.082	4	LONG!	981220	67.00	981220-C3	79.30		
3/8	4	.060	II	.433	.082	2-1/2		895120	51.90	895120-C3	60.90			
1/2	2	.010	I	.687		3		960420	78.90	960420-C3	92.30			
1/2	4	.080	II	.577	.110	3		18320	67.00	18320-C3	80.40			
1/2	6	.080	II	.577	.110	3		839220	73.20	839220-C3	86.60			
22.5°	1/8	2	.010	I	.151		1-1/2		18723	19.80	18723-C3	24.40	18723-C8	26.60
	1/8	3	.040	II	.103	.048	1-1/2		968623	19.80	968623-C3	24.40		
	3/16	2	.010	I	.226		2		72423	25.90	72423-C3	30.90		
	3/16	3	.040	II	.178	.048	2		978123	25.90	978123-C3	30.90		
	1/4	2	.010	I	.302		2-1/2		47623	37.10	47623-C3	43.90		
	1/4	3	.060	II	.229	.072	2-1/2		18523	37.10	18523-C3	43.90		
	3/8	2	.010	I	.453		2-1/2		72523	49.90	72523-C3	58.90		
	3/8	3	.060	II	.380	.072	2-1/2		18423	49.90	18423-C3	58.90		
	1/2	2	.010	I	.604		3		960423	79.30	960423-C3	92.70		
1/2	4	.080	II	.507	.097	3		18323	70.10	18323-C3	83.50			
25°	1/8	2	.010	I	.134		1-1/2		18725	19.80	18725-C3	24.40	18725-C8	26.60
	1/8	3	.040	II	.091	.043	1-1/2		968625	19.80	968625-C3	24.40		
	3/16	2	.010	I	.201		2		72425	25.70	72425-C3	30.70		
	3/16	3	.040	II	.158	.043	2		978125	25.70	978125-C3	30.70		
	1/4	2	.010	I	.268		2-1/2		47625	37.10	47625-C3	43.90		
	1/4	3	.060	II	.204	.064	2-1/2		18525	36.90	18525-C3	43.70		
	3/8	2	.010	I	.402		2-1/2		72525	49.50	72525-C3	58.50		
	3/8	3	.060	II	.338	.064	2-1/2		18425	49.50	18425-C3	58.50		
	1/2	2	.010	I	.536		3		960425	78.50	960425-C3	91.90		
1/2	4	.080	II	.450	.086	3		18325	69.30	18325-C3	82.70			

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# CHAMFER CUTTERS

Pointed & Flat End (cont.)

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ANGLE PER SIDE A <sub>1</sub>	DIA.	FLUTES	TIP	TYPE	LOC			UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED		
					T (MAX.)	L <sub>2</sub>	L <sub>4</sub> (MAX.)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
27.5°	1/8	2	.010	I	.120			1-1/2	18728	20.40	18728-C3	25.00		
	1/4	2	.010	I	.240			2-1/2	47628	37.10	47628-C3	43.90		
	1/4	3	.060	II	.182	.058		2-1/2	18528	37.10	18528-C3	43.90		
	1/2	4	.080	II	.403	.077		3	18328	70.10	18328-C3	83.50		
30°	1/8	2	.010	I	.108			1-1/2	18730	18.10	18730-C3	22.70	18730-C8	24.90
	1/8	2	.010	I	.108			3 <i>LONG!</i>	50630	22.30	50630-C3	26.90		
	1/8	3	.040	II	.074	.035		1-1/2	968630	18.80	968630-C3	23.40		
	1/8	4	.040	II	.074	.035		1-1/2	866130	19.80	866130-C3	24.40		
	3/16	2	.010	I	.162			2	72430	24.40	72430-C3	29.40		
	3/16	2	.010	I	.162			4 <i>LONG!</i>	986930	35.80	986930-C3	42.60		
	3/16	3	.040	II	.128	.035		2	978130	30.30	978130-C3	35.30		
	3/16	4	.040	II	.128	.035		2	848730	31.70	848730-C3	36.70		
	1/4	2	.010	I	.217			2-1/2	47630	35.00	47630-C3	41.80	47630-C8	42.30
	1/4	3	.060	II	.165	.052		2-1/2	18530	33.70	18530-C3	40.50	18530-C8	41.00
	1/4	3	.060	II	.165	.052		4 <i>LONG!</i>	48530	44.40	48530-C3	48.60		
	1/4	4	.060	II	.165	.052		2-1/2	876430	36.70	876430-C3	43.50		
	1/4	4	.040	III	.181	.035		2-1/2	833130	38.70	833130-C3	45.50		
	5/16	2	.010	I	.271			2-1/2	880330	42.30	880330-C3	50.20		
	5/16	3	.060	II	.219	.052		2-1/2	977030	41.20	977030-C3	49.10		
	5/16	4	.060	II	.219	.052		2-1/2	873230	43.90	873230-C3	51.80		
	3/8	2	.010	I	.325			2-1/2	72530	46.90	72530-C3	55.90		
	3/8	3	.060	II	.273	.052		2-1/2	18430	45.20	18430-C3	54.20		
	3/8	3	.060	II	.273	.052		4 <i>LONG!</i>	981230	67.00	981230-C3	79.30		
	3/8	4	.060	II	.273	.052		2-1/2	895130	49.30	895130-C3	58.30		
3/8	4	.060	III	.273	.052		2-1/2	827830	51.70	827830-C3	60.70			
1/2	2	.010	I	.433			3	960430	74.50	960430-C3	87.90			
1/2	3	.080	II	.364	.069		3	871830	73.40	871830-C3	86.80			
1/2	4	.080	II	.364	.069		3	18330	63.20	18330-C3	76.60			
1/2	4	.080	III	.364	.069		3	820230	67.30	820230-C3	80.70			
1/2	6	.080	II	.364	.069		3	839230	69.00	839230-C3	82.40			
5/8	6	.080	II	.472	.069		3-1/2	952830	114.90	952830-C3	128.30			
3/4	6	.100	II	.563	.087		4	949330	172.00	949330-C3	186.50			
32.5°	1/8	2	.010	I	.095			1-1/2	18733	20.40	18733-C3	25.00		
	1/4	3	.060	II	.149	.047		2-1/2	18533	37.10	18533-C3	43.90		
	1/2	4	.080	II	.330	.063		3	18333	70.10	18333-C3	83.50		
35°	1/8	2	.010	I	.089			1-1/2	18735	19.30	18735-C3	23.90		
	1/8	3	.040	II	.061	.029		1-1/2	968635	19.30	968635-C3	23.90		
	3/16	2	.010	I	.134			2	72435	24.90	72435-C3	29.90		
	3/16	3	.040	II	.105	.029		2	978135	24.90	978135-C3	29.90		
	1/4	2	.010	I	.179			2-1/2	47635	45.50	47635-C3	52.30		
	1/4	3	.060	II	.136	.043		2-1/2	18535	35.80	18535-C3	42.60		
	3/8	2	.010	I	.268			2-1/2	72535	48.10	72535-C3	57.10		
	3/8	3	.060	II	.225	.043		2-1/2	18435	48.10	18435-C3	57.10		
	1/2	2	.010	I	.357			3	960435	76.30	960435-C3	89.70		
	1/2	4	.080	II	.300	.057		3	18335	67.30	18335-C3	80.70		

CHAMFER CUTTERS

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# CHAMFER CUTTERS

Pointed & Flat End (cont.)

continued from previous page

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 #
37.5°	D <sub>2</sub>		T <sub>(MAX.)</sub>										
40°													
41°													
42.5°													
45°	3 mm	2	.25 mm	I	1.50 mm		38 mm	900245	21.50	900245-C3	26.10		
	3 mm	3	1.00 mm	II	1.00 mm	.500 mm	38 mm	899545	21.50	899545-C3	26.10		
	1/8	2	.010	I	.063		1-1/2	18745	18.10	18745-C3	22.70	18745-C8	24.90
	1/8	2	.010	I	.063		3	50645	22.30	50645-C3	26.90	50645-C8	29.10
	1/8	3	.040	II	.043	.020	1-1/2	968645	18.80	968645-C3	23.40	968645-C8	25.60
	1/8	4	.040	II	.043	.020	1-1/2	866145	19.80	866145-C3	24.40		
	1/8	4	.040	III	.042	.020	1-1/2	802845	21.30	802845-C3	25.90		NEW
	4 mm	2	.25 mm	I	2.00 mm		50 mm	878445	27.40	878445-C3	32.40		
	4 mm	3	1.00 mm	II	1.50 mm	.500 mm	50 mm	863845	27.40	863845-C3	32.40		
	3/16	2	.010	I	.094		2	72445	25.20	72445-C3	30.20	72445-C8	32.00
	3/16	2	.010	I	.094		4	986945	35.80	986945-C3	42.60		
	3/16	3	.040	II	.074	.020	2	978145	30.30	978145-C3	35.30		
	3/16	4	.040	II	.074	.020	2	848745	31.70	848745-C3	36.70		
	3/16	4	.040	III	.073	.020	2	809745	33.20	809745-C3	38.20		NEW
	6 mm	2	.25 mm	I	3.00 mm		63 mm	840045	38.00	840045-C3	44.80		
	6 mm	3	1.50 mm	II	2.25 mm	.750 mm	63 mm	837745	38.00	837745-C3	44.80		
	1/4	2	.010	I	.125		2-1/2	47645	35.00	47645-C3	41.80	47645-C8	42.30
1/4	3	.060	II	.095	.030	2-1/2	18545	33.90	18545-C3	40.70	18545-C8	41.20	
1/4	3	.060	II	.095	.030	4	48545	44.40	48545-C3	48.60			
1/4	4	.060	II	.095	.030	2-1/2	876445	41.20	876445-C3	48.00			
1/4	4	.040	III	.105	.020	2-1/2	833145	44.20	833145-C3	51.00			
5/16	2	.010	I	.156		2-1/2	880345	41.20	880345-C3	49.10			
5/16	3	.060	II	.126	.030	2-1/2	977045	41.20	977045-C3	49.10			
5/16	4	.060	II	.126	.030	2-1/2	873245	43.90	873245-C3	51.80			

CHAMFER CUTTERS

continued on next page

## CHAMFER CUTTERS

Pointed &amp; Flat End (cont.)

continued from previous page

ANGLE PER SIDE	DIA.	FLUTES	TIP	TYPE	LOC	OAL	UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED		
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>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
45°	8 mm	3	1.50 mm	II	3.25 mm	.750 mm	63 mm	868845	50.30	868845-C3	58.20		
	3/8	2	.010	I	.188		2-1/2	72545	48.10	72545-C3	57.10	72545-C8	66.90
	3/8	3	.060	II	.158	.030	2-1/2	18445	45.20	18445-C3	54.20	18445-C8	64.00
	3/8	3	.060	II	.158	.030	4	LONG!	981245	67.00	981245-C3	79.30	
	3/8	4	.060	II	.158	.030	2-1/2	895145	51.20	895145-C3	60.20		
	3/8	4	.060	III	.158	.030	2-1/2	827845	53.90	827845-C3	62.90		
	10 mm	4	1.50 mm	II	4.25 mm	.750 mm	75 mm	871045	78.70	871045-C3	92.10		
	12 mm	4	1.50 mm	II	5.25 mm	.750 mm	75 mm	881245	78.70	881245-C3	92.10		
	1/2	2	.010	I	.250		3	960445	74.50	960445-C3	87.90	960445-C8	96.60
	1/2	3	.080	II	.210	.040	3	871845	73.40	871845-C3	86.80		
	1/2	4	.080	II	.210	.040	3	18345	63.20	18345-C3	76.60	18345-C8	85.30
	1/2	4	.080	II	.210	.040	6	LONG!	982445	112.20	982445-C3	125.60	
	1/2	4	.080	III	.210	.040	3	820245	67.30	820245-C3	80.70		
	1/2	6	.080	II	.210	.040	3	839245	69.00	839245-C3	82.40		
5/8	6	.080	II	.273	.040	3-1/2	952845	114.90	952845-C3	128.30			
3/4	6	.100	II	.325	.050	4	949345	172.00	949345-C3	186.50			
1	6	.120	II	.440	.060	4	884745	305.50	884745-C3	327.60			
50°	1/8	2	.010	I	.052		1-1/2	18750	19.30	18750-C3	23.90	18750-C8	26.10
	1/8	3	.040	II	.036	.017	1-1/2	968650	19.30	968650-C3	23.90		
	3/16	2	.010	I	.079		2	72450	24.90	72450-C3	29.90		
	3/16	3	.040	II	.062	.017	2	978150	30.90	978150-C3	35.90		
	1/4	2	.010	I	.105		2-1/2	47650	35.80	47650-C3	42.60		
	1/4	3	.060	II	.080	.025	2-1/2	18550	35.80	18550-C3	42.60		
	3/8	2	.010	I	.157		2-1/2	72550	48.10	72550-C3	57.10		
	3/8	3	.060	II	.132	.025	2-1/2	18450	48.10	18450-C3	57.10		
	1/2	2	.010	I	.210		3	960450	76.30	960450-C3	89.70		
1/2	4	.080	II	.176	.034	3	18350	67.30	18350-C3	80.70			
55°	1/8	2	.010	I	.044		1-1/2	18755	21.00	18755-C3	25.60		
	3/16	2	.010	I	.066		2	72455	25.90	72455-C3	30.90		
	1/4	2	.010	I	.088		2-1/2	47655	49.10	47655-C3	55.90		
	1/4	3	.060	II	.067	.021	2-1/2	18555	38.40	18555-C3	45.20		
	3/8	3	.060	II	.110	.021	2-1/2	18455	49.90	18455-C3	58.90		
	1/2	4	.080	II	.147	.028	3	18355	72.00	18355-C3	85.40		
60°	1/8	2	.010	I	.036		1-1/2	18760	18.10	18760-C3	22.70	18760-C8	24.90
	1/8	2	.010	I	.036		3	LONG!	50660	22.30	50660-C3	26.90	
	1/8	3	.040	II	.025	.012	1-1/2	968660	18.80	968660-C3	23.40		
	3/16	2	.010	I	.054		2	72460	24.40	72460-C3	29.40		
	3/16	3	.040	II	.043	.012	2	978160	30.30	978160-C3	35.30		
	1/4	2	.010	I	.072		2-1/2	47660	35.00	47660-C3	41.80		
	1/4	3	.060	II	.055	.017	2-1/2	18560	33.70	18560-C3	40.50		
	1/4	3	.060	II	.055	.017	4	LONG!	48560	44.40	48560-C3	48.60	
	5/16	3	.060	II	.073	.017	2-1/2	977060	41.20	977060-C3	49.10		
	3/8	2	.010	I	.108		2-1/2	72560	46.90	72560-C3	55.90		
	3/8	3	.060	II	.091	.017	2-1/2	18460	45.20	18460-C3	54.20		
	1/2	2	.010	I	.144		3	960460	74.50	960460-C3	87.90		
	1/2	4	.080	II	.121	.023	3	18360	63.20	18360-C3	76.60		
	5/8	6	.080	II	.157	.023	3-1/2	952860	114.90	952860-C3	128.30		
3/4	6	.100	II	.188	.029	4	949360	172.00	949360-C3	186.50			

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# CHAMFER CUTTERS

## Pointed & Flat End (cont.)

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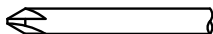
CHAMFER CUTTERS

ANGLE PER SIDE	DIA.	FLUTES	TIP	TYPE	LOC			OAL		UNCOATED		A1TiN COATED		TiB <sub>2</sub> COATED	
					L <sub>2</sub>	L <sub>4 (MAX.)</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE		
A <sub>1</sub> <sup>+0°30'</sup> <sub>-0°30'</sub>	D <sub>2</sub>		T (MAX.)												
65°	1/8	2	.010	I	.029			1-1/2	18765	19.80	18765-C3	24.40			
	3/16	2	.010	I	.044			2	72465	25.90	72465-C3	30.90			
	1/4	2	.010	I	.058			2-1/2	47665	47.20	47665-C3	54.00			
	1/4	3	.060	II	.044	.014		2-1/2	18565	37.10	18565-C3	43.90			
	3/8	3	.060	II	.073	.014		2-1/2	18465	49.90	18465-C3	58.90			
	1/2	4	.080	II	.098	.019		3	18365	70.10	18365-C3	83.50			
70°	1/8	2	.010	I	.023			1-1/2	18770	19.30	18770-C3	23.90			
	3/16	2	.010	I	.034			2	72470	24.90	72470-C3	29.90			
	1/4	2	.010	I	.045			2-1/2	47670	45.50	47670-C3	52.30			
	1/4	3	.060	II	.035	.011		2-1/2	18570	35.80	18570-C3	42.60			
	1/2	4	.080	II	.076	.015		3	18370	67.30	18370-C3	80.70			
75°	1/8	2	.010	I	.017			1-1/2	18775	21.00	18775-C3	25.60	18775-C8	27.80	
	1/8	3	.040	II	.011	.005		1-1/2	968675	21.00	968675-C3	25.60			
	3/16	2	.010	I	.025			2	72475	27.10	72475-C3	32.10			
	3/16	3	.040	II	.020	.005		2	978175	32.00	978175-C3	36.40			
	1/4	2	.010	I	.033			2-1/2	47675	38.40	47675-C3	45.20			
	1/4	3	.060	II	.025	.008		2-1/2	18575	39.10	18575-C3	45.90			
	3/8	2	.010	I	.050			2-1/2	72575	52.50	72575-C3	61.50			
	3/8	3	.060	II	.042	.008		2-1/2	18475	52.50	18475-C3	61.50			
	1/2	2	.010	I	.067			3	960475	83.30	960475-C3	96.70			
	1/2	4	.080	II	.056	.011		3	18375	73.50	18375-C3	86.90			
80°	1/8	2	.010	I	.011			1-1/2	18780	21.00	18780-C3	25.60			
	1/4	3	.060	II	.017	.005		2-1/2	18580	28.40	18580-C3	35.20			
	1/2	4	.080	II	.037	.007		3	18380	87.90	18380-C3	101.30			



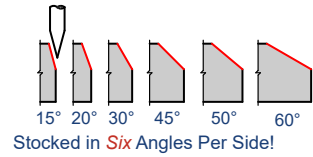
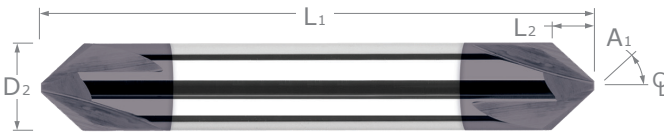
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# CHAMFER CUTTERS

## Pointed & Flat End – Double-Ended



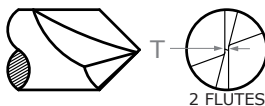
↻ Double-ended   ↻ Solid carbide   ↻ CNC ground in the USA

CHAMFER CUTTERS

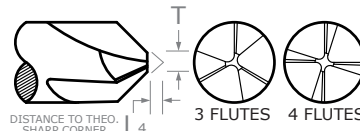
ANGLE PER SIDE	DIAMETER	FLUTES	TIP	TYPE	LENGTH OF CUT		OVERALL LENGTH	UNCOATED		A1 IN COATED	
					L2	L4 (MAX.)		TOOL #	PRICE	TOOL #	PRICE
A1 $\begin{matrix} +0^\circ30' \\ -0^\circ30' \end{matrix}$	D2		T (MAX.)		L2	L4 (MAX.)	L1	TOOL #	PRICE	TOOL #	PRICE
15°	1/8	2	.010	I	.233		1-1/2	988415	35.70	988415-C3	41.40
	1/4	2	.010	I	.467		2-1/2	977615	52.30	977615-C3	61.30
	1/4	3	.060	II	.355	.112	2-1/2	891015	58.10	891015-C3	67.10
	3/8	2	.010	I	.700		3	998315	75.80	998315-C3	87.00
	3/8	3	.060	II	.588	.112	2-1/2	934015	87.50	934015-C3	100.90
	1/2	4	.080	II	.784	.149	3	18615	105.40	18615-C3	123.80
20°	1/8	2	.010	I	.172		1-1/2	988420	35.70	988420-C3	41.40
	1/4	2	.010	I	.343		2-1/2	977620	52.30	977620-C3	61.30
	1/4	3	.060	II	.261	.082	2-1/2	891020	58.10	891020-C3	67.10
	3/8	2	.010	I	.515		2-1/2	998320	75.80	998320-C3	89.20
	3/8	3	.060	II	.433	.082	2-1/2	934020	87.50	934020-C3	100.90
	1/2	4	.080	II	.577	.110	3	18620	105.40	18620-C3	123.80
30°	1/8	2	.010	I	.108		1-1/2	988430	30.30	988430-C3	36.00
	3/16	2	.010	I	.162		2	902330	30.30	902330-C3	37.10
	3/16	3	.040	II	.128	.035	2	897130	40.50	897130-C3	47.30
	1/4	2	.010	I	.217		2-1/2	977630	46.70	977630-C3	55.70
	1/4	3	.060	II	.165	.052	2-1/2	891030	56.20	891030-C3	65.20
	3/8	2	.010	I	.325		2-1/2	998330	70.20	998330-C3	83.60
	3/8	3	.060	II	.273	.052	2-1/2	934030	78.80	934030-C3	92.20
	1/2	2	.010	I	.433		3	905830	95.00	905830-C3	113.40
	1/2	4	.080	II	.364	.069	3	18630	99.10	18630-C3	117.50
45°	1/8	2	.010	I	.063		1-1/2	988445	30.30	988445-C3	36.00
	1/8	3	.040	II	.043	.020	1-1/2	873945	40.10	873945-C3	45.80
	1/8	4	.040	II	.043	.020	1-1/2	808245	42.00	808245-C3	46.60
	3/16	2	.010	I	.094		2	902345	30.30	902345-C3	37.10
	3/16	3	.040	II	.074	.020	2	897145	40.10	897145-C3	46.90
	3/16	4	.040	II	.074	.020	2	808145	42.00	808145-C3	47.00
	1/4	2	.010	I	.125		2-1/2	977645	46.70	977645-C3	55.70
	1/4	3	.060	II	.095	.030	2-1/2	891045	56.20	891045-C3	65.20
	1/4	4	.060	II	.095	.030	2-1/2	842445	58.50	842445-C3	67.50
	5/16	3	.060	II	.126	.030	2-1/2	966645	61.90	966645-C3	73.10
	3/8	2	.010	I	.188		2-1/2	998345	70.20	998345-C3	83.60
	3/8	3	.060	II	.158	.030	2-1/2	934045	78.80	934045-C3	92.20
	3/8	4	.060	II	.158	.030	2-1/2	833645	81.90	833645-C3	95.30
	1/2	2	.010	I	.250		3	905845	95.00	905845-C3	113.40
	1/2	4	.080	II	.210	.040	3	18645	99.10	18645-C3	117.50
	5/8	4	.080	II	.273	.040	3-1/2	976445	143.30	976445-C3	163.30
	3/4	4	.100	II	.325	.050	4	984645	182.10	984645-C3	205.20

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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)



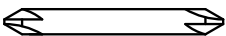
**CHAMFER CUTTERS**

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 (MAX.)</sub>		L <sub>1</sub>	TOOL #	PRICE	TOOL #
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>	TOOL #	PRICE	TOOL #	PRICE
50°	1/8	2	.010	I	.052		1-1/2	988450	30.30	988450-C3	36.00
	1/4	2	.010	I	.105		2-1/2	977650	46.70	977650-C3	55.70
	1/4	3	.060	II	.080	.025	2-1/2	891050	56.80	891050-C3	65.80
	3/8	2	.010	I	.157		2-1/2	998350	70.20	998350-C3	83.60
	3/8	3	.060	II	.132	.025	2-1/2	934050	79.50	934050-C3	92.90
	1/2	2	.010	I	.210		3	905850	95.00	905850-C3	113.40
	1/2	4	.080	II	.173	.034	3	18650	100.00	18650-C3	118.40
60°	1/8	2	.010	I	.036		1-1/2	988460	30.30	988460-C3	36.00
	3/16	2	.010	I	.054		2	902360	30.30	902360-C3	37.10
	1/4	2	.010	I	.072		2-1/2	977660	46.70	977660-C3	55.70
	1/4	3	.060	II	.055	.017	2-1/2	891060	56.20	891060-C3	65.20
	3/8	2	.010	I	.108		2-1/2	998360	70.20	998360-C3	83.60
	3/8	3	.060	II	.091	.017	2-1/2	934060	78.80	934060-C3	92.20
	1/2	2	.010	I	.144		3	905860	95.00	905860-C3	113.40
	1/2	4	.080	II	.121	.023	3	18660	99.10	18660-C3	117.50

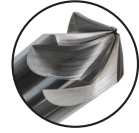
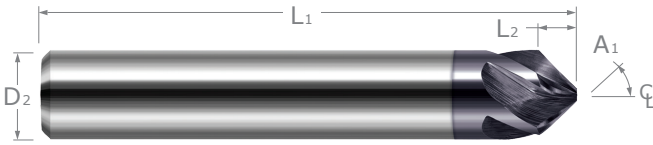
CHAMFER CUTTERS





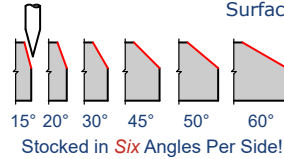
## CHAMFER CUTTERS

## Pointed &amp; 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
- Offered in Type I pointed and Type II flat end (non-cutting) styles
- 2, 3, 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			UNCOATED		A1TiN COATED	
					L2	L4 (MAX.)	L1	TOOL #	PRICE	TOOL #	PRICE
A1 $^{+0^{\circ}15'}$ $_{-0^{\circ}15'}$	D2 (h6)		T*								
15°	1/4	3	.060	II	.355	.116	2-1/2	831316	38.10	831316-C3	44.60
	1/4	5	.060	II	.355	.116	2-1/2	832516	40.30	832516-C3	46.70
	3/8	3	.070	II	.569	.134	2-1/2	831324	51.00	831324-C3	59.60
	3/8	5	.070	II	.569	.134	2-1/2	832524	53.10	832524-C3	61.60
	1/2	3	.080	II	.784	.153	3	831332	71.50	831332-C3	83.20
	1/2	5	.080	II	.784	.153	3	832532	73.70	832532-C3	85.40
20°	1/4	3	.060	II	.261	.085	2-1/2	844616	38.10	844616-C3	44.60
	1/4	5	.060	II	.261	.085	2-1/2	851416	40.30	851416-C3	46.70
	3/8	3	.070	II	.419	.099	2-1/2	844624	51.00	844624-C3	59.60
	3/8	5	.070	II	.419	.099	2-1/2	851424	53.10	851424-C3	61.60
	1/2	3	.080	II	.577	.113	3	844632	71.50	844632-C3	83.20
	1/2	5	.080	II	.577	.113	3	851432	73.70	851432-C3	85.40
30°	1/8	2	.010	I	.100		1-1/2	900108	22.40	900108-C3	27.00
	1/8	3	.040	II	.074	.036	1-1/2	916508	22.40	916508-C3	27.00
	1/8	5	.040	II	.074	.036	1-1/2	899008	24.70	899008-C3	29.10
	3/16	2	.010	I	.154		2	900112	30.30	900112-C3	35.00
	3/16	3	.050	II	.119	.045	2	916512	30.30	916512-C3	35.00
	3/16	4	.010	I	.154		2	889712	32.30	889712-C3	37.10
	3/16	5	.050	II	.119	.045	2	899012	32.30	899012-C3	37.10
	1/4	2	.010	I	.208		2-1/2	900116	38.10	900116-C3	44.60
	1/4	3	.060	II	.164	.054	2-1/2	916516	36.60	916516-C3	42.80
	1/4	4	.010	I	.208		2-1/2	889716	40.30	889716-C3	46.70
	1/4	5	.060	II	.164	.054	2-1/2	899016	38.80	899016-C3	44.90
	3/8	2	.010	I	.316		2-1/2	900124	51.00	900124-C3	59.60
	3/8	3	.070	II	.264	.062	2-1/2	916524	49.00	916524-C3	57.20
	3/8	4	.010	I	.316		2-1/2	889724	51.00	889724-C3	59.60
	3/8	5	.070	II	.264	.062	2-1/2	899024	49.00	899024-C3	57.20
	1/2	2	.010	I	.424		3	900132	71.50	900132-C3	83.20
1/2	3	.080	II	.364	.071	3	916532	68.70	916532-C3	80.00	

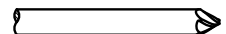
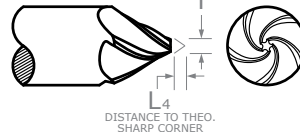
\* Tolerance for Type I is  $+ .000"/- .005"$ . Tolerance for type II is  $+ .002"/- .002"$ .

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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)



# CHAMFER CUTTERS

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

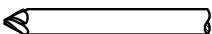
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CHAMFER CUTTERS

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 #	PRICE
A <sub>1</sub> <sup>+0°15'</sup> / <sub>-0°15'</sub>	D <sub>2</sub> (h6)		T*									
	30°	1/2	4	.010	I	.424		3	889732	71.50	889732-C3	83.20
		1/2	5	.080	II	.364	.071	3	899032	68.70	899032-C3	80.00
		5/8	3	.090	II	.463	.080	3	916540	70.90	916540-C3	82.20
		5/8	5	.090	II	.463	.080	3	899040	120.40	899040-C3	132.70
		3/4	3	.100	II	.562	.088	3	916548	170.60	916548-C3	183.90
		3/4	4	.015	I	.637		3	889748	177.50	889748-C3	191.30
3/4		5	.100	II	.562	.088	3	899048	172.80	899048-C3	186.10	
45°	1/8	2	.010	I	.058		1-1/2	860508	22.40	860508-C3	25.00	
	1/8	3	.040	II	.043	.021	1-1/2	897208	22.40	897208-C3	27.00	
	1/8	4	.010	I	.058		1-1/2	859708	24.70	859708-C3	29.30	
	1/8	5	.040	II	.043	.021	1-1/2	908408	24.70	908408-C3	29.10	
	3/16	2	.010	I	.089		2	860512	30.30	860512-C3	35.00	
	3/16	3	.050	II	.069	.026	2	897212	30.30	897212-C3	35.00	
	3/16	4	.010	I	.089		2	859712	32.30	859712-C3	37.10	
	3/16	5	.050	II	.069	.026	2	908412	32.30	908412-C3	37.10	
	1/4	2	.010	I	.120		2-1/2	860516	38.10	860516-C3	44.60	
	1/4	3	.060	II	.095	.031	2-1/2	897216	36.60	897216-C3	42.80	
	1/4	4	.010	I	.120		2-1/2	859716	40.30	859716-C3	46.70	
	1/4	5	.060	II	.095	.031	2-1/2	908416	38.80	908416-C3	44.90	
	5/16	3	.060	II	.126	.031	2-1/2	897220	46.40	897220-C3	54.30	
	5/16	5	.060	II	.126	.031	2-1/2	908420	46.40	908420-C3	54.30	
	3/8	2	.010	I	.183		2-1/2	860524	51.00	860524-C3	59.60	
	3/8	3	.070	II	.153	.036	2-1/2	897224	49.00	897224-C3	57.20	
	3/8	4	.010	I	.183		2-1/2	859724	51.00	859724-C3	59.60	
	3/8	5	.070	II	.153	.036	2-1/2	908424	49.00	908424-C3	57.20	
	1/2	2	.010	I	.245		3	860532	71.50	860532-C3	83.20	
	1/2	3	.080	II	.210	.041	3	897232	68.70	897232-C3	80.00	
1/2	4	.010	I	.245		3	859732	71.50	859732-C3	83.20		
1/2	5	.080	II	.210	.041	3	908432	68.70	908432-C3	80.00		
5/8	3	.090	II	.268	.046	3	897240	118.20	897240-C3	130.50		
5/8	5	.090	II	.268	.046	3	908440	120.40	908440-C3	132.70		
3/4	3	.100	II	.325	.051	3	897248	170.60	897248-C3	183.90		
3/4	4	.015	I	.368		3	859748	177.50	859748-C3	191.30		
3/4	5	.100	II	.325	.051	3	908448	172.80	908448-C3	186.10		
50°	1/4	3	.060	II	.080	.026	2-1/2	875016	38.10	875016-C3	44.60	
	1/4	5	.060	II	.080	.026	2-1/2	871116	40.30	871116-C3	46.70	
	3/8	3	.070	II	.128	.030	2-1/2	875024	51.00	875024-C3	59.60	
	3/8	5	.070	II	.128	.030	2-1/2	871124	53.10	871124-C3	61.60	
	1/2	3	.080	II	.176	.034	3	875032	71.50	875032-C3	83.20	
	1/2	5	.080	II	.176	.034	3	871132	73.70	871132-C3	85.40	

\* 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.)

continued from previous page

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 #
60°	A <sub>1</sub> <sup>+0°15'</sup> / <sub>-0°15'</sub>	D <sub>2</sub> (h6)	T*								
	1/8	2	.010	I	.033		1-1/2	872108	24.70	872108-C3	29.10
	3/16	2	.010	I	.051		2	872112	30.30	872112-C3	35.00
	3/16	4	.010	I	.051		2	888812	30.30	888812-C3	35.00
	1/4	2	.010	I	.069		2-1/2	872116	38.10	872116-C3	44.60
	1/4	3	.060	II	.057	.018	2-1/2	863416	36.60	863416-C3	42.80
	1/4	4	.010	I	.069		2-1/2	888816	40.30	888816-C3	46.70
	1/4	5	.060	II	.057	.018	2-1/2	867616	38.80	867616-C3	44.90
	3/8	2	.010	I	.105		2-1/2	872124	51.00	872124-C3	59.60
	3/8	3	.070	II	.091	.021	2-1/2	863424	49.00	863424-C3	57.20
	3/8	4	.010	I	.105		2-1/2	888824	53.10	888824-C3	61.60
	3/8	5	.070	II	.091	.021	2-1/2	867624	51.10	867624-C3	59.30
	1/2	2	.010	I	.141		3	872132	71.50	872132-C3	83.20
	1/2	3	.080	II	.126	.024	3	863432	68.70	863432-C3	80.00
	1/2	4	.010	I	.141		3	888832	71.50	888832-C3	83.20
	1/2	5	.080	II	.126	.024	3	867632	70.90	867632-C3	82.20
	5/8	3	.090	II	.157	.027	3	863440	118.20	863440-C3	130.50
	5/8	5	.090	II	.157	.027	3	867640	120.40	867640-C3	132.70
	3/4	3	.100	II	.195	.029	3	863448	170.60	863448-C3	183.90
	3/4	4	.015	I	.212		3	888848	177.50	888848-C3	191.30
3/4	5	.100	II	.195	.029	3	867648	172.80	867648-C3	186.10	

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

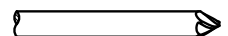


## The Multiple Uses of a Chamfer Mill

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

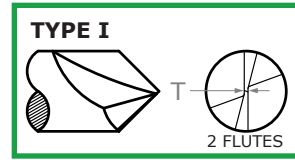
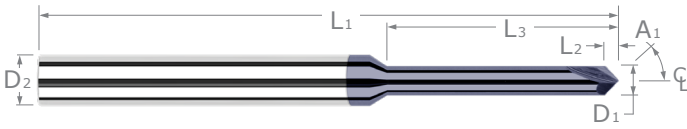
**The Multiple Uses of a Chamfer Mill.**

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

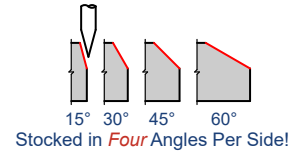


# CHAMFER CUTTERS

## 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



CHAMFER CUTTERS

ANGLE PER SIDE	NECK DIAMETER	OVERALL REACH	LENGTH OF CUT	TIP	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI 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	26.60		
	.031 (1/32)	.250 (8x)	.058	.005	1/8	2-1/2	57215	28.80		
	.062 (1/16)	.312 (5x)	.116	.006	1/8	2-1/2	54715	26.60		
	.062 (1/16)	.500 (8x)	.116	.006	1/8	2-1/2	55615	28.80		
	.093 (3/32)	.500 (5x)	.174	.006	1/8	2-1/2	52115	26.60		
	.093 (3/32)	.750 (8x)	.174	.006	1/8	2-1/2	53515	28.80		
30°	.031 (1/32)	.093 (3x)	.027	.005	1/8	1-1/2	994830	24.90	994830-C3	29.50
	.031 (1/32)	.156 (5x)	.027	.005	1/8	2-1/2	56830	26.60	56830-C3	31.20
	.031 (1/32)	.250 (8x)	.027	.005	1/8	2-1/2	57230	28.80	57230-C3	33.40
	.047 (3/64)	.250 (5x)	.041	.005	1/8	2-1/2	996830	26.30	996830-C3	30.90
	.062 (1/16)	.187 (3x)	.054	.006	1/8	1-1/2	998930	24.90	998930-C3	29.50
	.062 (1/16)	.312 (5x)	.054	.006	1/8	2-1/2	54730	26.60	54730-C3	31.20
	.062 (1/16)	.500 (8x)	.054	.006	1/8	2-1/2	55630	28.80	55630-C3	33.40
	.078 (5/64)	.406 (5x)	.068	.006	1/8	2-1/2	996930	26.30	996930-C3	30.90
	.093 (3/32)	.279 (3x)	.081	.006	1/8	1-1/2	995330	24.90	995330-C3	29.50
	.093 (3/32)	.500 (5x)	.081	.006	1/8	2-1/2	52130	26.60	52130-C3	31.20
.093 (3/32)	.750 (8x)	.081	.006	1/8	2-1/2	53530	28.80	53530-C3	33.40	
45°	.015 (1/64)	.078 (5x)	.008	.003	1/8	2-1/2	997545	29.60	997545-C3	34.20
	.015 (1/64)	.125 (8x)	.008	.003	1/8	2-1/2	995945	33.00	995945-C3	37.60
	.020	.100 (5x)	.010	.003	1/8	2-1/2	940245	29.00	940245-C3	33.60
	.020	.160 (8x)	.010	.003	1/8	2-1/2	948545	32.40	948545-C3	37.00
	.025	.125 (5x)	.013	.003	1/8	2-1/2	821945	29.00	821945-C3	33.60
	.031 (1/32)	.093 (3x)	.016	.005	1/8	1-1/2	994845	25.30	994845-C3	29.90
	.031 (1/32)	.125 (4x)	.016	.005	1/8	2-1/2	862745	26.60	862745-C3	31.20
	.031 (1/32)	.156 (5x)	.016	.005	1/8	2-1/2	56845	26.60	56845-C3	31.20
	.031 (1/32)	.187 (6x)	.016	.005	1/8	2-1/2	870845	27.70	870845-C3	32.30
	.031 (1/32)	.218 (7x)	.016	.005	1/8	2-1/2	855445	27.70	855445-C3	32.30
	.031 (1/32)	.250 (8x)	.016	.005	1/8	2-1/2	57245	28.80	57245-C3	33.40
	.031 (1/32)	.312 (10x)	.016	.005	1/8	2-1/2	838445	30.40	838445-C3	35.00
	.031 (1/32)	.375 (12x)	.016	.005	1/8	2-1/2	998245	32.10	998245-C3	36.70
	.031 (1/32)	.470 (15x)	.016	.005	1/8	2-1/2	918245	34.60	918245-C3	39.20
	.040	.203 (5x)	.020	.005	1/8	2-1/2	830645	26.70	830645-C3	31.30

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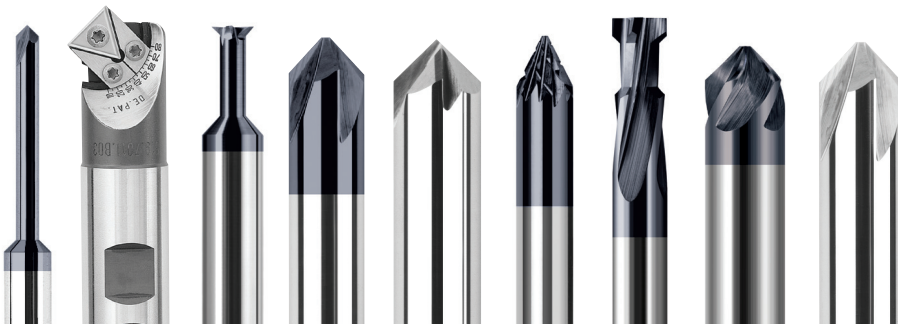
## CHAMFER CUTTERS

Pointed Long Reach (cont.)

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ANGLE PER SIDE	NECK DIAMETER	OVERALL REACH	LENGTH OF CUT	TIP	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI IN COATED		
							2 FL	PRICE	2 FL	PRICE	
45°	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
	.047 (3/64)	.141 (3x)	.024	.005	1/8	1-1/2	911045	24.70	911045-C3	29.30	
	.047 (3/64)	.250 (5x)	.024	.005	1/8	2-1/2	996845	26.70	996845-C3	31.30	
	.047 (3/64)	.375 (8x)	.024	.005	1/8	2-1/2	999245	28.80	999245-C3	33.40	
	.047 (3/64)	.570 (12x)	.024	.005	1/8	2-1/2	919045	31.50	919045-C3	36.10	
	.062 (1/16)	.187 (3x)	.031	.006	1/8	1-1/2	998945	25.30	998945-C3	29.90	
	.062 (1/16)	.250 (4x)	.031	.006	1/8	2-1/2	853945	26.60	853945-C3	31.20	
	.062 (1/16)	.312 (5x)	.031	.006	1/8	2-1/2	54745	26.60	54745-C3	31.20	
	.062 (1/16)	.375 (6x)	.031	.006	1/8	2-1/2	846045	27.70	846045-C3	32.30	
	.062 (1/16)	.437 (7x)	.031	.006	1/8	2-1/2	869745	27.70	869745-C3	32.30	
	.062 (1/16)	.500 (8x)	.031	.006	1/8	2-1/2	55645	28.80	55645-C3	33.40	
	.062 (1/16)	.625 (10x)	.031	.006	1/8	2-1/2	844145	30.40	844145-C3	35.00	
	.062 (1/16)	.750 (12x)	.031	.006	1/8	2-1/2	997245	32.10	997245-C3	36.70	
	.062 (1/16)	.950 (15x)	.031	.006	1/8	2-1/2	913345	34.60	913345-C3	39.20	
	.078 (5/64)	.234 (3x)	.039	.006	1/8	1-1/2	906645	24.70	906645-C3	29.30	
	.078 (5/64)	.406 (5x)	.039	.006	1/8	2-1/2	996945	26.70	996945-C3	31.30	
	.078 (5/64)	.625 (8x)	.039	.006	1/8	2-1/2	999545	28.80	999545-C3	33.40	
	.078 (5/64)	.940 (12x)	.039	.006	1/8	2-1/2	924045	31.50	924045-C3	36.10	
	.093 (3/32)	.279 (3x)	.047	.006	1/8	1-1/2	995345	25.30	995345-C3	29.90	
	.093 (3/32)	.375 (4x)	.047	.006	1/8	2-1/2	874345	26.60	874345-C3	31.20	
	.093 (3/32)	.500 (5x)	.047	.006	1/8	2-1/2	52145	26.60	52145-C3	31.20	
	.093 (3/32)	.585 (6x)	.047	.006	1/8	2-1/2	849445	27.70	849445-C3	32.30	
	.093 (3/32)	.670 (7x)	.047	.006	1/8	2-1/2	843045	27.70	843045-C3	32.30	
	.093 (3/32)	.750 (8x)	.047	.006	1/8	2-1/2	53545	28.80	53545-C3	33.40	
	.093 (3/32)	.950 (10x)	.047	.006	1/8	2-1/2	825645	30.40	825645-C3	35.00	
	.093 (3/32)	1.125 (12x)	.047	.006	1/8	2-1/2	999645	32.10	999645-C3	36.70	
	.093 (3/32)	1.400 (15x)	.047	.006	1/8	2-1/2	902845	34.60	902845-C3	39.20	
	60°	.031 (1/32)	.156 (5x)	.009	.005	1/8	2-1/2	56860	26.60		
.031 (1/32)		.250 (8x)	.009	.005	1/8	2-1/2	57260	28.80			
.062 (1/16)		.312 (5x)	.018	.006	1/8	2-1/2	54760	26.60			
.062 (1/16)		.500 (8x)	.018	.006	1/8	2-1/2	55660	28.80			
.093 (3/32)		.500 (5x)	.027	.006	1/8	2-1/2	52160	26.60			
.093 (3/32)		.750 (8x)	.027	.006	1/8	2-1/2	53560	28.80			

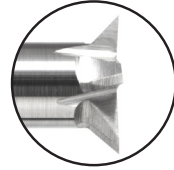
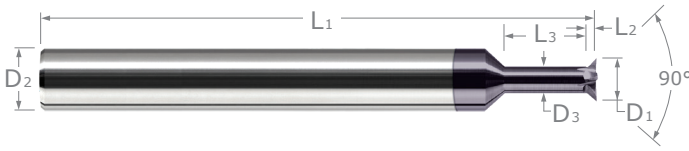
CHAMFER CUTTERS



Check Out All of Our Chamfering Solutions!

# CHAMFER CUTTERS

## Back Chamfer Cutters



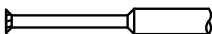
Left Hand Shear Flute & Right Hand Cut Evacuate Chips Away From Part

- 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

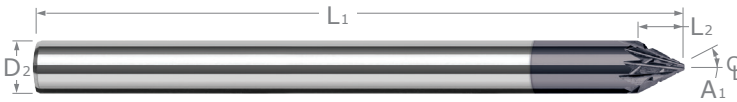
HEAD DIAMETER	AXIAL LOC	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIIIN COATED	
							TOOL #	PRICE	TOOL #	PRICE
$D_1 \begin{smallmatrix} +.000'' \\ -.001'' \end{smallmatrix}$	L <sub>2</sub>	D <sub>3</sub>	$L_3 \begin{smallmatrix} +.010'' \\ -.000'' \end{smallmatrix}$		D <sub>2</sub>	L <sub>1</sub>				
.055	.010	.033	<b>.093</b> (1.5x)	4	1/8	1-1/2	943355	61.10	943355-C3	65.70
.055	.010	.033	<b>.156</b> (3x)	4	1/8	1-1/2	938155	61.10	938155-C3	65.70
.055	.010	.033	<b>.250</b> (4.5x)	4	1/8	1-1/2	910355	60.50	910355-C3	65.10
.080	.014	.047	<b>.070</b> (0.8x)	4	1/8	1-1/2	906080	59.90	906080-C3	64.50
.080	.014	.047	<b>.140</b> (1.5x)	4	1/8	1-1/2	943380	59.90	943380-C3	64.50
.080	.014	.047	<b>.250</b> (3x)	4	1/8	1-1/2	938180	59.90	938180-C3	64.50
.080	.014	.047	<b>.375</b> (4.5x)	4	1/8	1-1/2	910380	59.40	910380-C3	64.00
.115	.020	.068	<b>.109</b> (0.8x)	4	1/8	1-1/2	906015	58.60	906015-C3	63.20
.115	.020	.068	<b>.218</b> (1.5x)	4	1/8	1-1/2	943410	58.60	943410-C3	63.20
.115	.020	.068	<b>.375</b> (3x)	4	1/8	1-1/2	938210	58.60	938210-C3	63.20
.115	.020	.068	<b>.562</b> (5x)	4	1/8	2	910410	60.50	910410-C3	65.10

D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L <sub>2</sub>	D <sub>3</sub>	L <sub>3</sub> $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
.135	.024	.081	.125 (0.8x)	5	3/16	2	906119	68.10	906119-C3	73.10
.135	.024	.081	.250 (1.5x)	5	3/16	2	943420	68.10	943420-C3	73.10
.135	.024	.081	.406 (3x)	5	3/16	2	938220	68.10	938220-C3	73.10
.135	.024	.081	.625 (5x)	5	3/16	2	910420	67.50	910420-C3	72.50
.165	.029	.101	.156 (0.8x)	5	3/16	2	906130	68.10	906130-C3	73.10
.165	.029	.101	.312 (2x)	5	3/16	2	943430	68.10	943430-C3	73.10
.165	.029	.101	.500 (3x)	5	3/16	2	938230	68.10	938230-C3	73.10
.165	.029	.101	.750 (4.5x)	5	3/16	2	910430	67.50	910430-C3	72.50
.210	.037	.130	.187 (0.8x)	5	1/4	2-1/2	906140	77.10	906140-C3	83.90
.210	.037	.130	.375 (1.5x)	5	1/4	2-1/2	943440	77.10	943440-C3	83.90
.210	.037	.130	.625 (3x)	5	1/4	2-1/2	938240	77.10	938240-C3	83.90
.210	.037	.130	1.000 (5x)	5	1/4	2-1/2	910440	76.50	910440-C3	83.30
.250	.044	.156	.250 (1x)	5	1/4	2-1/2	906116	77.10	906116-C3	83.90
.250	.044	.156	.437 (2x)	5	1/4	2-1/2	943416	77.10	943416-C3	83.90
.250	.044	.156	.750 (3x)	5	1/4	2-1/2	938216	77.10	938216-C3	83.90
.250	.044	.156	1.250 (5x)	5	1/4	3	910450	79.00	910450-C3	85.80
.312	.055	.196	.281 (0.8x)	6	5/16	2-1/2	906120	81.60	906120-C3	89.50
.312	.055	.196	.562 (2x)	6	5/16	2-1/2	943460	81.60	943460-C3	89.50
.312	.055	.196	1.500 (5x)	6	5/16	3	910460	83.60	910460-C3	91.50
.375	.066	.237	.375 (1x)	6	3/8	2-1/2	906124	88.00	906124-C3	97.00
.375	.066	.237	.750 (2x)	6	3/8	2-1/2	943470	88.00	943470-C3	97.00
.375	.066	.237	1.870 (5x)	6	3/8	4	910470	92.60	910470-C3	99.90
.500	.088	.317	.500 (1x)	6	1/2	3	906132	121.20	906132-C3	134.60
.500	.088	.317	1.000 (2x)	6	1/2	3	943480	121.20	943480-C3	134.60
.500	.088	.317	2.500 (5x)	6	1/2	4	910480	125.40	910480-C3	138.80



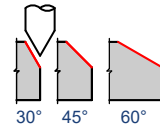
# CHAMFER CUTTERS

## Deburring 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

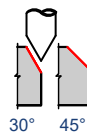
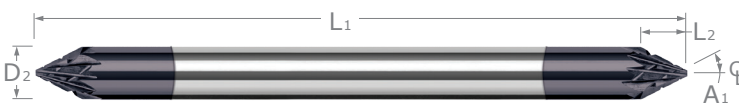


Stocked in **Three** Angles Per Side!

CHAMFER CUTTERS

### Single-Ended

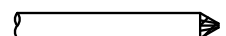
ANGLE PER SIDE	LOC	RIGHT HAND TEETH	LEFT HAND TEETH	MINOR DIA.	SHANK DIA.	OAL	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
$A_1 \begin{smallmatrix} +0^\circ30' \\ -0^\circ30' \end{smallmatrix}$	L <sub>2</sub>				D <sub>2</sub>	L <sub>1</sub>						
<b>30°</b>	.099	12	6	.012 (Max.)	1/8	2-1/2	58130	24.50	58130-C3	29.10		
	.207	12	6	.012 (Max.)	1/4	2-1/2	994030	34.80	994030-C3	41.60		
<b>45°</b>	.057	12	6	.012 (Max.)	1/8	2-1/2	58145	24.50	58145-C3	29.10	58145-C4	36.20
	.088	12	6	.012 (Max.)	3/16	2-1/2	891145	30.60	891145-C3	35.60	891145-C4	46.70
	.120	12	6	.012 (Max.)	1/4	2-1/2	994045	34.80	994045-C3	41.60	994045-C4	53.10
<b>60°</b>	.033	12	6	.012 (Max.)	1/8	2-1/2	58160	24.50	58160-C3	29.10		



Stocked in **Two** Angles Per Side!

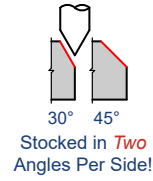
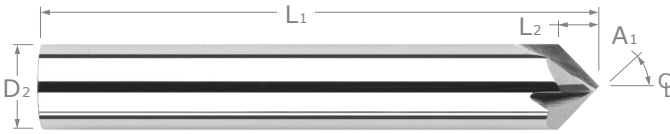
### Double-Ended

ANGLE PER SIDE	LENGTH OF CUT	RIGHT HAND TEETH	LEFT HAND TEETH	MINOR DIAMETER	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
							TOOL #	PRICE	TOOL #	PRICE
$A_1 \begin{smallmatrix} +0^\circ30' \\ -0^\circ30' \end{smallmatrix}$	L <sub>2</sub>				D <sub>2</sub>	L <sub>1</sub>				
<b>30°</b>	.099	12	6	.012 (Max.)	1/8	2-1/2	898330	36.80	898330-C3	42.50
	.057	12	6	.012 (Max.)	1/8	2-1/2	898345	36.80	898345-C3	42.50
<b>45°</b>	.088	12	6	.012 (Max.)	3/16	2-1/2	879745	44.20	879745-C3	51.00
	.120	12	6	.012 (Max.)	1/4	2-1/2	867545	52.30	867545-C3	61.30



# CHAMFER CUTTERS

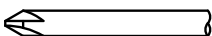
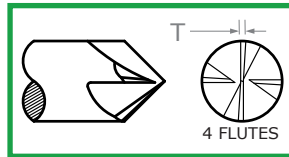
Cobalt – Pointed



CHAMFER CUTTERS

- ⚡ 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

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	38.80
	.325	.010	3/8	2-1/2	18124	46.70
	.433	.010	1/2	3	18132	60.20
<b>45°</b>	.125	.010	1/4	2	18016	38.80
	.188	.010	3/8	2-1/2	18024	46.70
	.250	.010	1/2	3	18032	60.20





## CHAMFER CUTTERS

### Adjustable 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	344.80
1	3-3/4	81260	344.80

DESCRIPTION	TOOL #	PRICE	
TPET-321 Insert with TiN Coating	60031	130.00	(Box of 10)
TPET-321-AL Insert for Non-Ferrous Materials	60038	143.00	(Box of 10)
Clamp Plate (Replacement)	81245	20.10	(Each)
Screw (Replacement)	81247	7.50	(Each)
Seat Pocket (Replacement)	81249	73.40	(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

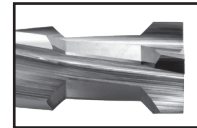
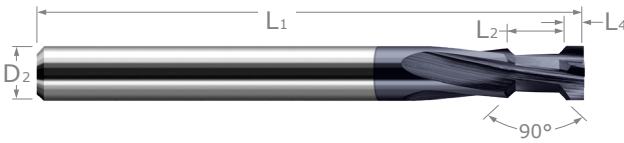
  

\* CORNER RADIUS NOT INCLUDED IN DIMENSIONS

# CHAMFER CUTTERS

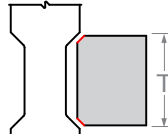
## Plate Chamfer Cutters

CHAMFER CUTTERS

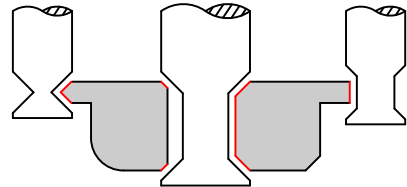


Cutting Along Entirety of Concave Form

- 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

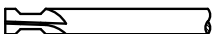
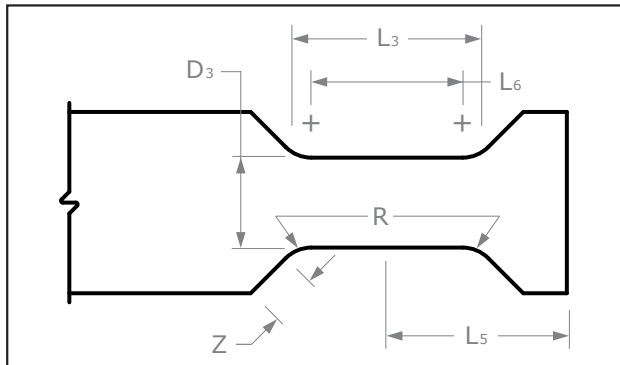


Capable of Performing Full Form Engagement, Light Profiling, & Edge Trimming

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		
										4 FL	PRICE	4 FL	PRICE	
L <sub>2</sub> <sup>+0.001"</sup> / <sub>-0.001"</sub>	L <sub>3</sub>	Z	D <sub>3</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	L <sub>6</sub>	R (MAX.)	L <sub>4</sub>	L <sub>5</sub> <sup>+0.001"</sup> / <sub>-0.001"</sub>	T	D <sub>2</sub>	L <sub>1</sub>	4 FL	PRICE	4 FL	PRICE
.037	.010	.015	.096	.008	.006	.040	.059	.031	1/8	1-1/2	955202	51.70	955202-C3	56.30
.068	.037	.022	.091	.029	.006	.040	.074	.062	1/8	1-1/2	955204	51.70	955204-C3	56.30
.074	.012	.044	.184	.001	.008	.060	.097	.068	1/4	2-1/2	971104	57.20	971104-C3	64.00
.099	.037	.044	.184	.026	.008	.060	.110	.093	1/4	2-1/2	971106	57.20	971106-C3	64.00
.135	.104	.022	.091	.096	.006	.040	.108	.125	1/8	1-1/2	955208	51.70	955208-C3	56.30
.135	.073	.044	.184	.062	.008	.060	.128	.125	1/4	2-1/2	971108	57.20	971108-C3	64.00
.197	.135	.044	.184	.124	.008	.060	.159	.187	1/4	2-1/2	971112	57.20	971112-C3	64.00
.197	.105	.065	.278	.093	.008	.060	.159	.187	3/8	2-1/2	980812	71.60	980812-C3	80.60
.260	.198	.044	.184	.187	.008	.060	.190	.250	1/4	2-1/2	971116	57.20	971116-C3	64.00
.260	.137	.087	.372	.126	.008	.060	.190	.250	1/2	3	965916	109.00	965916-C3	122.40
.385	.293	.065	.278	.281	.008	.060	.253	.375	3/8	2-1/2	980824	71.60	980824-C3	80.60
.385	.262	.087	.372	.251	.008	.060	.253	.375	1/2	3	965924	109.00	965924-C3	122.40
.510	.387	.087	.372	.376	.008	.060	.315	.500	1/2	3	965932	109.00	965932-C3	122.40

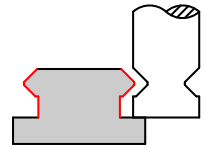
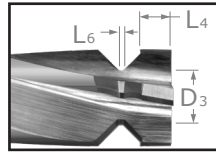
\*Nominal Plate Thickness is ideal thickness of plate for chamfering top and bottom simultaneously.

For additional tool dimensions, search for keyword **PLATECHAMFER** on [www.harveytool.com](http://www.harveytool.com).



# PICATINNY FORM CUTTERS

## Picatinny Rail Form Cutters

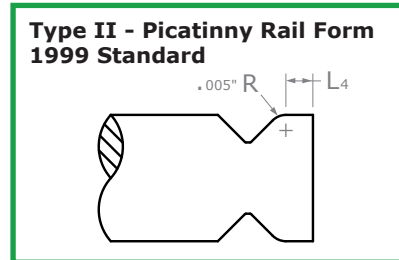
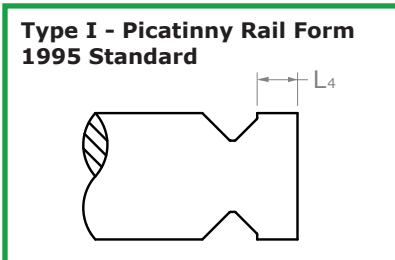


- Designed to the MIL-STD-1913 specifications
- Mill the entire Picatinny Rail in a single pass without tool changes
- Choose from two types:
  - **Type I:** Slight undercut at end of End Length (L4)
  - **Type II:** .005" radius tangent to angle and End Length (L4)
- Cutting on entirety of concave form 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!**

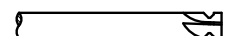
PICATINNY FORM CUTTERS

	CUTTER DIAMETER	LENGTH OF CUT	MINOR DIAMETER	MINOR DIA. LENGTH (TSC)	END LENGTH	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED	
									4 FL	PRICE	4 FL	PRICE
	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.008"</sup> / <sub>-.000"</sub>	D <sub>3</sub> <sup>+0.001"</sup> / <sub>-.001"</sub>	L <sub>6</sub>	L <sub>4</sub>		D <sub>2</sub>	L <sub>1</sub>				
NEW	.500 (1/2)	.377	.282	.021	.160	I	1/2	3	875632	139.70	875632-C8	161.80
NEW	.500 (1/2)	.377	.282	.021	.137	II	1/2	3	830032	139.70	830032-C8	161.80
NEW	.625 (5/8)	.377	.407	.021	.160	I	5/8	3-1/2	875640	160.00	875640-C8	192.20



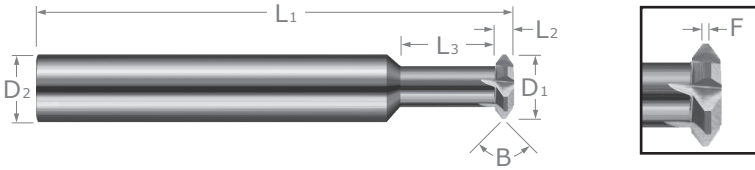
View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)



# 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>-0.002"</sub>	F	L <sub>2</sub> <sup>+0.002"</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>	6 FL	PRICE	6 FL	PRICE
<b>90°</b>	.500 (1/2)	.021	.2075	1/4	.375	1/2	3	859232	125.40	859232-C8	147.50
	.625 (5/8)	.021	.2075	3/8	.500	5/8	3-1/2	859240	163.30	859240-C8	195.50

NEW

NEW

# 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>-0.000"</sub>	R <sup>+0.001"</sup> <sub>-0.001"</sub>	L <sub>2</sub> <sup>+0.008"</sup> <sub>-0.000"</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	33.60	864806-C8	40.90
.206	.005	.118	1/4	2-1/2	874406	36.90	874406-C8	44.20
.206	.010	.118	1/4	2-1/2	862606	36.90	862606-C8	44.20
.210	<b>SHARP!</b>	.118	1/4	2-1/2	864810	33.60	864810-C8	40.90
.210	.005	.118	1/4	2-1/2	874410	36.90	874410-C8	44.20
.210	.010	.118	1/4	2-1/2	862610	36.90	862610-C8	44.20

NEW

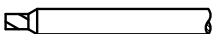
NEW

NEW

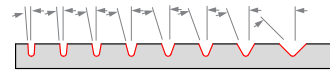
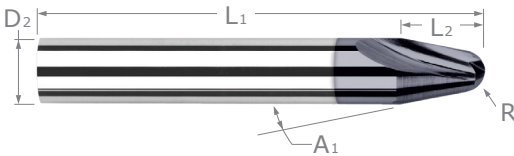
NEW

NEW

NEW



# RUNNER CUTTERS



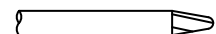
3° 5° 10° 15° 20° 22.5° 30° 45°

Stocked in *Eight* Angles Per Side!

- ↳ Designed to mill 3°, 5°, 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

ANGLE PER SIDE A <sub>1</sub> $\begin{matrix} +0^{\circ}30' \\ -0^{\circ}30' \end{matrix}$	RADIUS R $\begin{matrix} +.0005'' \\ -.0005'' \end{matrix}$	LENGTH OF CUT L <sub>2</sub>	SHANK DIAMETER D <sub>2</sub> (h6)	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AITiN COATED		AITiN NANO COATED	
					2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
<b>3°</b>	1/64	.921	1/8	1-1/2	843600	43.00	843600-C3	47.60		
	1/32	.631	1/8	1-1/2	843602	43.00	843602-C3	47.60		
	1/16	.666	3/16	2	843604	47.40	843604-C3	52.40		
<b>5°</b>	1/64	.557	1/8	1-1/2	936300	43.00	936300-C3	47.60		
	1/32	.390	1/8	1-1/2	936302	43.00	936302-C3	47.60		
	3/64	.579	3/16	2	936303	47.40	936303-C3	52.40		
	1/16	.422	3/16	2	936304	47.40	936304-C3	52.40		
	3/32	.812	5/16	2-1/2	936306	60.80	936306-C3	68.70		
	1/8	.834	3/8	2-1/2	936308	68.20	936308-C3	77.20		
<b>10°</b>	.005	.331	1/8	1-1/2	75050	37.80	75050-C3	42.40		
	.010	.307	1/8	1-1/2	75052	37.80	75052-C3	42.40	75052-C6	44.60
	1/64	.283	1/8	1-1/2	75000	37.80	75000-C3	42.40	75000-C6	44.60
	.020	.259	1/8	1-1/2	75001	37.80	75001-C3	42.40	75001-C6	44.60
	.025	.235	1/8	1-1/2	75054	37.80	75054-C3	42.40		
	1/32	.384	3/16	2	75002	43.00	75002-C3	48.00	75002-C6	50.30
	.040	.341	3/16	2	75062	47.40	75062-C3	52.40		
	3/64	.308	3/16	2	75003	47.40	75003-C3	52.40		
	1/16	.414	1/4	2-1/2	75004	53.10	75004-C3	59.90	75004-C6	63.10
	5/64	.338	1/4	2-1/2	75005	54.40	75005-C3	61.20		
	3/32	.444	5/16	2-1/2	75006	60.80	75006-C3	68.70		
	7/64	.367	5/16	2-1/2	75007	61.00	75007-C3	68.90		
	1/8	.469	3/8	2-1/2	75008	68.20	75008-C3	77.20		
5/32	.675	1/2	3	75010	80.20	75010-C3	93.60			
<b>15°</b>	.005	.219	1/8	1-1/2	75150	38.40	75150-C3	43.00		
	.010	.205	1/8	1-1/2	75152	37.80	75152-C3	42.40	75152-C6	44.60
	1/64	.190	1/8	1-1/2	75100	37.80	75100-C3	42.40	75100-C6	44.60
	.020	.176	1/8	1-1/2	75101	37.80	75101-C3	42.40	75101-C6	44.60
	.025	.162	1/8	1-1/2	75154	37.80	75154-C3	42.40		
	1/32	.261	3/16	2	75102	43.00	75102-C3	48.00	75102-C6	50.30
	.040	.235	3/16	2	75162	47.40	75162-C3	52.40		
	3/64	.215	3/16	2	75103	47.40	75103-C3	52.40		
	1/16	.289	1/4	2-1/2	75104	53.10	75104-C3	59.90	75104-C6	63.10
	5/64	.243	1/4	2-1/2	75105	54.40	75105-C3	61.20		
	3/32	.317	5/16	2-1/2	75106	60.80	75106-C3	68.70		
	7/64	.271	5/16	2-1/2	75107	61.00	75107-C3	68.90		
	1/8	.342	3/8	2-1/2	75108	68.20	75108-C3	77.20		
5/32	.486	1/2	3	75110	80.20	75110-C3	93.60			

continued on next page



# RUNNER CUTTERS

(cont.)

continued from previous page

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>						
<b>20°</b>	.005	.162	1/8	1-1/2	979950	39.50	979950-C3	44.10		
	.010	.152	1/8	1-1/2	979952	39.50	979952-C3	44.10		
	1/64	.143	1/8	1-1/2	979900	37.80	979900-C3	42.40	979900-C6	44.60
	.020	.133	1/8	1-1/2	979901	40.60	979901-C3	45.20	979901-C6	47.40
	.025	.124	1/8	1-1/2	979954	40.60	979954-C3	45.20		
	1/32	.198	3/16	2	979902	43.00	979902-C3	48.00		
	3/64	.167	3/16	2	979903	47.40	979903-C3	52.40		
	1/16	.224	1/4	2-1/2	979904	53.10	979904-C3	59.90		
	5/64	.193	1/4	2-1/2	979905	54.40	979905-C3	61.20		
	3/32	.250	5/16	2-1/2	979906	60.80	979906-C3	68.70		
1/8	.275	3/8	2-1/2	979908	68.20	979908-C3	77.20			
<b>22.5°</b>	1/64	.127	1/8	1-1/2	867800	37.80	867800-C3	42.40		
	1/32	.176	3/16	2	867802	43.00	867802-C3	48.00		
	1/16	.277	5/16	2-1/2	867804	60.80	867804-C3	68.30		
<b>30°</b>	.005	.157	3/16	2	934550	56.10	934550-C3	61.10		
	.010	.152	3/16	2	934552	56.10	934552-C3	61.10		
	1/64	.147	3/16	2	934500	54.40	934500-C3	59.40		
	.020	.142	3/16	2	934501	54.40	934501-C3	59.40		
	1/32	.186	1/4	2-1/2	934502	54.40	934502-C3	61.20	934502-C6	64.40
	3/64	.224	5/16	2-1/2	934503	60.80	934503-C3	68.70		
	1/16	.263	3/8	2-1/2	934504	68.20	934504-C3	77.20		
<b>45°</b>	1/64	.119	1/4	2-1/2	856500	55.50	856500-C3	62.30		
	1/32	.143	5/16	2-1/2	856502	61.80	856502-C3	69.70		
	3/64	.168	3/8	2-1/2	856503	69.50	856503-C3	78.50		
	1/16	.224	1/2	3	856504	83.90	856504-C3	97.30		

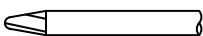
RUNNER CUTTERS



## Multi-Functional Tools Every Shop Should Have

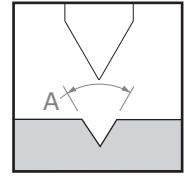
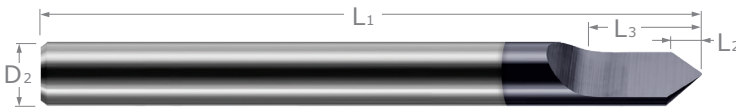
Is your shop trying to become more efficient? Which shop isn't? Learn how these 5 tools can go a long way toward reducing your cycle times and boosting your shop's daily output in our "In the Loupe" blog post **Multi-Functional Tools Every Shop Should Have**.

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

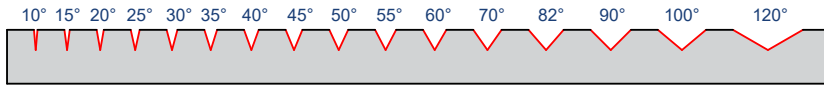


## ENGRAVING CUTTERS

Pointed



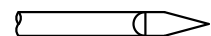
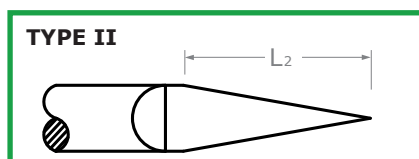
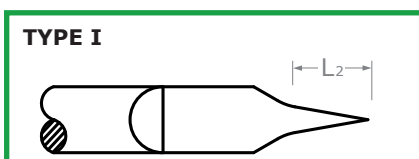
- ↻ Ground to a point    ↻ Half-round drill style
- ↻ Relieved for right hand milling    ↻ Solid carbide    ↻ CNC ground in the USA

Stocked in *Sixteen* Included Angles!

mm &amp; in

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	21.20	996508-C3	25.80		
	3/16	.080	I	1/4	2	996512	21.40	996512-C3	26.40		
	1/4	.080	I	5/16	2-1/2	996516	25.90	996516-C3	32.70		
15°	1/8	.080	I	.200	1-1/2	998108	21.20	998108-C3	25.80		
	3/16	.080	I	1/4	2	998112	21.40	998112-C3	26.40		
	1/4	.080	I	5/16	2-1/2	998116	25.90	998116-C3	32.70		
20°	1/8	.080	I	.200	1-1/2	999708	21.20	999708-C3	25.80	999708-C4	32.90
	3/16	.080	I	1/4	2	999712	21.40	999712-C3	26.40		
	1/4	.080	I	5/16	2-1/2	999716	25.90	999716-C3	32.70		
25°	1/8	.080	I	.200	1-1/2	983808	21.20	983808-C3	25.80		
	3/16	.080	I	1/4	2	983812	21.40	983812-C3	26.40		
	1/4	.080	I	5/16	2-1/2	983816	25.90	983816-C3	32.70		
30°	1/8	.080	I	.200	1-1/2	981508	19.00	981508-C3	23.60		
	1/8	.233	II	3/8	1-1/2	25010	14.50	25010-C3	19.10	25010-C4	26.20
	1/8	.233	II	3/8	4 <i>LONG!</i>	941708	23.90	941708-C3	30.10		
	3/16	.350	II	3/8	2	25020	18.80	25020-C3	23.80		
	1/4	.466	II	1/2	2-1/2	25030	23.30	25030-C3	30.10		
35°	1/8	.198	II	3/8	1-1/2	853508	17.10	853508-C3	21.70		
40°	1/8	.080	I	.200	1-1/2	978608	19.90	978608-C3	24.50		
	1/8	.171	II	3/8	1-1/2	25110	15.10	25110-C3	19.70	25110-C4	26.80
	1/8	.171	II	3/8	4 <i>LONG!</i>	937808	24.90	937808-C3	31.10		
	3/16	.257	II	3/8	2	25120	20.10	25120-C3	25.10		
	1/4	.343	II	3/8	2-1/2	25130	24.40	25130-C3	31.20		
45°	1/8	.151	II	3/8	1-1/2	997308	15.80	997308-C3	20.40	997308-C4	27.50
	3/16	.226	II	3/8	2	997312	20.30	997312-C3	25.30		
	1/4	.302	II	3/8	2-1/2	997316	25.30	997316-C3	32.10		
50°	1/8	.134	II	3/8	1-1/2	998408	15.90	998408-C3	20.50		
	3/16	.201	II	3/8	2	998412	20.70	998412-C3	25.40		
	1/4	.268	II	3/8	2-1/2	998416	25.90	998416-C3	32.70		
55°	1/8	.120	II	3/8	1-1/2	855508	17.10	855508-C3	21.70		

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# ENGRAVING CUTTERS

Pointed (cont.)



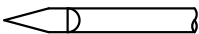
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INCL. ANGLE	DIA.	LENGTH OF CUT	TYPE	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
A	D <sub>2</sub>	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>						
60°	3 mm	2.60 mm	II	10 mm	38 mm	898657	16.60	898657-C3	21.20		
	1/8	.108	II	3/8	1-1/2	30010	14.50	30010-C3	19.10	30010-C4	26.20
	1/8	.108	II	3/8	4	30410	23.90	30410-C3	30.10	30410-C4	35.60
	3/16	.162	II	3/8	2	30020	18.80	30020-C3	23.80	30020-C4	34.90
	3/16	.162	II	3/8	4	30420	31.50	30420-C3	38.30		
	6 mm	5.20 mm	II	10 mm	63 mm	898666	26.90	898666-C3	33.70		
	1/4	.216	II	3/8	2-1/2	30030	23.30	30030-C3	30.10	30030-C4	41.60
	1/4	.216	II	3/8	6	30430	45.20	30430-C3	54.20		
70°	1/8	.089	II	3/8	1-1/2	937208	15.90	937208-C3	20.50		
	3/16	.134	II	3/8	2	937212	20.70	937212-C3	25.40		
	1/4	.179	II	3/8	2-1/2	937216	25.90	937216-C3	32.70		
82°	1/8	.072	II	3/8	1-1/2	971708	15.90	971708-C3	20.50		
	3/16	.108	II	3/8	2	971712	20.70	971712-C3	25.40		
	1/4	.144	II	3/8	2-1/2	971716	25.90	971716-C3	32.70		
90°	3 mm	1.50 mm	II	10 mm	38 mm	884157	16.60	884157-C3	21.20		
	1/8	.062	II	3/8	1-1/2	30110	14.50	30110-C3	19.10	30110-C4	26.20
	1/8	.062	II	3/8	4	30510	23.90	30510-C3	30.10		
	3/16	.093	II	3/8	2	30120	18.80	30120-C3	23.80	30120-C4	34.90
	3/16	.093	II	3/8	4	30520	31.50	30520-C3	38.30		
	6 mm	3.00 mm	II	10 mm	63 mm	884166	26.90	884166-C3	33.70		
	1/4	.125	II	3/8	2-1/2	30130	23.30	30130-C3	30.10	30130-C4	41.60
	1/4	.125	II	3/8	6	30530	45.20	30530-C3	54.20		
100°	1/8	.052	II	3/8	1-1/2	983508	15.90	983508-C3	20.50		
	3/16	.079	II	3/8	2	983512	20.70	983512-C3	25.40		
	1/4	.105	II	3/8	2-1/2	983516	25.90	983516-C3	32.70		
120°	1/8	.036	II	3/8	1-1/2	990508	14.50	990508-C3	19.10		
	3/16	.054	II	3/8	2	990512	18.80	990512-C3	23.80		
	1/4	.072	II	3/8	2-1/2	990516	23.30	990516-C3	30.10		

ENGRAVING CUTTERS



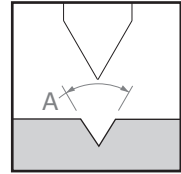
**Check Out All of Our Engraving Solutions!**



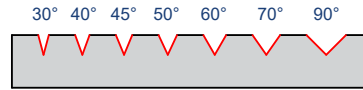


## ENGRAVING CUTTERS

Pointed – Double-Ended

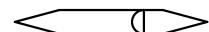
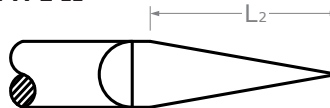


- ↻ Double-ended
- ↻ 180° opposing split lengths for improved balance at higher RPMs
- ↻ Ground to a point
- ↻ Half-round drill style
- ↻ Relieved for right hand milling
- ↻ Solid carbide
- ↻ CNC ground in the USA

Stocked in **Seven** Included Angles!

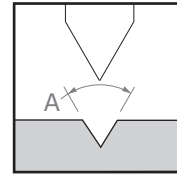
INCLUDED ANGLE	DIA.	LENGTH OF CUT	TYPE	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
A	D <sub>2</sub>	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>						
30°	1/8	.233	II	3/8	2	938408	25.00	938408-C3	30.70		
	3/16	.350	II	3/8	2	938410	31.00	938410-C3	37.80		
	1/4	.466	II	1/2	2-1/2	938412	36.90	938412-C3	45.90		
40°	1/8	.172	II	3/8	2	854008	27.10	854008-C3	32.80		
	3/16	.258	II	3/8	2	854010	33.20	854010-C3	40.00		
	1/4	.343	II	3/8	2-1/2	854012	39.40	854012-C3	48.40		
45°	1/8	.151	II	3/8	2	854508	27.10	854508-C3	32.80		
	3/16	.226	II	3/8	2	854510	33.20	854510-C3	40.00		
	1/4	.302	II	3/8	2-1/2	854512	39.40	854512-C3	48.40		
50°	1/8	.134	II	3/8	2	855008	27.10	855008-C3	32.80		
	3/16	.201	II	3/8	2	855010	33.20	855010-C3	40.00		
	1/4	.268	II	3/8	2-1/2	855012	39.40	855012-C3	48.40		
60°	1/8	.108	II	3/8	2	954608	25.00	954608-C3	30.70	954608-C4	45.90
	3/16	.162	II	3/8	2	954610	31.00	954610-C3	37.80		
	1/4	.216	II	3/8	2-1/2	954612	36.90	954612-C3	45.90		
70°	1/8	.089	II	3/8	2	857008	27.10	857008-C3	32.80		
	3/16	.134	II	3/8	2	857010	33.20	857010-C3	40.00		
	1/4	.179	II	3/8	2-1/2	857012	39.40	857012-C3	48.40		
90°	1/8	.062	II	3/8	2	975108	25.00	975108-C3	30.70	975108-C4	45.90
	3/16	.093	II	3/8	2	975110	31.00	975110-C3	37.80		
	1/4	.125	II	3/8	2-1/2	975112	36.90	975112-C3	45.90		

## TYPE II

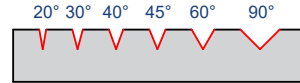


# ENGRAVING CUTTERS

## Pointed – Pyramid Point



- ⚡ 3 facet design increases tip strength
- ⚡ Ground to a point
- ⚡ Solid carbide
- ⚡ CNC ground in the USA



Stocked in **Six** Included Angles!

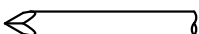
ENGRAVING CUTTERS

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>				
<b>20°</b>	1/8	.354	1-1/2	842810	24.70	842810-C3	29.30
<b>30°</b>	1/8	.233	1-1/2	842815	24.70	842815-C3	29.30
	3/16	.350	2	822015	26.90	822015-C3	31.90
	1/4	.467	2-1/2	834015	38.30	834015-C3	45.10
<b>40°</b>	1/8	.172	1-1/2	842820	24.70	842820-C3	29.30
<b>45°</b>	1/8	.151	1-1/2	842823	24.70	842823-C3	29.30
	1/4	.302	2-1/2	834023	26.90	834023-C3	33.70
<b>60°</b>	1/8	.108	1-1/2	842830	24.70	842830-C3	29.30
	3/16	.162	2	822030	26.90	822030-C3	31.90
	1/4	.217	2-1/2	834030	38.30	834030-C3	45.10
<b>90°</b>	1/8	.063	1-1/2	842845	24.70	842845-C3	29.30
	3/16	.094	2	822045	26.90	822045-C3	31.90
	1/4	.125	2-1/2	834045	38.30	834045-C3	45.10



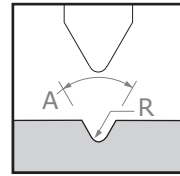
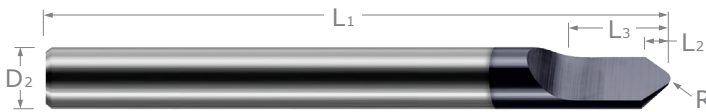
View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)

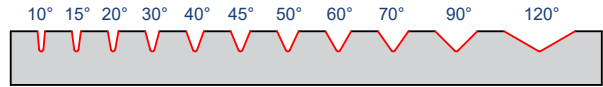


## ENGRAVING CUTTERS

## Tip Radius

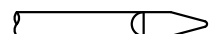


- ↪ Radius on tip creates radius in bottom of groove and improves strength
- ↪ Half-round drill style
- ↪ Relieved for right-hand milling
- ↪ Solid carbide ↪ CNC ground in the USA

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	23.40	940410-C3	28.00		
	1/8	.0100	.080	I	.200	1-1/2	948010	23.40	948010-C3	28.00		
15°	1/8	.0050	.080	I	.200	1-1/2	952910	23.40	952910-C3	28.00		
	1/8	.0100	.080	I	.200	1-1/2	963510	23.40	963510-C3	28.00		
20°	1/8	.0050	.080	I	.200	1-1/2	989310	23.40	989310-C3	28.00		
	1/8	.0100	.080	I	.200	1-1/2	956010	23.40	956010-C3	28.00		
30°	1/8	.0025	.226	II	3/8	1-1/2	72715	21.50	72715-C3	26.10	72715-C4	33.20
	1/8	.0050	.219	II	3/8	1-1/2	47510	21.50	47510-C3	26.10	47510-C4	33.20
	1/8	.0100	.207	II	3/8	1-1/2	48810	21.50	48810-C3	26.10	48810-C4	33.20
	1/8	.0150	.190	II	3/8	1-1/2	49710	21.50	49710-C3	26.10		
	1/8	.0200	.176	II	3/8	1-1/2	58610	21.50	58610-C3	26.10		
	1/8	.0300	.147	II	3/8	1-1/2	868910	21.50	868910-C3	26.10		
	3/16	.0050	.336	II	3/8	2	47520	26.20	47520-C3	31.20		
	3/16	.0100	.321	II	3/8	2	48820	26.20	48820-C3	31.20		
	1/4	.0050	.452	II	1/2	2-1/2	47530	36.90	47530-C3	43.70		
1/4	.0100	.438	II	1/2	2-1/2	48830	36.90	48830-C3	43.70			
40°	1/8	.0025	.167	II	3/8	1-1/2	72720	22.50	72720-C3	27.10		
	1/8	.0050	.162	II	3/8	1-1/2	57610	22.50	57610-C3	27.10		
	1/8	.0100	.152	II	3/8	1-1/2	58210	22.50	58210-C3	27.10		
	1/8	.0150	.143	II	3/8	1-1/2	59310	22.50	59310-C3	27.10		
	1/8	.0200	.133	II	3/8	1-1/2	60510	22.50	60510-C3	27.10		
45°	1/8	.0050	.143	II	3/8	1-1/2	946502	23.00	946502-C3	27.60		
	1/8	.0100	.135	II	3/8	1-1/2	957910	23.00	957910-C3	27.60		
50°	1/8	.0050	.127	II	3/8	1-1/2	845010	23.00	845010-C3	27.60		
	1/8	.0100	.120	II	3/8	1-1/2	847210	23.00	847210-C3	27.60		
60°	1/8	.0025	.106	II	3/8	1-1/2	72730	21.50	72730-C3	26.10	72730-C4	33.20
	1/8	.0050	.103	II	3/8	1-1/2	48110	21.50	48110-C3	26.10	48110-C4	33.20
	1/8	.0050	.103	II	3/8	4	<i>LONG!</i> 974910	38.60	974910-C3	43.60		
	1/8	.0075	.101	II	3/8	1-1/2	967310	21.50	967310-C3	26.10		
	1/8	.0100	.098	II	3/8	1-1/2	49410	21.50	49410-C3	26.10	49410-C4	33.20
	1/8	.0125	.096	II	3/8	1-1/2	817110	21.50	817110-C3	26.10		
	1/8	.0150	.093	II	3/8	1-1/2	51710	21.50	51710-C3	26.10		
	1/8	.0200	.088	II	3/8	1-1/2	58910	21.50	58910-C3	26.10		
	1/8	.0300	.078	II	3/8	1-1/2	877010	21.50	877010-C3	26.10		
	3/16	.0025	.160	II	3/8	2	964830	26.20	964830-C3	31.20		
	3/16	.0050	.157	II	3/8	2	48120	26.20	48120-C3	31.20		
3/16	.0075	.155	II	3/8	2	967320	26.20	967320-C3	31.20			

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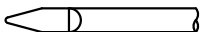
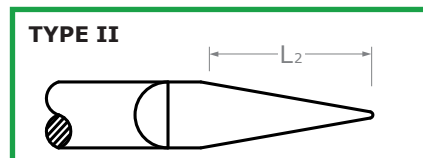
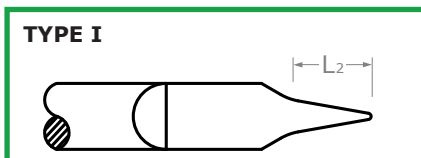
# ENGRAVING CUTTERS

## Tip Radius (cont.)

continued from previous page

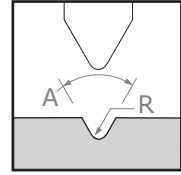
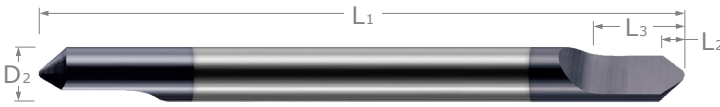
INCL. ANGLE	DIA.	RADIUS	LENGTH OF CUT	TYPE	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND		
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	
A	D <sub>2</sub>	R	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>							
60°	3/16	.0100	.152	II	3/8	2	49420	26.20	49420-C3	31.20			
	3/16	.0150	.147	II	3/8	2	51720	26.20	51720-C3	31.20			
	3/16	.0200	.142	II	3/8	2	58920	26.20	58920-C3	31.20			
	1/4	.0025	.214	II	3/8	2-1/2	943730	28.80	943730-C3	35.60			
	1/4	.0050	.212	II	3/8	2-1/2	48130	28.80	48130-C3	35.60			
	1/4	.0075	.209	II	3/8	2-1/2	967330	28.80	967330-C3	35.60			
	1/4	.0100	.207	II	3/8	2-1/2	49430	28.80	49430-C3	35.60			
	1/4	.0150	.202	II	3/8	2-1/2	51730	28.80	51730-C3	35.60			
70°	1/8	.0050	.086	II	3/8	1-1/2	843810	23.00	843810-C3	27.60			
	1/8	.0100	.082	II	3/8	1-1/2	844710	23.00	844710-C3	27.60			
90°	1/8	.0025	.061	II	3/8	1-1/2	72745	21.50	72745-C3	26.10	72745-C4	33.20	
	1/8	.0050	.060	II	3/8	1-1/2	48410	21.50	48410-C3	26.10	48410-C4	33.20	
	1/8	.0050	.060	II	3/8	4	LONG!	986810	38.60	986810-C3	43.60		
	1/8	.0075	.059	II	3/8	1-1/2	959810	21.50	959810-C3	26.10			
	1/8	.0100	.058	II	3/8	1-1/2	49110	21.50	49110-C3	26.10	49110-C4	33.20	
	1/8	.0125	.057	II	3/8	1-1/2	817010	21.50	817010-C3	26.10			
	1/8	.0150	.056	II	3/8	1-1/2	50810	21.50	50810-C3	26.10			
	1/8	.0200	.054	II	3/8	1-1/2	59910	21.50	59910-C3	26.10			
	1/8	.0300	.050	II	3/8	1-1/2	891410	21.50	891410-C3	26.10			
	3/16	.0025	.093	II	3/8	2	964845	26.20	964845-C3	31.20			
	3/16	.0050	.092	II	3/8	2	48420	26.20	48420-C3	31.20			
	3/16	.0100	.090	II	3/8	2	49120	26.20	49120-C3	31.20			
	3/16	.0150	.088	II	3/8	2	50820	26.20	50820-C3	31.20			
	3/16	.0200	.085	II	3/8	2	59920	26.20	59920-C3	31.20			
	1/4	.0025	.124	II	3/8	2-1/2	943745	28.80	943745-C3	35.60			
	1/4	.0050	.123	II	3/8	2-1/2	48430	28.80	48430-C3	35.60			
	1/4	.0100	.121	II	3/8	2-1/2	49130	28.80	49130-C3	35.60			
	1/4	.0150	.119	II	3/8	2-1/2	50830	28.80	50830-C3	35.60			
1/4	.0200	.116	II	3/8	2-1/2	59930	28.80	59930-C3	35.60				
120°	1/8	.0050	.035	II	3/8	1-1/2	947310	21.50	947310-C3	26.10			
	1/8	.0100	.035	II	3/8	1-1/2	939110	21.50	939110-C3	26.10			

ENGRAVING CUTTERS

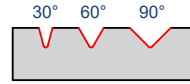


## ENGRAVING CUTTERS

## Tip Radius – Double-Ended



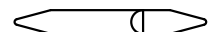
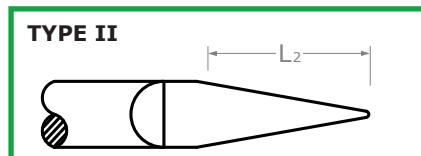
- ↪ Double-ended
- ↪ 180° opposing split lengths for improved balance at higher RPMs
- ↪ Radius on tip creates radius in bottom of groove and improves strength
- ↪ Half-round drill style
- ↪ Relieved for right-hand milling
- ↪ Solid carbide
- ↪ CNC ground in the USA



Stocked in *Three* Included Angles!

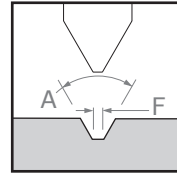
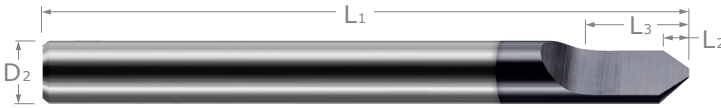
INCLUDED ANGLE	DIAMETER	RADIUS	LENGTH OF CUT	TYPE	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		A1TiN COATED	
							TOOL #	PRICE	TOOL #	PRICE
A	D <sub>2</sub>	R	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>				
30°	1/8	.0025	.226	II	3/8	2	842008	33.10	842008-C3	38.80
	1/8	.0050	.219	II	3/8	2	834408	33.10	834408-C3	38.80
	1/8	.0100	.205	II	3/8	2	835008	33.10	835008-C3	38.80
	1/8	.0200	.176	II	3/8	2	836108	33.10	836108-C3	38.80
	1/4	.0050	.452	II	1/2	2-1/2	834416	43.50	834416-C3	52.50
	1/4	.0100	.438	II	1/2	2-1/2	835016	43.50	835016-C3	52.50
60°	1/8	.0025	.106	II	3/8	2	834708	33.10	834708-C3	38.80
	1/8	.0050	.103	II	3/8	2	828208	33.10	828208-C3	38.80
	1/8	.0100	.098	II	3/8	2	828808	33.10	828808-C3	38.80
	1/8	.0200	.088	II	3/8	2	829908	33.10	829908-C3	38.80
	1/4	.0050	.212	II	3/8	2-1/2	828216	43.50	828216-C3	52.50
	1/4	.0100	.207	II	3/8	2-1/2	828816	43.50	828816-C3	52.50
90°	1/8	.0025	.061	II	3/8	2	828908	33.10	828908-C3	38.80
	1/8	.0050	.060	II	3/8	2	818308	33.10	818308-C3	38.80
	1/8	.0100	.058	II	3/8	2	818908	33.10	818908-C3	38.80
	1/8	.0200	.054	II	3/8	2	820108	33.10	820108-C3	38.80
	1/4	.0050	.123	II	3/8	2-1/2	818316	43.50	818316-C3	52.50
	1/4	.0100	.121	II	3/8	2-1/2	818916	43.50	818916-C3	52.50

ENGRAVING CUTTERS

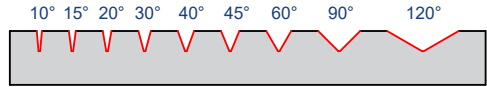


# ENGRAVING CUTTERS

## 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

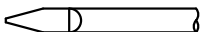
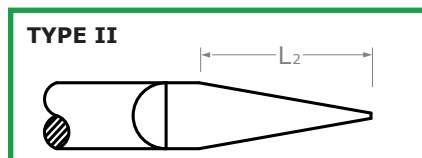
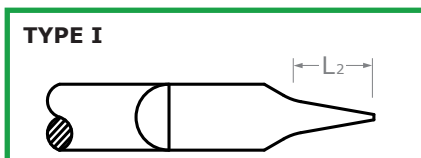


Stocked in *Nine* Included Angles!

ENGRAVING CUTTERS

INCL. ANGLE	DIA.	FLAT ON PART	LENGTH OF CUT	TYPE	SPLIT LENGTH	OAL	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
10°	D <sub>2</sub>	F	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>						
	1/8	.005	.080	I	.200	1-1/2	993002	22.70	993002-C3	27.30		
	1/8	.010	.080	I	.200	1-1/2	993010	22.70	993010-C3	27.30		
15°	1/8	.020	.080	I	.200	1-1/2	993052	22.70	993052-C3	27.30		
	1/8	.005	.080	I	.200	1-1/2	990002	22.70	990002-C3	27.30		
	1/8	.010	.080	I	.200	1-1/2	990010	22.70	990010-C3	27.30		
20°	1/8	.020	.080	I	.200	1-1/2	990052	22.70	990052-C3	27.30		
	1/8	.005	.080	I	.200	1-1/2	987002	22.70	987002-C3	27.30		
	1/8	.010	.080	I	.200	1-1/2	987010	22.70	987010-C3	27.30		
30°	1/8	.020	.080	I	.200	1-1/2	987052	22.70	987052-C3	27.30		
	1/8	.005	.224	II	3/8	1-1/2	25202	16.50	25202-C3	21.10		
	1/8	.010	.215	II	3/8	1-1/2	25210	16.50	25210-C3	21.10	25210-C4	28.20
	1/8	.015	.205	II	3/8	1-1/2	25242	16.50	25242-C3	21.10		
	1/8	.020	.196	II	3/8	1-1/2	25252	16.50	25252-C3	21.10		
	1/8	.030	.177	II	3/8	1-1/2	25256	16.50	25256-C3	23.30		
	3/16	.010	.331	II	3/8	2	25220	21.50	25220-C3	26.50		
	3/16	.020	.313	II	3/8	2	25226	21.50	25226-C3	26.50		
	3/16	.030	.294	II	3/8	2	25224	21.50	25224-C3	26.10		
	1/4	.005	.457	II	1/2	2-1/2	25228	24.90	25228-C3	31.70		
	1/4	.010	.448	II	1/2	2-1/2	25230	24.90	25230-C3	31.70		
40°	1/4	.020	.429	II	1/2	2-1/2	25234	24.90	25234-C3	31.70		
	1/4	.030	.411	II	1/2	2-1/2	25236	24.90	25236-C3	33.90		
	1/8	.005	.165	II	3/8	1-1/2	25302	17.20	25302-C3	21.80		
	1/8	.010	.158	II	3/8	1-1/2	25310	17.20	25310-C3	21.80	25310-C4	28.90
	1/8	.015	.151	II	3/8	1-1/2	25342	17.20	25342-C3	21.80		
	1/8	.020	.144	II	3/8	1-1/2	25352	17.20	25352-C3	21.80		
	3/16	.010	.244	II	3/8	2	25320	22.50	25320-C3	27.50		
	1/4	.005	.337	II	3/8	2-1/2	25328	26.20	25328-C3	33.00		
	1/4	.010	.330	II	3/8	2-1/2	25330	26.20	25330-C3	33.00		

continued on next page



## ENGRAVING CUTTERS

Tipped Off (cont.)

continued from previous page

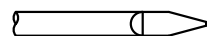
INCL. ANGLE	DIA.	FLAT ON PART	LENGTH OF CUT	TYPE	SPLIT LENGTH		UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND	
					L <sub>3</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
45°	1/8	.005	.145	II	3/8	1-1/2	955002	17.50	955002-C3	22.10		
	1/8	.010	.139	II	3/8	1-1/2	955010	17.50	955010-C3	22.10		
	3/16	.010	.214	II	3/8	2	955020	23.00	955020-C3	28.00		
	1/4	.010	.290	II	3/8	2-1/2	955030	26.70	955030-C3	33.50		
60°	1/8	.005	.104	II	3/8	1-1/2	50710	16.50	50710-C3	21.10	50710-C4	28.20
	1/8	.005	.104	II	3/8	4 <i>LONG!</i>	823602	16.50	823602-C3	28.80		
	1/8	.010	.099	II	3/8	1-1/2	30210	16.50	30210-C3	21.10	30210-C4	28.20
	1/8	.015	.095	II	3/8	1-1/2	18242	16.50	18242-C3	21.10		
	1/8	.020	.091	II	3/8	1-1/2	26910	16.50	26910-C3	21.10	26910-C4	28.20
	1/8	.030	.082	II	3/8	1-1/2	27610	16.50	27610-C3	21.10	27610-C4	28.20
	3/16	.005	.158	II	3/8	2	50720	21.50	50720-C3	26.50		
	3/16	.005	.158	II	3/8	4 <i>LONG!</i>	823618	21.50	823618-C3	26.50		
	3/16	.010	.153	II	3/8	2	30220	21.50	30220-C3	26.50		
	3/16	.020	.145	II	3/8	2	26920	21.50	26920-C3	26.50		
	3/16	.030	.136	II	3/8	2	27620	21.50	27620-C3	26.50		
	1/4	.005	.212	II	3/8	2-1/2	50730	24.90	50730-C3	31.70		
	1/4	.005	.212	II	3/8	6 <i>LONG!</i>	823628	24.90	823628-C3	38.80		
	1/4	.010	.207	II	3/8	2-1/2	30230	24.90	30230-C3	31.70		
	1/4	.020	.199	II	3/8	2-1/2	26930	24.90	26930-C3	31.70		
	1/4	.030	.191	II	3/8	2-1/2	27630	24.90	27630-C3	31.70		
90°	1/8	.005	.060	II	3/8	1-1/2	30302	16.50	30302-C3	21.10		
	1/8	.010	.057	II	3/8	1-1/2	30310	16.50	30310-C3	21.10	30310-C4	28.20
	1/8	.015	.055	II	3/8	1-1/2	30342	16.50	30342-C3	21.10		
	1/8	.020	.053	II	3/8	1-1/2	30352	16.50	30352-C3	21.10		
	1/8	.030	.048	II	3/8	1-1/2	30356	16.50	30356-C3	21.10		
	3/16	.010	.088	II	3/8	2	30320	21.50	30320-C3	26.50		
	3/16	.020	.084	II	3/8	2	30324	21.50	30324-C3	26.50		
	3/16	.030	.079	II	3/8	2	30326	21.50	30326-C3	30.50		
	1/4	.005	.123	II	3/8	2-1/2	30328	24.90	30328-C3	31.70		
	1/4	.010	.120	II	3/8	2-1/2	30330	24.90	30330-C3	31.70		
	1/4	.020	.115	II	3/8	2-1/2	30334	24.90	30334-C3	31.70		
	1/4	.030	.110	II	3/8	2-1/2	30336	24.90	30336-C3	29.50		
120°	1/8	.005	.035	II	3/8	1-1/2	954102	16.50	954102-C3	21.10		
	1/8	.010	.033	II	3/8	1-1/2	954110	16.50	954110-C3	21.10		

ENGRAVING CUTTERS



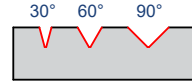
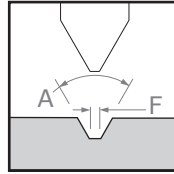
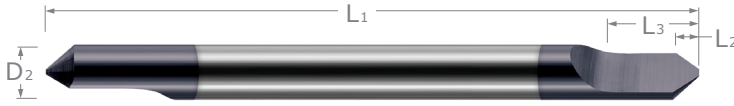
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# ENGRAVING CUTTERS

## Tipped Off – Double-Ended

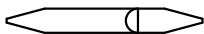
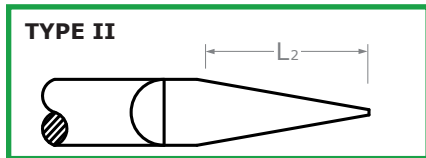


Stocked in *Three* Included Angles!

- ↪ 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

ENGRAVING CUTTERS

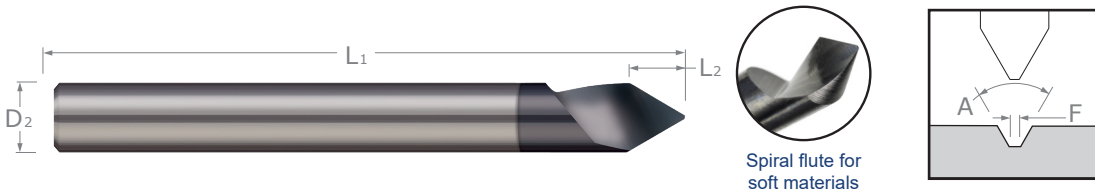
INCLUDED ANGLE	DIAMETER	FLAT ON PART	LENGTH OF CUT	TYPE	SPLIT LENGTH	OVERALL LENGTH	UNCOATED		AISI COATED	
							TOOL #	PRICE	TOOL #	PRICE
A	D <sub>2</sub>	F	L <sub>2</sub>		L <sub>3</sub>	L <sub>1</sub>				
30°	1/8	.005	.224	II	3/8	2	834308	28.00	834308-C3	33.70
	1/8	.010	.215	II	3/8	2	834908	28.00	834908-C3	33.70
	1/8	.015	.205	II	3/8	2	835508	28.00	835508-C3	33.70
	1/8	.020	.196	II	3/8	2	836208	28.00	836208-C3	33.70
	1/4	.010	.448	II	1/2	2-1/2	834916	39.70	834916-C3	48.70
60°	1/8	.005	.104	II	3/8	2	828108	28.00	828108-C3	33.70
	1/8	.010	.100	II	3/8	2	828708	28.00	828708-C3	33.70
	1/8	.015	.095	II	3/8	2	829308	28.00	829308-C3	33.70
	1/8	.020	.091	II	3/8	2	829808	28.00	829808-C3	33.70
	1/4	.010	.208	II	3/8	2-1/2	828716	39.70	828716-C3	48.70
90°	1/8	.005	.060	II	3/8	2	818208	28.00	818208-C3	33.70
	1/8	.010	.058	II	3/8	2	818808	28.00	818808-C3	33.70
	1/8	.015	.055	II	3/8	2	819408	28.00	819408-C3	33.70
	1/8	.020	.053	II	3/8	2	820008	28.00	820008-C3	33.70
	1/4	.010	.120	II	3/8	2-1/2	818816	39.70	818816-C3	48.70



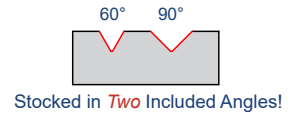



## ENGRAVING CUTTERS

## Tipped Off – Helical Flute

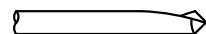


Spiral flute for soft materials

Stocked in *Two* Included Angles!

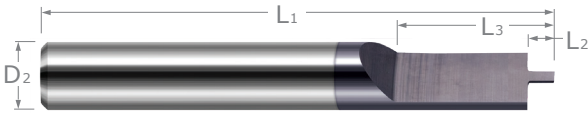
- ⚡ Optimized geometry for superior engraving in softer materials such as plastics and aluminum
- ⚡ Free cutting action provides excellent surface finish and chip evacuation
- ⚡ Tipped-off end diameter for improved cutting action
- ⚡ Right hand spiral, right hand cut
- ⚡ Solid carbide
- ⚡ CNC ground in the USA 


INCLUDED ANGLE	DIAMETER	FLAT ON PART	LENGTH OF CUT	OVERALL LENGTH	UNCOATED		AII <sup>T</sup> N COATED	
					TOOL #	PRICE	TOOL #	PRICE
A	D <sub>2</sub>	F	L <sub>2</sub>	L <sub>1</sub>				
60°	1/8	.010	.100	1-1/2	824708	17.40	824708-C3	22.00
	3/16	.010	.154	2	824712	22.60	824712-C3	27.20
	1/4	.010	.208	2-1/2	824716	26.30	824716-C3	30.90
90°	1/8	.010	.058	1-1/2	814708	17.40	814708-C3	22.40
	3/16	.010	.089	2	814712	22.60	814712-C3	27.20
	1/4	.010	.120	2-1/2	814716	26.30	814716-C3	30.90



# ENGRAVING CUTTERS

## Parallel – Square

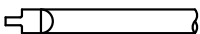


- ↻ Engraves a 90° vertical wall
- ↻ Flat (F) represents flat generated in workpiece
- ↻ Half-round drill style
- ↻ Non-cutting transition radius at end of length of cut
- ↻ Relieved for right hand milling
- ↻ Solid carbide
- ↻ CNC ground in the USA 



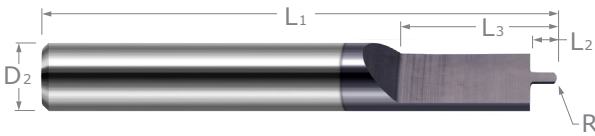
ENGRAVING CUTTERS


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	18.00	844230-C3	22.60
1/8	.060	.090	3/8	1-1/2	844260	18.00	844260-C3	22.60
1/8	.090	.135	3/8	1-1/2	844290	18.00	844290-C3	22.60
3/16	.060	.090	3/8	2	827260	23.20	827260-C3	28.20
3/16	.090	.135	3/8	2	827290	23.20	827290-C3	28.20
3/16	.125	.190	1/2	2	827308	23.20	827308-C3	28.20
1/4	.060	.090	3/8	2-1/2	838960	27.00	838960-C3	33.80
1/4	.090	.135	3/8	2-1/2	838990	27.00	838990-C3	33.80
1/4	.125	.190	1/2	2-1/2	839008	27.00	839008-C3	33.80

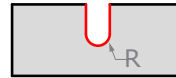


## ENGRAVING CUTTERS

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	.0150	.044	3/8	1-1/2	828530	20.20	828530-C3	24.80
1/8	.0300	.090	3/8	1-1/2	828560	20.20	828560-C3	24.80
1/8	.0450	.135	3/8	1-1/2	828590	20.20	828590-C3	24.80
3/16	.0300	.090	3/8	2	832660	25.40	832660-C3	30.40
3/16	.0450	.135	3/8	2	832690	25.40	832690-C3	30.40
3/16	.0625	.190	1/2	2	832708	25.40	832708-C3	30.40
1/4	.0300	.090	3/8	2-1/2	841360	29.20	841360-C3	36.00
1/4	.0450	.135	3/8	2-1/2	841390	29.20	841390-C3	36.00
1/4	.0625	.190	1/2	2-1/2	841408	29.20	841408-C3	36.00

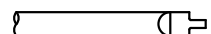
ENGRAVING CUTTERS



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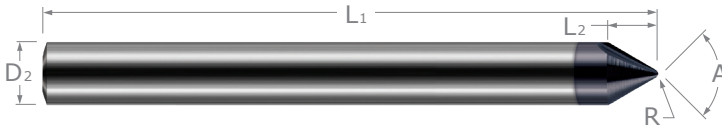
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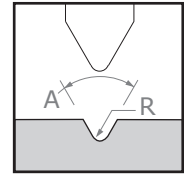


# ENGRAVING CUTTERS

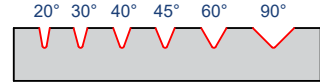
Tip Radius - 2 Flute - For Hardened Steels



2 Shallow Flute Design



- 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

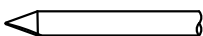
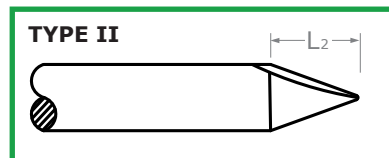
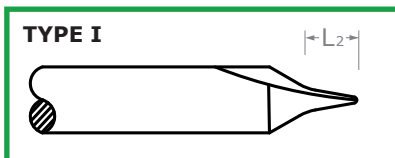


Stocked in Six Included Angles!

ENGRAVING CUTTERS

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>		
<b>20°</b>	1/8	.0050	.080	I	1-1/2	873308-C6	29.30
	1/8	.0100	.080	I	1-1/2	857508-C6	29.30
	1/4	.0100	.080	I	2-1/2	857516-C6	45.20
<b>30°</b>	1/8	.0050	.218	II	1-1/2	858308-C6	28.20
	1/8	.0075	.211	II	1-1/2	825508-C6	28.20 <span style="color: red;">NEW</span>
	1/8	.0100	.204	II	1-1/2	851208-C6	28.20
	1/8	.0150	.190	II	1-1/2	821208-C6	28.20
	1/8	.0200	.175	II	1-1/2	843708-C6	28.20
	1/8	.0250	.161	II	1-1/2	821008-C6	28.20
	3/16	.0050	.335	II	2	858312-C6	34.40 <span style="color: red;">NEW</span>
	3/16	.0100	.331	II	2	851212-C6	34.40 <span style="color: red;">NEW</span>
	1/4	.0050	.452	II	2-1/2	858316-C6	43.30
	1/4	.0100	.437	II	2-1/2	851216-C6	43.30
<b>40°</b>	1/8	.0050	.162	II	1-1/2	837508-C6	29.30
	1/8	.0100	.152	II	1-1/2	859308-C6	29.30
	1/4	.0100	.324	II	2-1/2	859316-C6	45.20
<b>45°</b>	1/8	.0050	.142	II	1-1/2	825808-C6	29.30 <span style="color: red;">NEW</span>
	1/8	.0100	.152	II	1-1/2	825708-C6	29.30 <span style="color: red;">NEW</span>
<b>60°</b>	1/8	.0050	.103	II	1-1/2	860008-C6	28.20
	1/8	.0075	.100	II	1-1/2	838108-C6	28.20
	1/8	.0100	.098	II	1-1/2	877308-C6	28.20
	1/8	.0150	.093	II	1-1/2	849008-C6	28.20
	1/8	.0200	.088	II	1-1/2	845808-C6	28.20
	1/8	.0250	.083	II	1-1/2	820908-C6	28.20
	3/16	.0050	.157	II	2	860012-C6	34.40
	3/16	.0100	.152	II	2	877312-C6	34.40
	1/4	.0050	.211	II	2-1/2	860016-C6	43.30
	1/4	.0075	.209	II	2-1/2	838116-C6	43.30
	1/4	.0100	.206	II	2-1/2	877316-C6	43.30
	1/4	.0150	.201	II	2-1/2	849016-C6	43.30
	1/4	.0200	.196	II	2-1/2	845816-C6	43.30

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## ENGRAVING CUTTERS

Tip Radius – 2 Flute – For Hardened Steels (cont.)

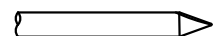
continued from previous page

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>		
NEW	1/8	.0050	.060	II	1-1/2	853108-C6	28.20
	1/8	.0075	.058	II	1-1/2	825908-C6	28.20
	1/8	.0100	.058	II	1-1/2	869408-C6	28.20
	1/8	.0150	.056	II	1-1/2	821108-C6	28.20
	1/8	.0200	.054	II	1-1/2	837108-C6	28.20
NEW NEW	1/8	.0250	.052	II	1-1/2	820808-C6	28.20
	3/16	.0050	.091	II	2	853112-C6	34.40
	3/16	.0100	.089	II	2	869412-C6	34.40
	1/4	.0050	.122	II	2-1/2	853116-C6	43.30
	1/4	.0100	.120	II	2-1/2	869416-C6	43.30
	1/4	.0200	.116	II	2-1/2	837116-C6	43.30



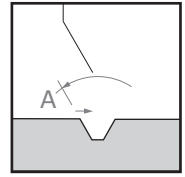
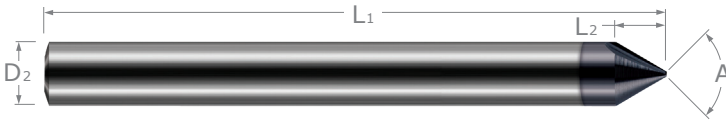
View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

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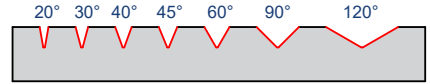


# ENGRAVING CUTTERS

Tipped Off – 2 Flute – For Hardened Steels



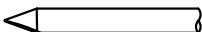
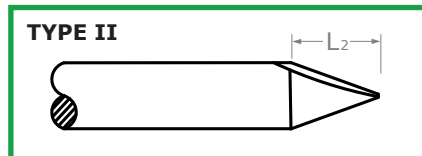
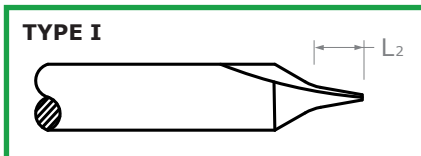
- Strong 2 flute design for engraving hardened steels 46–68Rc
- Eccentric relief increases durability and tool life
- Tipped off end diameter and shallow flute design for improved cutting and strength
- Latest generation ALTiN Nano coating offers superior hardness and heat resistance
- Solid carbide
- CNC ground in the USA



Stocked in Seven Included Angles!

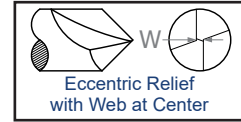
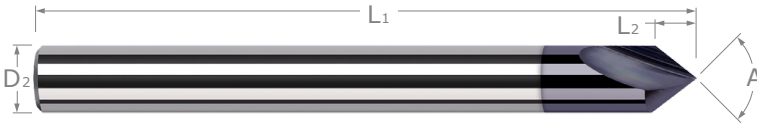
ENGRAVING CUTTERS

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	.010	.080	I	1-1/2	892508-C6	23.90
	1/4	.010	.080	I	2-1/2	892516-C6	38.30
30°	1/8	.005	.223	II	1-1/2	896708-C6	22.70
	1/8	.010	.214	II	1-1/2	882008-C6	22.70
	1/8	.015	.205	II	1-1/2	817908-C6	22.70
	1/8	.020	.195	II	1-1/2	879608-C6	22.70
	1/8	.030	.177	II	1-1/2	817608-C6	22.70
	3/16	.010	.331	II	2	882012-C6	27.50
	1/4	.010	.447	II	2-1/2	882016-C6	36.50
40°	1/8	.005	.164	I	1-1/2	811708-C6	23.90
	1/8	.010	.157	II	1-1/2	875108-C6	23.90
	1/4	.010	.329	II	2-1/2	875116-C6	38.30
45°	1/8	.005	.144	II	1-1/2	811608-C6	23.90
	1/8	.010	.138	II	1-1/2	811508-C6	23.90
60°	1/8	.005	.103	II	1-1/2	866708-C6	22.70
	1/8	.010	.099	II	1-1/2	889608-C6	22.70
	1/8	.015	.095	II	1-1/2	868108-C6	22.70
	1/8	.020	.090	II	1-1/2	892308-C6	22.70
	1/8	.030	.082	II	1-1/2	817508-C6	22.70
	3/16	.005	.158	II	2	866712-C6	27.50
	3/16	.010	.153	II	2	889612-C6	27.50
	1/4	.010	.207	II	2-1/2	889616-C6	36.50
	1/4	.020	.199	II	2-1/2	892316-C6	36.50
90°	1/8	.005	.060	II	1-1/2	880908-C6	22.70
	1/8	.010	.057	II	1-1/2	876508-C6	22.70
	1/8	.015	.055	II	1-1/2	817708-C6	22.70
	1/8	.020	.052	II	1-1/2	868408-C6	22.70
	1/8	.030	.047	II	1-1/2	817408-C6	22.70
	3/16	.005	.091	II	2	880912-C6	27.50
	3/16	.010	.088	II	2	876512-C6	27.50
	1/4	.010	.120	II	2-1/2	876516-C6	36.50
120°	1/8	.010	.033	II	1-1/2	865308-C6	22.70
	1/4	.010	.069	II	2-1/2	865316-C6	36.50

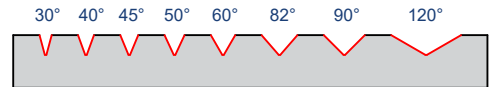


# ENGRAVING CUTTERS

## Marking Cutters for Ferrous Materials



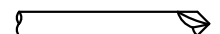
- **Designed for milling legible part numbers in difficult-to-machine materials**
- Burr-free, two flute cutting design has improved strength over single point engravers
- Produces flat in bottom of groove
- Eccentric relief improves durability over half-round style engravers
- Requires less RPM than half-round engravers
- Solid carbide
- CNC ground in the USA



Stocked in *Eight* Included Angles!

INCLUDED ANGLE	DIAMETER	WEB THICKNESS	LENGTH OF CUT	OVERALL LENGTH	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
					2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
30°	1/8	.003	.228	1-1/2	923908	18.00	923908-C3	22.60	47708-C4	29.70
	1/8	.005	.224	1-1/2	47708	18.00	47708-C3	22.60		
	1/8	.010	.215	1-1/2	996108	18.00	996108-C3	22.60		
	1/8	.015	.205	1-1/2	954008	18.00	954008-C3	22.60		
	3/16	.003	.344	2	923912	22.40	923912-C3	27.40		
	3/16	.005	.341	2	47712	22.40	47712-C3	27.40		
	3/16	.010	.331	2	996112	22.40	996112-C3	27.40		
	1/4	.003	.461	2-1/2	923916	31.40	923916-C3	38.20		
	1/4	.005	.457	2-1/2	47716	31.40	47716-C3	38.20		
	1/4	.010	.448	2-1/2	996116	31.40	996116-C3	38.20		
40°	1/8	.005	.165	1-1/2	995508	19.30	995508-C3	23.90	995508-C4	31.00
	1/8	.010	.158	1-1/2	996708	19.30	996708-C3	23.90		
	3/16	.005	.251	2	995512	24.40	995512-C3	29.40		
	3/16	.010	.244	2	996712	24.40	996712-C3	29.40		
	1/4	.005	.337	2-1/2	995516	34.10	995516-C3	40.90		
	1/4	.010	.330	2-1/2	996716	34.10	996716-C3	40.90		
45°	1/8	.005	.145	1-1/2	987408	19.00	987408-C3	23.60		
	3/16	.005	.220	2	987412	24.40	987412-C3	29.40		
	1/4	.005	.296	2-1/2	987416	34.10	987416-C3	40.90		
50°	1/8	.005	.129	1-1/2	976608	19.30	976608-C3	23.90		
	3/16	.005	.196	2	976612	24.20	976612-C3	29.20		
	1/4	.005	.263	2-1/2	976616	34.00	976616-C3	40.80		
60°	1/8	.003	.106	1-1/2	905708	18.00	905708-C3	22.60	29608-C4	29.70
	1/8	.005	.104	1-1/2	29608	18.00	29608-C3	22.60		
	1/8	.005	.104	3 <i>LONG!</i>	957808	22.00	957808-C3	26.60		
	1/8	.010	.100	1-1/2	48308	18.00	48308-C3	22.60		
	1/8	.015	.095	1-1/2	948108	18.00	948108-C3	22.60		
	3/16	.003	.160	2	905712	22.40	905712-C3	27.40		
	3/16	.005	.158	2	29612	22.40	29612-C3	27.40		
	3/16	.010	.154	2	48312	22.40	48312-C3	27.40		
	3/16	.015	.149	2	948112	22.40	948112-C3	27.40		

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# ENGRAVING CUTTERS

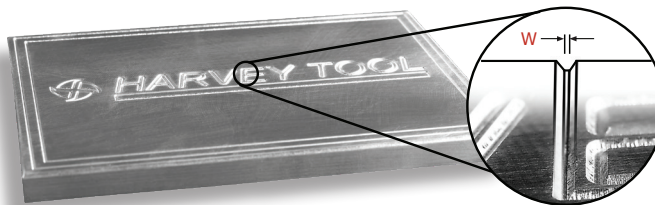
## Marking Cutters for Ferrous Materials (cont.)

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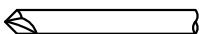
INCLUDED ANGLE	DIAMETER	WEB THICKNESS	LENGTH OF CUT	OVERALL LENGTH	UNCOATED		A1TiN COATED		AMORPHOUS DIAMOND	
					2 FL	PRICE	2 FL	PRICE	2 FL	PRICE
<b>60°</b>	1/4	.003	.214	2-1/2	905716	31.40	905716-C3	38.20		
	1/4	.005	.212	2-1/2	29616	31.40	29616-C3	38.20	29616-C4	49.70
	1/4	.010	.208	2-1/2	48316	31.40	48316-C3	38.20		
	1/4	.015	.204	2-1/2	948116	31.40	948116-C3	38.20		
<b>82°</b>	1/8	.005	.069	1-1/2	974108	19.30	974108-C3	23.90		
<b>90°</b>	1/8	.003	.061	1-1/2	914608	18.00	914608-C3	22.60		
	1/8	.005	.060	1-1/2	23608	18.00	23608-C3	22.60	23608-C4	29.70
	1/8	.005	.060	3	968108	22.00	968108-C3	26.60		
	1/8	.010	.058	1-1/2	50408	18.00	50408-C3	22.60	50408-C4	29.70
	1/8	.015	.055	1-1/2	939708	18.00	939708-C3	22.60		
	3/16	.003	.092	2	914612	22.40	914612-C3	27.40		
	3/16	.005	.091	2	23612	22.40	23612-C3	27.40	23612-C4	38.50
	3/16	.010	.089	2	50412	22.40	50412-C3	27.40		
	3/16	.015	.086	2	939712	22.40	939712-C3	27.40		
	1/4	.003	.124	2-1/2	914616	31.40	914616-C3	38.20		
	1/4	.005	.123	2-1/2	23616	31.40	23616-C3	38.20	23616-C4	49.70
	1/4	.010	.120	2-1/2	50416	31.40	50416-C3	38.20		
<b>120°</b>	1/4	.015	.118	2-1/2	939716	31.40	939716-C3	38.20		
	1/8	.003	.035	1-1/2	844808	18.00	844808-C3	22.60		
	1/8	.005	.035	1-1/2	23708	18.00	23708-C3	22.60	23708-C4	29.70
	1/8	.010	.033	1-1/2	998808	18.00	998808-C3	22.60		
	3/16	.005	.053	2	23712	22.40	23712-C3	27.40		
	3/16	.010	.051	2	998812	22.40	998812-C3	27.40		
	1/4	.005	.071	2-1/2	23716	31.40	23716-C3	38.20		
1/4	.010	.069	2-1/2	998816	31.40	998816-C3	38.20			

ENGRAVING CUTTERS

*For Marking Cutters for Non-Ferrous Materials, please see page 290.*



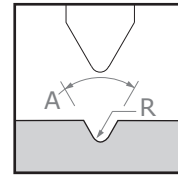
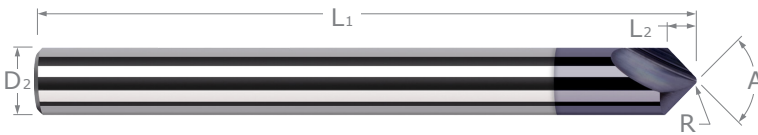
**Produces Flat  
in Bottom  
of Groove**



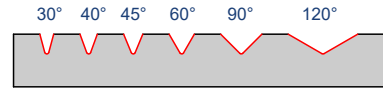


# ENGRAVING CUTTERS

## Marking Cutters – Tip Radius for Ferrous Materials



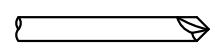
- **Designed for milling legible part numbers in difficult-to-machine materials**
- Radiused tip design for improved strength
- 2 flute cutting design has improved strength over single point engravers
- Produces radius in bottom of groove
- Solid carbide    ➤ CNC ground in the USA



Stocked in Six Included Angles!

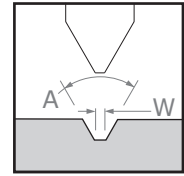
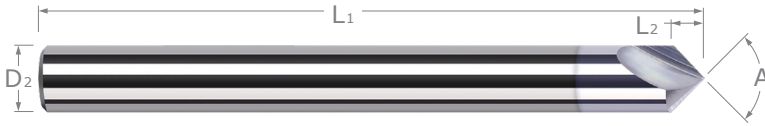
INCLUDED ANGLE	DIAMETER	RADIUS	LENGTH OF CUT	OVERALL LENGTH	UNCOATED		A11N COATED	
					2 FL	PRICE	2 FL	PRICE
A $\begin{smallmatrix} +1^\circ \\ -1^\circ \end{smallmatrix}$	D <sub>2</sub>	R	L <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
<b>30°</b>	1/8	.0050	.218	1-1/2	987615	22.20	987615-C3	26.80
	1/8	.0100	.204	1-1/2	961915	22.20	961915-C3	26.80
	1/8	.0150	.190	1-1/2	981815	22.20	981815-C3	26.80
	3/16	.0050	.335	2	958715	27.10	958715-C3	32.10
	3/16	.0100	.321	2	947215	27.10	947215-C3	32.10
	1/4	.0050	.452	2-1/2	966815	36.30	966815-C3	43.10
<b>40°</b>	1/8	.0050	.162	1-1/2	987640	24.20	987640-C3	28.80
	1/8	.0100	.152	1-1/2	961940	24.20	961940-C3	28.80
	1/8	.0150	.142	1-1/2	981820	24.20	981820-C3	28.80
<b>45°</b>	1/8	.0050	.143	1-1/2	987622	24.20	987622-C3	28.80
	1/8	.0100	.135	1-1/2	961922	24.20	961922-C3	28.80
<b>60°</b>	1/8	.0050	.103	1-1/2	987630	22.20	987630-C3	26.80
	1/8	.0075	.100	1-1/2	926330	22.20	926330-C3	26.80
	1/8	.0100	.098	1-1/2	961930	22.20	961930-C3	26.80
	1/8	.0150	.093	1-1/2	981830	22.20	981830-C3	26.80
	1/8	.0200	.088	1-1/2	918430	22.20	918430-C3	26.80
	3/16	.0050	.157	2	958730	27.10	958730-C3	32.10
	3/16	.0100	.152	2	947230	27.10	947230-C3	32.10
	3/16	.0150	.147	2	914330	27.10	914330-C3	32.10
	1/4	.0050	.211	2-1/2	966830	36.30	966830-C3	43.10
	1/4	.0100	.206	2-1/2	954930	36.30	954930-C3	43.10
	1/4	.0150	.201	2-1/2	909730	36.30	909730-C3	43.10
<b>90°</b>	1/8	.0050	.060	1-1/2	987645	22.20	987645-C3	26.80
	1/8	.0075	.059	1-1/2	926345	22.20	926345-C3	26.80
	1/8	.0100	.058	1-1/2	961945	22.20	961945-C3	26.80
	1/8	.0150	.056	1-1/2	981845	22.20	981845-C3	26.80
	1/8	.0200	.054	1-1/2	918445	22.20	918445-C3	26.80
	3/16	.0050	.091	2	958745	27.10	958745-C3	32.10
	3/16	.0100	.089	2	947245	27.10	947245-C3	32.10
	3/16	.0150	.087	2	914345	27.10	914345-C3	32.10
	1/4	.0050	.122	2-1/2	966845	36.30	966845-C3	43.10
	1/4	.0075	.122	2-1/2	830745	36.30	830745-C3	43.10
	1/4	.0100	.120	2-1/2	954945	36.30	954945-C3	43.10
<b>120°</b>	1/8	.0050	.035	1-1/2	987660	22.20	987660-C3	26.80
	1/8	.0100	.034	1-1/2	961960	22.20	961960-C3	26.80
	1/8	.0150	.034	1-1/2	909745	36.30	909745-C3	43.10

ENGRAVING CUTTERS



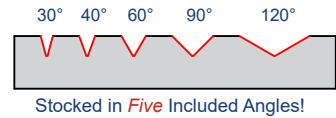
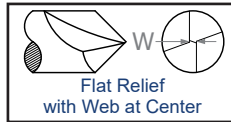
# ENGRAVING CUTTERS

## Marking Cutters for Non-Ferrous Materials



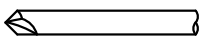
➤ **Designed for milling legible part numbers in non-ferrous and easy-to-machine materials**

- 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



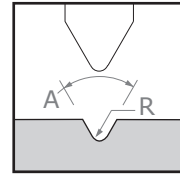
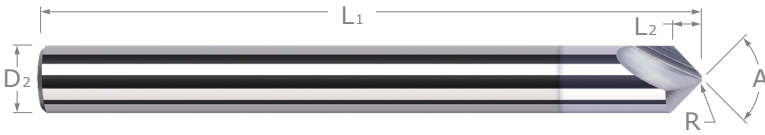
ENGRAVING CUTTERS

INCLUDED ANGLE	DIAMETER	WEB THICKNESS	LENGTH OF CUT	OVERALL LENGTH	UNCOATED		TiB <sub>2</sub> COATED	
					2 FL	PRICE	2 FL	PRICE
$A \begin{smallmatrix} +1^\circ \\ -1^\circ \end{smallmatrix}$	D <sub>2</sub>	W	L <sub>2</sub>	L <sub>1</sub>				
<b>30°</b>	1/8	.005	.230	1-1/2	993215	18.00	993215-C8	24.80
	1/8	.010	.228	1-1/2	963215	18.00	963215-C8	24.80
	1/8	.015	.225	1-1/2	902915	18.00	902915-C8	24.80
	3/16	.005	.347	2	987815	22.40	987815-C8	29.20
	1/4	.005	.464	2-1/2	967415	31.40	967415-C8	38.70
<b>40°</b>	1/8	.005	.170	1-1/2	993220	19.30	993220-C8	26.10
	1/8	.010	.168	1-1/2	963220	19.30	963220-C8	26.10
	3/16	.005	.255	2	987820	22.70	987820-C8	29.50
	1/4	.005	.339	2-1/2	967420	31.50	967420-C8	38.80
<b>60°</b>	1/8	.005	.107	1-1/2	993230	18.00	993230-C8	24.80
	1/8	.010	.106	1-1/2	963230	18.00	963230-C8	24.80
	1/8	.015	.104	1-1/2	902930	18.00	902930-C8	24.80
	3/16	.005	.161	2	987830	22.40	987830-C8	29.20
	3/16	.010	.160	2	921230	22.40	921230-C8	29.20
	1/4	.005	.215	2-1/2	967430	31.40	967430-C8	38.70
	1/4	.010	.214	2-1/2	918630	31.40	918630-C8	38.70
<b>90°</b>	1/8	.005	.062	1-1/2	993245	18.00	993245-C8	24.80
	1/8	.010	.061	1-1/2	963245	18.00	963245-C8	24.80
	1/8	.015	.060	1-1/2	902945	18.00	902945-C8	24.80
	3/16	.005	.093	2	987845	22.40	987845-C8	29.20
	3/16	.010	.092	2	921245	22.40	921245-C8	29.20
	1/4	.005	.124	2-1/2	967445	31.40	967445-C8	38.70
	1/4	.010	.123	2-1/2	918645	31.40	918645-C8	38.70
<b>120°</b>	1/8	.005	.036	1-1/2	993260	18.00	993260-C8	24.80
	1/8	.010	.035	1-1/2	963260	18.00	963260-C8	24.80



## ENGRAVING CUTTERS

## Marking Cutters – Tip Radius for Non-Ferrous Materials




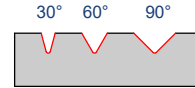
➤ **Designed for milling legible part numbers in non-ferrous and easy-to-machine materials**

➤ 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
A $\begin{smallmatrix} +1^\circ \\ -1^\circ \end{smallmatrix}$	D <sub>2</sub>	R	L <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
<b>30°</b>	1/8	<b>.005</b>	.219	1-1/2	847115	22.20	847115-C8	29.00
	1/8	<b>.010</b>	.205	1-1/2	854415	22.20	854415-C8	29.00
<b>60°</b>	1/8	<b>.005</b>	.103	1-1/2	847130	22.20	847130-C8	29.00
	1/8	<b>.010</b>	.098	1-1/2	854430	22.20	854430-C8	29.00
<b>90°</b>	1/8	<b>.005</b>	.060	1-1/2	847145	22.20	847145-C8	29.00
	1/8	<b>.010</b>	.058	1-1/2	854445	22.20	854445-C8	29.00

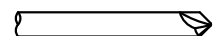
ENGRAVING CUTTERS



### Main Differences Between Engravers vs. Marking Cutters

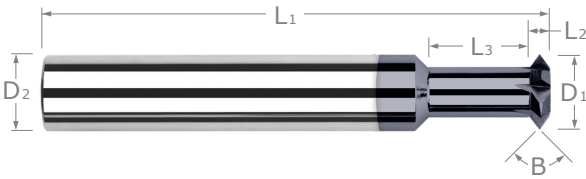
Although similar in look, Engravers and Marking Cutters serve different purposes. Do you need assistance deciding between the two? We can help! Our "In the Loupe" blog post **Main Differences Between Engravers & Marking Cutters** helps you decide which tooling option is best for you.

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

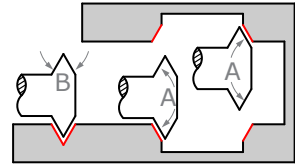


# DOUBLE ANGLE SHANK CUTTERS

Pointed



Great for Chamfering and Deburring

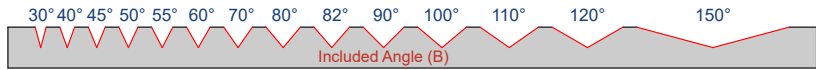


- Ideal for back chamfering, chamfering, deburring, and milling a "V-groove"
- Reduced neck for long reach machining
- Tip of included angle ground to a point
- 60° angle can also be used for thread milling
- Solid carbide
- CNC ground in the USA

**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°

For tool selection tips, search for keyword **AnglesUntangled** on [www.harveytol.com](http://www.harveytol.com)

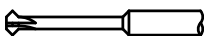


Stocked in *Fourteen* Included Angles!

DOUBLE ANGLE SHANK CUTTERS

INCL. ANGLE	CUTTER DIAMETER	CUTTER WIDTH	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
B <sup>+1°</sup> <sub>-1°</sub>	D1 <sup>+0.000"</sup> <sub>-.002"</sub>	L2		L3 <sup>+0.020"</sup> <sub>-.000"</sub>		D2	L1				
<b>30°</b>	1/16	.008	1/32	<b>.093</b>	2	1/8	1-1/2	66062	48.10	66062-C3	52.70
	5/64	.010	.039	<b>.118</b>	2	1/8	1-1/2	66078	48.10	66078-C3	52.70
	3/32	.012	3/64	<b>.141</b>	2	1/8	1-1/2	66093	48.10	66093-C3	52.70
	1/8	.017	1/16	<b>.187</b>	4	1/8	1-1/2	66108	47.00	66108-C3	51.60
	1/8	.017	1/16	<b>.500</b>	4	1/8	1-1/2	934308	48.10	934308-C3	52.70
	3/16	.025	3/32	<b>.312</b>	4	3/16	2	66112	48.70	66112-C3	53.70
	1/4	.033	1/8	<b>.312</b>	4	1/4	2	66116	61.90	66116-C3	68.70
	1/4	.033	1/8	<b>.625</b>	4	1/4	2	921716	72.90	921716-C3	79.70
	3/8	.033	1/4	<b>.500</b>	6	3/8	2-1/2	66105	81.40	66105-C3	90.40
	3/8	.033	1/4	<b>1.500</b>	6	3/8	3-1/2	934324	96.80	934324-C3	105.80
<b>40°</b>	1/2	.050	5/16	<b>.500</b>	6	1/2	3	66110	112.00	66110-C3	125.40
	1/2	.050	5/16	<b>1.500</b>	6	1/2	4	934332	142.90	934332-C3	156.30
	1/4	.045	1/8	<b>.312</b>	4	1/4	2	29720	62.20	29720-C3	69.00
	1/4	.045	1/8	<b>.625</b>	4	1/4	2	918116	72.40	918116-C3	79.20
	3/8	.045	1/4	<b>.500</b>	6	3/8	2-1/2	909924	78.70	909924-C3	87.70
	3/8	.045	1/4	<b>1.500</b>	6	3/8	3-1/2	967505	97.80	967505-C3	106.80
<b>45°</b>	1/2	.068	5/16	<b>.500</b>	6	1/2	3	909932	107.20	909932-C3	120.60
	1/2	.068	5/16	<b>1.500</b>	6	1/2	4	967510	139.40	967510-C3	152.80
	1/8	.026	1/16	<b>.187</b>	4	1/8	1-1/2	905608	48.10	905608-C3	52.70
	3/16	.039	3/32	<b>.312</b>	4	3/16	2	905612	48.70	905612-C3	53.70
	1/4	.052	1/8	<b>.312</b>	4	1/4	2	29723	61.90	29723-C3	68.70
	1/4	.052	1/8	<b>.625</b>	4	1/4	2	917016	72.90	917016-C3	79.70
	1/4	.052	1/8	<b>1.000</b>	4	1/4	3	984903	75.80	984903-C3	82.60
	3/8	.052	1/4	<b>.500</b>	6	3/8	2-1/2	905624	78.30	905624-C3	87.30
	3/8	.052	1/4	<b>1.000</b>	6	3/8	2-1/2	917024	89.30	917024-C3	98.30
	3/8	.052	1/4	<b>1.500</b>	6	3/8	3-1/2	984905	97.30	984905-C3	106.30
1/2	.078	5/16	<b>.500</b>	6	1/2	3	905632	106.70	905632-C3	120.10	
1/2	.078	5/16	<b>1.500</b>	6	1/2	4	984910	138.70	984910-C3	152.10	

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# DOUBLE ANGLE SHANK CUTTERS

Pointed (cont.)

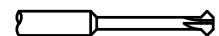
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INCL. ANGLE	CUTTER DIAMETER	CUTTER WIDTH	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
								TOOL #	PRICE	TOOL #	PRICE
B $+1^\circ$ $-1^\circ$	D <sub>1</sub> $+0.000''$ $-0.002''$	L <sub>2</sub>		L <sub>3</sub> $+0.020''$ $-0.000''$		D <sub>2</sub>	L <sub>1</sub>				
50°	1/8	.029	1/16	.187	4	1/8	1-1/2	985801	46.50	985801-C3	51.10
	1/8	.029	1/16	.500	4	1/8	1-1/2	974401	55.60	974401-C3	60.20
	3/16	.044	3/32	.312	4	3/16	2	985802	49.70	985802-C3	54.70
	3/16	.044	3/32	.750	4	3/16	2-1/2	974402	57.70	974402-C3	62.70
	1/4	.058	1/8	.312	4	1/4	2	29725	65.80	29725-C3	72.60
	1/4	.058	1/8	1.000	4	1/4	3	974403	76.10	974403-C3	82.90
	3/8	.058	1/4	.500	6	3/8	2-1/2	985805	80.90	985805-C3	89.90
	3/8	.058	1/4	1.500	6	3/8	3-1/2	974405	99.20	974405-C3	108.20
	1/2	.088	5/16	.500	6	1/2	3	985810	110.20	985810-C3	123.60
1/2	.088	5/16	1.500	6	1/2	4	974410	141.40	974410-C3	154.80	
55°	1/4	.065	1/8	.312	4	1/4	2	29728	66.10	29728-C3	72.90
60°	1/16	.018	1/32	.093	2	1/8	1-1/2	47362	46.70	47362-C3	51.30
	1/16	.018	1/32	.156	2	1/8	1-1/2	965562	46.70	965562-C3	51.30
	5/64	.023	.039	.118	2	1/8	1-1/2	47378	46.70	47378-C3	51.30
	3/32	.027	3/64	.141	2	1/8	1-1/2	47393	46.70	47393-C3	51.30
	3/32	.027	3/64	.250	2	1/8	1-1/2	965593	46.70	965593-C3	51.30
	1/8	.036	1/16	.125	4	1/8	1-1/2	937501	43.10	937501-C3	47.70
	1/8	.036	1/16	.187	4	1/8	1-1/2	16201	43.10	16201-C3	47.70
	1/8	.036	1/16	.312	4	1/8	1-1/2	984401	48.40	984401-C3	53.00
	1/8	.036	1/16	.500	4	1/8	2	27501	52.70	27501-C3	57.30
	1/8	.036	1/16	.875	4	1/8	2	981001	57.60	981001-C3	62.20
	5/32	.045	5/64	.250	4	3/16	2	16256	46.70	16256-C3	51.70
	5/32	.045	5/64	.625	4	3/16	2-1/2	27556	52.70	27556-C3	57.70
	3/16	.055	3/32	.187	4	3/16	2	937502	45.90	937502-C3	50.90
	3/16	.055	3/32	.312	4	3/16	2	16202	45.90	16202-C3	50.90
	3/16	.055	3/32	.500	4	3/16	2	984402	53.10	984402-C3	58.10
	3/16	.055	3/32	.750	4	3/16	2-1/2	27502	56.40	27502-C3	61.40
	3/16	.055	3/32	1.000	4	3/16	2-1/2	925502	59.00	925502-C3	64.00
	1/4	.072	1/8	.187	4	1/4	2	937503	61.90	937503-C3	68.70
	1/4	.072	1/8	.312	4	1/4	2	16203	61.90	16203-C3	68.70
	1/4	.072	1/8	.312	6	1/4	2	808016	66.30	808016-C3	73.10
	1/4	.072	1/8	.625	4	1/4	2-1/2	984403	69.40	984403-C3	76.20
	1/4	.072	1/8	1.000	4	1/4	3	27503	74.00	27503-C3	80.80
	1/4	.072	1/8	1.312	4	1/4	3	925503	74.40	925503-C3	81.20
	1/4	.072	1/8	1.750	4	1/4	3	981003	75.50	981003-C3	82.30
	5/16	.072	3/16	.375	6	5/16	2-1/2	16272	75.00	16272-C3	82.90
	5/16	.072	3/16	.875	6	5/16	2-1/2	984472	77.20	984472-C3	85.10
	3/8	.072	1/4	.312	6	3/8	2-1/2	937505	78.90	937505-C3	87.90
	3/8	.072	1/4	.500	6	3/8	2-1/2	16205	78.90	16205-C3	87.90
	3/8	.072	1/4	1.000	6	3/8	2-1/2	984405	88.90	984405-C3	97.90
	3/8	.072	1/4	1.500	6	3/8	3-1/2	27505	98.80	27505-C3	107.80
	3/8	.072	1/4	2.000	6	3/8	3-1/2	925505	103.50	925505-C3	112.50
	1/2	.109	5/16	.500	6	1/2	3	16210	108.00	16210-C3	121.40
1/2	.109	5/16	1.000	6	1/2	3	984410	117.70	984410-C3	131.10	
1/2	.109	5/16	1.500	6	1/2	4	27510	137.70	27510-C3	151.10	
1/2	.109	5/16	2.000	6	1/2	4	925510	141.20	925510-C3	154.60	
1/2	.109	5/16	2.625	6	1/2	4	981010	144.90	981010-C3	158.30	
5/8	.144	3/8	.750	6	5/8	3-1/2	16215	194.40	16215-C3	207.80	

DOUBLE ANGLE SHANK CUTTERS

NEW

continued on next page



# DOUBLE ANGLE SHANK CUTTERS

Pointed (cont.)

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INCL. ANGLE	CUTTER DIAMETER	CUTTER WIDTH	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
B $\begin{smallmatrix} +1^\circ \\ -1^\circ \end{smallmatrix}$	D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L <sub>2</sub>		L <sub>3</sub> $\begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		D <sub>2</sub>	L <sub>1</sub>				
<b>70°</b>	1/4	.088	1/8	.312	4	1/4	2	871903	66.10	871903-C3	72.90
<b>80°</b>	1/4	.105	1/8	.312	4	1/4	2	29740	66.10	29740-C3	72.90
<b>82°</b>	1/4	.109	1/8	.312	4	1/4	2	29741	66.10	29741-C3	72.90
	3/8	.109	1/4	1.500	6	3/8	3-1/2	920805	104.30	920805-C3	113.30
	1/2	.163	5/16	1.500	6	1/2	4	920810	145.30	920810-C3	158.70
<b>90°</b>	1/32	.015	1/64	.093	2	1/8	1-1/2	45131	42.00	45131-C3	46.60
	1/16	.031	1/32	.062	2	1/8	1-1/2	946862	42.00	946862-C3	46.60
	1/16	.031	1/32	.093	2	1/8	1-1/2	19162	42.00	19162-C3	46.60
	1/16	.031	1/32	.125	2	1/8	1-1/2	807662	42.00	807662-C3	46.60
	1/16	.031	1/32	.156	2	1/8	1-1/2	45162	46.70	45162-C3	51.30
	1/16	.031	1/32	.156	4	1/8	1-1/2	832404	49.10	832404-C3	53.70
	1/16	.031	1/32	.250	2	1/8	1-1/2	71662	51.20	71662-C3	55.80
	1/16	.031	1/32	.375	2	1/8	1-1/2	963662	51.20	963662-C3	55.80
	5/64	.039	.039	.078	2	1/8	1-1/2	946878	42.00	946878-C3	46.60
	5/64	.039	.039	.118	2	1/8	1-1/2	19178	42.00	19178-C3	46.60
	5/64	.039	.039	.187	2	1/8	1-1/2	45178	46.70	45178-C3	51.30
	5/64	.039	.039	.187	4	1/8	1-1/2	832405	49.10	832405-C3	53.70
	5/64	.039	.039	.250	2	1/8	1-1/2	822178	49.10	822178-C3	58.10
	5/64	.039	.039	.312	2	1/8	1-1/2	71678	51.20	71678-C3	55.80
	5/64	.039	.039	.500	2	1/8	1-1/2	963678	51.20	963678-C3	55.80
	3/32	.047	3/64	.093	2	1/8	1-1/2	946893	42.00	946893-C3	46.60
	3/32	.047	3/64	.141	2	1/8	1-1/2	19193	42.00	19193-C3	46.60
	3/32	.047	3/64	.250	2	1/8	1-1/2	45193	46.70	45193-C3	51.30
	3/32	.047	3/64	.250	4	1/8	1-1/2	832406	49.10	832406-C3	53.70
	3/32	.047	3/64	.312	2	1/8	1-1/2	807493	51.20	807493-C3	55.80
	3/32	.047	3/64	.375	2	1/8	1-1/2	71693	51.20	71693-C3	55.80
	3/32	.047	3/64	.500	2	1/8	1-1/2	857893	51.20	857893-C3	55.80
	3/32	.047	3/64	.625	2	1/8	2	963693	53.10	963693-C3	57.70
	3/32	.047	3/64	.750	2	1/8	2	855793	55.30	855793-C3	59.90
	3 mm	.059	.059	.187	2	1/8	1-1/2	1913M	42.70	1913M-C3	47.30
	3 mm	.059	.059	.312	2	1/8	1-1/2	4513M	49.10	4513M-C3	53.70
	1/8	.062	1/16	.125	4	1/8	1-1/2	946901	42.00	946901-C3	46.60
	1/8	.062	1/16	.187	4	1/8	1-1/2	19201	42.00	19201-C3	46.60
	1/8	.062	1/16	.187	6	1/8	1-1/2	838808	44.00	838808-C3	48.60
	1/8	.062	1/16	.250	4	1/8	1-1/2	807308	44.60	807308-C3	49.20
	1/8	.062	1/16	.312	4	1/8	1-1/2	72601	47.20	72601-C3	51.80
	1/8	.062	1/16	.312	6	1/8	1-1/2	847408	49.60	847408-C3	54.20
1/8	.062	1/16	.375	4	1/8	1-1/2	806908	47.20	806908-C3	51.80	
1/8	.062	1/16	.500	4	1/8	2	19501	54.50	19501-C3	59.10	
1/8	.062	1/16	.500	6	1/8	2	807908	56.90	807908-C3	61.50	
1/8	.062	1/16	.625	4	1/8	2	71701	56.40	71701-C3	61.00	
1/8	.062	1/16	.750	4	1/8	2	821808	57.80	821808-C3	64.60	
1/8	.062	1/16	.875	4	1/8	2	26801	59.40	26801-C3	64.00	
1/8	.062	1/16	1.125	4	1/8	2-1/2	963701	65.20	963701-C3	69.80	
5/32	.078	5/64	.156	4	3/16	2	946956	42.50	946956-C3	47.50	
5/32	.078	5/64	.250	4	3/16	2	19256	44.70	19256-C3	49.70	
5/32	.078	5/64	.375	4	3/16	2	807310	47.90	807310-C3	52.90	
5/32	.078	5/64	.437	4	3/16	2	72656	51.20	72656-C3	56.20	
5/32	.078	5/64	.625	4	3/16	2-1/2	19556	55.10	19556-C3	60.10	
5/32	.078	5/64	1.125	4	3/16	2-1/2	26856	61.60	26856-C3	66.60	

DOUBLE ANGLE SHANK CUTTERS

NEW

NEW

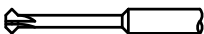
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# DOUBLE ANGLE SHANK CUTTERS

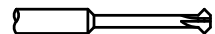
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INCL ANGLE	CUTTER DIAMETER	CUTTER WIDTH	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
90°	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>		D <sub>2</sub>	L <sub>1</sub>				
	NEW 3/16	.093	3/32	.187	4	3/16	2	946902	43.00	946902-C3	48.00
	NEW 3/16	.093	3/32	.187	6	3/16	2	807812	45.30	807812-C3	50.30
	NEW 3/16	.093	3/32	.250	4	3/16	2	807112	43.80	807112-C3	48.80
	NEW 3/16	.093	3/32	.312	4	3/16	2	19202	43.80	19202-C3	48.80
	NEW 3/16	.093	3/32	.312	6	3/16	2	838812	46.10	838812-C3	51.10
	NEW 3/16	.093	3/32	.375	4	3/16	2	807312	47.90	807312-C3	52.90
	NEW 3/16	.093	3/32	.500	4	3/16	2	72602	52.10	72602-C3	57.10
	NEW 3/16	.093	3/32	.500	6	3/16	2	847412	54.60	847412-C3	59.60
	NEW 3/16	.093	3/32	.750	4	3/16	2-1/2	19502	55.30	19502-C3	60.30
	NEW 3/16	.093	3/32	1.000	4	3/16	2-1/2	71702	60.40	71702-C3	65.40
	NEW 3/16	.093	3/32	1.312	4	3/16	2-1/2	26802	61.90	26802-C3	66.90
	NEW 3/16	.093	3/32	1.625	4	3/16	3	963702	68.70	963702-C3	73.70
	NEW 6 mm	.118	.118	.312	4	1/4	2	19262	68.40	19262-C3	75.20
	NEW 6 mm	.118	.118	.625	4	1/4	2	72662	70.70	72662-C3	77.50
	NEW 6 mm	.118	.118	1.000	4	1/4	2-1/2	19562	73.00	19562-C3	79.80
	NEW 1/4	.125	1/8	.187	4	1/4	2	946903	52.70	946903-C3	59.50
	NEW 1/4	.125	1/8	.250	4	1/4	2	807116	53.70	807116-C3	60.50
	NEW 1/4	.125	1/8	.312	4	1/4	2	19203	53.70	19203-C3	60.50
	NEW 1/4	.125	1/8	.312	6	1/4	2	838816	56.40	838816-C3	63.20
	NEW 1/4	.125	1/8	.375	4	1/4	2-1/2	807016	59.40	807016-C3	66.20
	NEW 1/4	.125	1/8	.500	4	1/4	2	807316	54.30	807316-C3	61.10
	NEW 1/4	.125	1/8	.625	4	1/4	2-1/2	72603	59.60	72603-C3	66.40
	NEW 1/4	.125	1/8	.625	6	1/4	2-1/2	847416	62.60	847416-C3	69.40
	NEW 1/4	.125	1/8	.750	4	1/4	2-1/2	807216	59.60	807216-C3	66.40
	NEW 1/4	.125	1/8	1.000	4	1/4	3	19503	65.20	19503-C3	72.00
	NEW 1/4	.125	1/8	1.000	6	1/4	3	822616	68.20	822616-C3	72.80
	NEW 1/4	.125	1/8	1.250	4	1/4	3	822216	69.70	822216-C3	76.50
	NEW 1/4	.125	1/8	1.312	4	1/4	3	71703	69.70	71703-C3	76.50
	NEW 1/4	.125	1/8	1.750	4	1/4	3	26803	71.80	26803-C3	78.60
	NEW 1/4	.125	1/8	2.125	4	1/4	4	963703	77.70	963703-C3	85.60
	NEW 5/16	.125	3/16	.250	6	5/16	2-1/2	946904	72.60	946904-C3	80.50
	NEW 5/16	.125	3/16	.375	6	5/16	2-1/2	19272	75.00	19272-C3	82.90
	NEW 5/16	.125	3/16	.625	6	5/16	2-1/2	833572	76.00	833572-C3	83.90
	NEW 5/16	.125	3/16	.875	6	5/16	2-1/2	72672	76.00	72672-C3	83.90
	NEW 5/16	.125	3/16	1.250	6	5/16	3	19572	81.40	19572-C3	89.30
	NEW 5/16	.125	3/16	1.625	6	5/16	3	71772	84.50	71772-C3	92.40
	NEW 5/16	.125	3/16	2.125	6	5/16	3	26872	87.60	26872-C3	95.50
	NEW 3/8	.125	1/4	.312	6	3/8	2-1/2	946905	72.90	946905-C3	81.90
	NEW 3/8	.125	1/4	.375	6	3/8	2-1/2	807124	75.30	807124-C3	84.30
NEW 3/8	.125	1/4	.500	6	3/8	2-1/2	19205	76.60	19205-C3	84.50	
NEW 3/8	.125	1/4	.500	8	3/8	2-1/2	838824	80.50	838824-C3	89.50	
NEW 3/8	.125	1/4	.750	6	3/8	2-1/2	807324	81.00	807324-C3	90.00	
NEW 3/8	.125	1/4	1.000	6	3/8	2-1/2	72605	85.30	72605-C3	94.30	
NEW 3/8	.125	1/4	1.500	6	3/8	3-1/2	19505	96.40	19505-C3	105.40	
NEW 3/8	.125	1/4	1.500	8	3/8	3-1/2	822624	100.20	822624-C3	104.80	
NEW 3/8	.125	1/4	1.750	6	3/8	3-1/2	822224	101.10	822224-C3	109.00	
NEW 3/8	.125	1/4	2.000	6	3/8	3-1/2	71705	101.10	71705-C3	110.10	
NEW 3/8	.125	1/4	2.312	6	3/8	3-1/2	26805	103.80	26805-C3	112.80	
NEW 3/8	.125	1/4	2.625	6	3/8	4	963705	109.90	963705-C3	122.20	

DOUBLE ANGLE SHANK CUTTERS

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# DOUBLE ANGLE SHANK CUTTERS

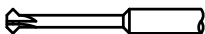
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INCL. ANGLE	CUTTER DIAMETER	CUTTER WIDTH	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
								TOOL #	PRICE	TOOL #	PRICE
B $\begin{smallmatrix} +1^\circ \\ -1^\circ \end{smallmatrix}$	D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L <sub>2</sub>		L <sub>3</sub> $\begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		D <sub>2</sub>	L <sub>1</sub>				
90°	7/16	.157	9/32	.500	6	7/16	2-3/4	19208	113.10	19208-C3	124.30
	7/16	.157	9/32	1.500	6	7/16	3-1/2	19508	131.00	19508-C3	144.40
	1/2	.187	5/16	.312	6	1/2	3	946910	99.20	946910-C3	112.60
	1/2	.187	5/16	.500	6	1/2	3	19210	102.40	19210-C3	115.80
	1/2	.187	5/16	.500	8	1/2	3	838832	107.50	838832-C3	120.90
	1/2	.187	5/16	1.000	6	1/2	3	72610	111.70	72610-C3	125.10
	1/2	.187	5/16	1.250	6	1/2	3-1/2	822432	114.40	822432-C3	122.30
	1/2	.187	5/16	1.500	6	1/2	4	19510	131.00	19510-C3	144.40
	1/2	.187	5/16	1.500	8	1/2	4	807932	136.10	807932-C3	149.50
	1/2	.187	5/16	2.000	6	1/2	4	71710	135.70	71710-C3	149.10
	1/2	.187	5/16	2.625	6	1/2	4	26810	139.30	26810-C3	152.70
	1/2	.187	5/16	3.125	6	1/2	6	963710	145.70	963710-C3	159.10
5/8	.250	3/8	.750	6	5/8	3-1/2	19215	194.90	19215-C3	208.30	
5/8	.250	3/8	1.250	6	5/8	3-1/2	72615	200.20	72615-C3	213.60	
100°	1/8	.075	1/16	.187	4	1/8	1-1/2	983401	45.50	983401-C3	50.10
	1/8	.075	1/16	.500	4	1/8	1-1/2	969901	54.70	969901-C3	59.30
	3/16	.113	3/32	.312	4	3/16	2	983402	47.80	983402-C3	52.80
	3/16	.113	3/32	.750	4	3/16	2-1/2	969902	56.90	969902-C3	61.90
	1/4	.149	1/8	.312	4	1/4	2	29750	66.60	29750-C3	73.40
	1/4	.149	1/8	1.000	4	1/4	3	969903	76.20	969903-C3	83.00
	3/8	.149	1/4	.500	6	3/8	2-1/2	983405	78.60	983405-C3	87.60
	3/8	.149	1/4	1.500	6	3/8	3-1/2	969905	99.70	969905-C3	108.70
	1/2	.224	5/16	.500	6	1/2	3	983410	104.60	983410-C3	118.00
1/2	.224	5/16	1.500	6	1/2	4	969910	135.40	969910-C3	148.80	
110°	1/4	.179	1/8	.312	4	1/4	2	830503	69.80	830503-C3	76.60
120°	1/8	.109	1/16	.125	4	1/8	1-1/2	903608	43.10	903608-C3	47.70
	1/8	.109	1/16	.187	4	1/8	1-1/2	39108	43.10	39108-C3	47.70
	1/8	.109	1/16	.500	4	1/8	2	989401	51.20	989401-C3	55.80
	3/16	.163	3/32	.187	4	3/16	2	903612	46.30	903612-C3	51.30
	3/16	.163	3/32	.312	4	3/16	2	39112	47.00	39112-C3	52.00
	3/16	.163	3/32	.750	4	3/16	2-1/2	989402	55.10	989402-C3	60.10
	1/4	.216	1/8	.187	4	1/4	2	903616	61.20	903616-C3	68.00
	1/4	.216	1/8	.312	4	1/4	2	39116	61.90	39116-C3	68.70
	1/4	.216	1/8	.625	4	1/4	2-1/2	910716	59.60	910716-C3	66.40
	1/4	.216	1/8	1.000	4	1/4	3	989403	70.20	989403-C3	77.00
	3/8	.216	1/4	.500	6	3/8	2-1/2	39124	80.90	39124-C3	89.90
	3/8	.216	1/4	1.000	6	3/8	2-1/2	910724	89.70	910724-C3	98.70
	3/8	.216	1/4	1.500	6	3/8	3-1/2	989405	101.10	989405-C3	110.10
	1/2	.325	5/16	.500	6	1/2	3	39132	107.50	39132-C3	120.90
	1/2	.325	5/16	1.000	6	1/2	3	910732	116.70	910732-C3	130.10
1/2	.325	5/16	1.500	6	1/2	4	989410	137.20	989410-C3	150.60	
150°	1/4	.467	1/8	.312	4	1/4	2	826003	69.80	826003-C3	76.60

DOUBLE ANGLE SHANK CUTTERS

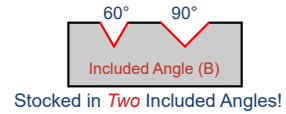
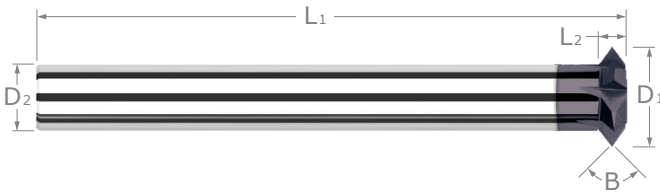
NEW






## 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 

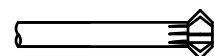
INCL. ANGLE	CUTTER DIAMETER	CUTTER WIDTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
						TOOL #	PRICE	TOOL #	PRICE
B $\begin{smallmatrix} +1^\circ \\ -1^\circ \end{smallmatrix}$	$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$L_2$		$D_2$	$L_1$				
60°	1/2	.144	8	1/4	3.144	866410	138.10	866410-C3	151.50
	3/4	.144	8	1/2	3.644	16220	145.90	16220-C3	160.40
	3/4	.144	8	1/2	6.144	27520	152.70	27520-C3	173.70
	1	.217	8	5/8	4.217	16230	160.50	16230-C3	182.60
90°	1/4	.125	6	1/8	2.625	875503	87.40	875503-C3	94.20
	3/8	.188	8	3/16	3.188	875505	122.60	875505-C3	137.10
	1/2	.250	8	1/4	3.250	875510	138.10	875510-C3	151.50
	3/4	.250	8	1/2	3-3/4	19220	145.40	19220-C3	159.90
	3/4	.250	8	1/2	6-1/4	19520	152.10	19520-C3	173.10
	1	.375	8	5/8	4-3/8	19230	160.80	19230-C3	182.90

DOUBLE ANGLE SHANK CUTTERS



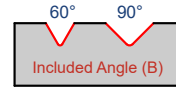
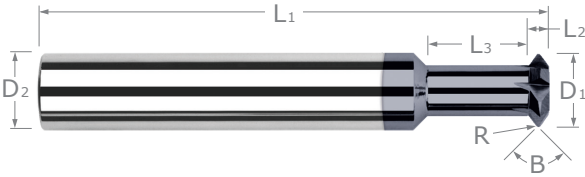
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# DOUBLE ANGLE SHANK CUTTERS

## Tip Radius



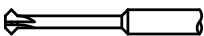
Stocked in **Two** Included Angles!

- 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

DOUBLE ANGLE SHANK CUTTERS

INCL. ANGLE	CUTTER DIA.	RADIUS	CUTTER WIDTH	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIA.	OAL	UNCOATED		A/TIN COATED	
									TOOL #	PRICE	TOOL #	PRICE
B $^{+1^{\circ}}_{-1^{\circ}}$	D1 $^{+.000"}_{-.002"}$	R $^{+.001"}_{-.001"}$	L2		L3 $^{+.020"}_{-.000"}$		D2	L1				
<b>60°</b>	1/8	<b>.005</b>	.042	1/16	<b>.187</b>	4	1/8	1-1/2	922508	54.40	922508-C3	59.00
	3/16	<b>.005</b>	.060	3/32	<b>.312</b>	4	3/16	2	922512	57.30	922512-C3	62.30
	1/4	<b>.005</b>	.078	1/8	<b>.312</b>	4	1/4	2	922516	73.40	922516-C3	80.20
	1/4	<b>.010</b>	.084	1/8	<b>.312</b>	4	1/4	2	934716	73.40	934716-C3	80.20
	1/4	<b>.010</b>	.084	1/8	<b>1.000</b>	4	1/4	3	930516	82.30	930516-C3	89.10
	3/8	<b>.010</b>	.084	1/4	<b>.500</b>	6	3/8	2-1/2	934724	98.40	934724-C3	107.40
	3/8	<b>.015</b>	.089	1/4	<b>.500</b>	6	3/8	2-1/2	911224	98.40	911224-C3	107.40
	1/2	<b>.010</b>	.120	5/16	<b>.500</b>	6	1/2	3	934732	119.90	934732-C3	133.30
	1/2	<b>.015</b>	.126	5/16	<b>.500</b>	6	1/2	3	911232	119.90	911232-C3	133.30
<b>90°</b>	1/16	<b>.005</b>	.035	1/32	<b>.093</b>	2	1/8	1-1/2	45804	55.50	45804-C3	60.10
	5/64	<b>.005</b>	.043	.039	<b>.118</b>	2	1/8	1-1/2	45805	55.50	45805-C3	60.10
	3/32	<b>.005</b>	.050	3/64	<b>.141</b>	2	1/8	1-1/2	45806	55.50	45806-C3	60.10
	1/8	<b>.005</b>	.067	1/16	<b>.187</b>	4	1/8	1-1/2	45808	55.50	45808-C3	60.10
	1/8	<b>.005</b>	.067	1/16	<b>.500</b>	4	1/8	1-1/2	928708	68.40	928708-C3	73.00
	1/8	<b>.010</b>	.071	1/16	<b>.187</b>	4	1/8	1-1/2	46608	55.50	46608-C3	60.10
	5/32	<b>.005</b>	.082	5/64	<b>.250</b>	4	3/16	2	45810	58.40	45810-C3	63.40
	5/32	<b>.005</b>	.082	5/64	<b>.625</b>	4	3/16	2-1/2	928710	65.40	928710-C3	70.40
	3/16	<b>.005</b>	.099	3/32	<b>.312</b>	4	3/16	2	45812	58.40	45812-C3	63.40
	3/16	<b>.005</b>	.099	3/32	<b>.750</b>	4	3/16	2-1/2	928712	65.40	928712-C3	70.40
	3/16	<b>.010</b>	.103	3/32	<b>.312</b>	4	3/16	2	46612	58.40	46612-C3	63.40
	1/4	<b>.005</b>	.129	1/8	<b>.312</b>	4	1/4	2	45816	67.30	45816-C3	74.10
	1/4	<b>.005</b>	.129	1/8	<b>.625</b>	4	1/4	2-1/2	898416	72.10	898416-C3	78.90
	1/4	<b>.005</b>	.129	1/8	<b>1.000</b>	4	1/4	3	928716	78.50	928716-C3	85.30
	1/4	<b>.010</b>	.133	1/8	<b>.312</b>	4	1/4	2	46616	67.30	46616-C3	74.10
	1/4	<b>.010</b>	.133	1/8	<b>.625</b>	4	1/4	2-1/2	890716	72.10	890716-C3	78.90
	1/4	<b>.010</b>	.133	1/8	<b>1.000</b>	4	1/4	3	931916	78.50	931916-C3	85.30
	1/4	<b>.015</b>	.137	1/8	<b>.312</b>	4	1/4	2	988616	67.30	988616-C3	74.10
	1/4	<b>.020</b>	.142	1/8	<b>.312</b>	4	1/4	2	831016	67.30	831016-C3	74.10
	5/16	<b>.005</b>	.130	3/16	<b>1.250</b>	6	5/16	3	928720	83.20	928720-C3	91.10
	5/16	<b>.010</b>	.134	3/16	<b>.375</b>	6	5/16	2-1/2	46620	84.60	46620-C3	92.50
5/16	<b>.010</b>	.134	3/16	<b>1.250</b>	6	5/16	3	931920	85.50	931920-C3	93.40	

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## DOUBLE ANGLE SHANK CUTTERS

Tip Radius (cont.)

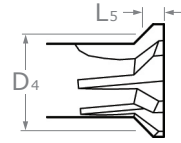
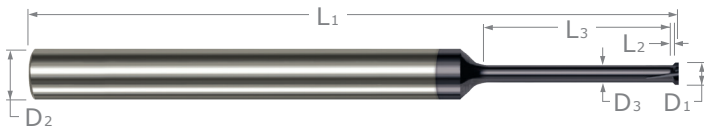
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INCL. ANGLE	CUTTER DIA.	RADIUS	CUTTER WIDTH	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED	
									TOOL #	PRICE	TOOL #	PRICE
$B \begin{smallmatrix} +1^\circ \\ -1^\circ \end{smallmatrix}$	$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$R \begin{smallmatrix} +.001'' \\ -.001'' \end{smallmatrix}$	$L_2$		$L_3 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		$D_2$	$L_1$				
90°	3/8	.010	.133	1/4	.500	6	3/8	2-1/2	46624	90.20	46624-C3	99.20
	3/8	.010	.133	1/4	1.000	6	3/8	2-1/2	890724	92.60	890724-C3	101.60
	3/8	.010	.133	1/4	1.500	6	3/8	3-1/2	931924	109.90	931924-C3	118.90
	3/8	.015	.137	1/4	.500	6	3/8	2-1/2	988624	90.20	988624-C3	99.20
	3/8	.015	.137	1/4	1.000	6	3/8	2-1/2	894124	92.60	894124-C3	101.60
	3/8	.015	.137	1/4	1.500	6	3/8	3-1/2	923524	109.90	923524-C3	118.90
	3/8	.020	.142	1/4	.500	6	3/8	2-1/2	831024	90.20	831024-C3	99.20
	1/2	.010	.196	5/16	.500	6	1/2	3	46632	115.80	46632-C3	129.20
	1/2	.010	.196	5/16	1.000	6	1/2	3	890732	119.10	890732-C3	132.50
	1/2	.010	.196	5/16	1.500	6	1/2	4	931932	143.60	931932-C3	157.00
	1/2	.015	.200	5/16	.500	6	1/2	3	988632	115.80	988632-C3	129.20
	1/2	.015	.200	5/16	1.000	6	1/2	3	894132	119.10	894132-C3	132.50
	1/2	.015	.200	5/16	1.500	6	1/2	4	923532	143.60	923532-C3	157.00

DOUBLE ANGLE SHANK CUTTERS



# BACK DEBURRING MILLS



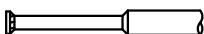
- **Ideal for deburring on backside of small holes and tight pockets**
- Slightly undersized to fit in common hole sizes
- 90° included angle, cutting on angle only
- Design has smaller radial projection than double angle shank cutters and back chamfer cutters, which results in increased neck diameter 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

BACK DEBURRING MILLS

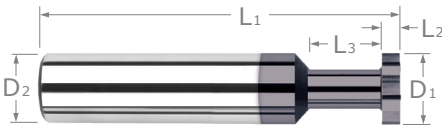
HEAD DIA.	AXIAL LOC	NECK DIA.	NECK LENGTH	CHAMFER CENTER LENGTH	CHAMFER CENTER DIAMETER	FLUTES	SHANK DIA.	OAL	UNCOATED		AISI COATED	
									TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.001"</sub>	L <sub>2</sub>	D <sub>3</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>5</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>	D <sub>4</sub> (Max.)		D <sub>2</sub>	L <sub>1</sub>				
.028	.0029	.021	<b>.093</b>	.0215	.0261	3	1/8	2	846328	62.40	846328-C3	67.00
.028	.0029	.021	<b>.125</b>	.0215	.0261	3	1/8	2	65728	62.40	65728-C3	67.00
.028	.0029	.021	<b>.250</b>	.0215	.0261	3	1/8	2	57028	62.40	57028-C3	67.00
.040	.0048	.028	<b>.125</b>	.0324	.0362	4	1/8	2	846340	58.00	846340-C3	62.60
.040	.0048	.028	<b>.187</b>	.0324	.0362	4	1/8	2	65740	58.00	65740-C3	62.60
.040	.0048	.028	<b>.312</b>	.0324	.0362	4	1/8	2	57040	58.00	57040-C3	62.60
.055	.0045	.043	<b>.187</b>	.0423	.0515	4	1/8	2	846355	58.00	846355-C3	62.60
.055	.0045	.043	<b>.281</b>	.0423	.0515	4	1/8	2	65755	58.00	65755-C3	62.60
.055	.0045	.043	<b>.437</b>	.0423	.0515	4	1/8	2	57055	58.00	57055-C3	62.60
.080	.0077	.060	<b>.250</b>	.0638	.0733	5	1/8	2	846380	52.50	846380-C3	57.10
.080	.0077	.060	<b>.375</b>	.0638	.0733	5	1/8	2	65780	52.50	65780-C3	57.10
.080	.0077	.060	<b>.625</b>	.0638	.0733	5	1/8	2	57080	52.50	57080-C3	57.10
.115	.0111	.087	<b>.375</b>	.0655	.1049	5	1/8	2	846410	52.50	846410-C3	57.10
.115	.0111	.087	<b>.562</b>	.0655	.1049	5	1/8	2	65810	52.50	65810-C3	57.10
.115	.0111	.087	<b>1.000</b>	.0655	.1049	5	1/8	2	57110	52.50	57110-C3	57.10

D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub>	D <sub>3</sub>	L <sub>3</sub> <sup>+0.010"</sup> / <sub>-.000"</sub>	L <sub>5</sub> <sup>+0.0005"</sup> / <sub>-.0005"</sub>	D <sub>4</sub> (Max.)		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
.135	.0111	.107	<b>.437</b>	.0655	.1249	5	3/16	2	846420	53.30	846420-C3	58.30
.135	.0111	.107	<b>.625</b>	.0655	.1249	5	3/16	2-1/2	65820	54.00	65820-C3	59.00
.135	.0111	.107	<b>1.125</b>	.0655	.1249	5	3/16	2-1/2	57120	54.00	57120-C3	59.00
.165	.0191	.121	<b>.500</b>	.0695	.1469	6	3/16	2	846430	53.30	846430-C3	58.30
.165	.0191	.121	<b>.750</b>	.0695	.1469	6	3/16	2-1/2	65830	54.00	65830-C3	59.00
.165	.0191	.121	<b>1.375</b>	.0695	.1469	6	3/16	2-1/2	57130	54.00	57130-C3	59.00
.210	.0191	.166	<b>.625</b>	.0695	.1919	6	1/4	2	846440	56.90	846440-C3	63.70
.210	.0191	.166	<b>1.000</b>	.0695	.1919	6	1/4	3	65840	58.00	65840-C3	64.80
.210	.0191	.166	<b>1.750</b>	.0695	.1919	6	1/4	3	57140	58.00	57140-C3	64.80
.262	.0251	.206	<b>1.375</b>	.0925	.2379	8	5/16	3	65850	59.00	65850-C3	66.90
.262	.0251	.206	<b>2.125</b>	.0925	.2379	8	5/16	4	57150	67.30	57150-C3	76.80
.315	.0251	.259	<b>1.625</b>	.0925	.2909	8	3/8	3	65860	72.80	65860-C3	81.80
.315	.0251	.259	<b>2.500</b>	.0925	.2909	8	3/8	4	57160	81.20	57160-C3	93.50
.420	.0321	.350	<b>2.125</b>	.1160	.3889	10	7/16	4	65870	92.20	65870-C3	105.60
.420	.0321	.350	<b>3.375</b>	.1160	.3889	10	7/16	6	57170	106.00	57170-C3	121.00

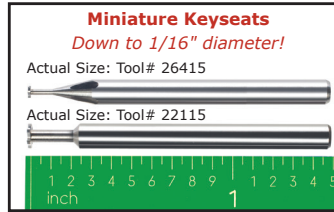


# KEYSEAT CUTTERS

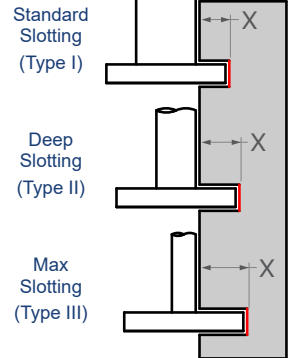
Square



- **Keyseat cutters down to 1/16" diameter**
- Both sides of cutter are dished for clearance
- Solid carbide
- CNC ground in the USA



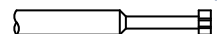
Stocked in Multiple Radial Depths of Cut!



CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AIIIN COATED	
									TOOL #	PRICE	TOOL #	PRICE
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				
<b>1/16</b>	.010	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26410	47.00	26410-C3	51.60
	.015 (1/64)	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26415	44.50	26415-C3	49.10
	.015 (1/64)	1/32	3/16 (3x)	.012	I	4	1/8	1-1/2	955115	52.10	955115-C3	56.70
	.020	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26420	44.50	26420-C3	49.10
	.025	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26425	44.50	26425-C3	49.10
	.030	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26430	44.50	26430-C3	49.10
	.031 (1/32)	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26431	44.50	26431-C3	49.10
	.031 (1/32)	1/32	3/16 (3x)	.012	I	4	1/8	1-1/2	955131	52.10	955131-C3	56.70
	.039 (1 mm)	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26439	44.50	26439-C3	49.10
	.047 (3/64)	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26447	44.50	26447-C3	49.10
	.062 (1/16)	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	26462	44.50	26462-C3	49.10
.062 (1/16)	1/32	3/16 (3x)	.012	I	4	1/8	1-1/2	955162	52.10	955162-C3	56.70	
<b>5/64</b>	.010	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27310	46.30	27310-C3	50.90
	.015 (1/64)	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27315	43.80	27315-C3	48.40
	.020	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27320	43.80	27320-C3	48.40
	.025	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27325	43.80	27325-C3	48.40
	.031 (1/32)	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27331	43.80	27331-C3	48.40
	.031 (1/32)	1 mm	6 mm (3x)	.018	I	4	1/8	1-1/2	922031	51.30	922031-C3	55.90
	.039 (1 mm)	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27339	43.80	27339-C3	48.40
	.047 (3/64)	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27347	43.80	27347-C3	48.40
	.062 (1/16)	1 mm	3 mm (1.5x)	.018	I	4	1/8	1-1/2	27362	43.80	27362-C3	48.40
<b>3/32</b>	.010	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28210	45.90	28210-C3	50.50
	.015 (1/64)	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28215	43.10	28215-C3	47.70
	.020	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28220	43.10	28220-C3	47.70
	.020	3/64	9/32 (3x)	.021	I	4	1/8	1-1/2	967720	43.10	967720-C3	47.70
	.025	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28225	43.10	28225-C3	47.70
	.030	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28230	43.10	28230-C3	47.70
	.031 (1/32)	1/32	3/64 (.5x)	<b>.031</b>	II	4	1/8	1-1/2	901131	45.50	901131-C3	50.10
	.031 (1/32)	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28231	43.10	28231-C3	47.70
	.031 (1/32)	3/64	9/32 (3x)	.021	I	4	1/8	1-1/2	967731	50.60	967731-C3	55.20
	.039 (1 mm)	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28239	43.10	28239-C3	47.70
	.040	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28240	43.10	28240-C3	47.70
	.047 (3/64)	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28247	43.10	28247-C3	47.70
	.047 (3/64)	3/64	9/32 (3x)	.021	I	4	1/8	1-1/2	967747	50.60	967747-C3	55.20
	.062 (1/16)	1/32	3/64 (.5x)	<b>.031</b>	II	4	1/8	1-1/2	901162	45.50	901162-C3	50.10
	.062 (1/16)	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28262	43.10	28262-C3	47.70
	.062 (1/16)	3/64	9/32 (3x)	.021	I	4	1/8	1-1/2	967762	50.60	967762-C3	55.20
.093 (3/32)	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	28293	43.10	28293-C3	47.70	

\*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		UNCOATED		AISI COATED	
							DIA.	OAL	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.005"</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	44.00	22110-C3	48.60
	.010	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43510	51.30	43510-C3	55.90
	.015 (1/64)	.040	1/16 (.5x)	.032	II	6	1/8	1-1/2	982515	52.10	982515-C3	56.70
	.015 (1/64)	.040	1/8 (1x)	.032	II	6	1/8	1-1/2	893315	53.20	893315-C3	57.80
	.015 (1/64)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22115	41.70	22115-C3	46.30
	.015 (1/64)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43515	48.90	43515-C3	53.50
	.020	.040	1/16 (.5x)	.032	II	6	1/8	1-1/2	982520	52.10	982520-C3	56.70
	.020	.040	1/8 (1x)	.032	II	6	1/8	1-1/2	893320	53.20	893320-C3	57.80
	.020	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22120	41.70	22120-C3	46.30
	.020	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43520	48.90	43520-C3	53.50
	.025	.040	1/16 (.5x)	.032	II	6	1/8	1-1/2	982525	52.10	982525-C3	56.70
	.025	.040	1/8 (1x)	.032	II	6	1/8	1-1/2	893325	53.20	893325-C3	57.80
	.025	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22125	41.70	22125-C3	46.30
	.025	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43525	48.90	43525-C3	53.50
	.030	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22130	41.70	22130-C3	46.30
	.030	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43530	48.90	43530-C3	53.50
	.031 (1/32)	.040	1/16 (.5x)	.032	II	6	1/8	1-1/2	982531	52.10	982531-C3	56.70
	.031 (1/32)	.040	1/8 (1x)	.032	II	6	1/8	1-1/2	893331	53.20	893331-C3	57.80
	.031 (1/32)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22131	41.70	22131-C3	46.30
	.031 (1/32)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43531	48.90	43531-C3	53.50
	.035	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22135	41.70	22135-C3	46.30
	.035	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43535	48.90	43535-C3	53.50
	.039 (1 mm)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22139	41.70	22139-C3	46.30
	.039 (1 mm)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43539	48.90	43539-C3	53.50
	.040	.040	1/16 (.5x)	.032	II	6	1/8	1-1/2	982540	52.10	982540-C3	56.70
	.040	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22140	41.70	22140-C3	46.30
	.040	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43540	48.90	43540-C3	53.50
	.045	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22145	41.70	22145-C3	46.30
	.047 (3/64)	.040	1/16 (.5x)	.032	II	6	1/8	1-1/2	982547	52.10	982547-C3	56.70
	.047 (3/64)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22147	41.70	22147-C3	46.30
	.047 (3/64)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43547	48.90	43547-C3	53.50
	.050	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22150	41.70	22150-C3	46.30
	.055	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22155	41.70	22155-C3	46.30
	.060	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22160	41.70	22160-C3	46.30
	.062 (1/16)	.040	1/16 (.5x)	.032	II	6	1/8	1-1/2	982562	52.10	982562-C3	56.70
	.062 (1/16)	.040	1/8 (1x)	.032	II	6	1/8	1-1/2	893362	53.20	893362-C3	57.80
	.062 (1/16)	1/16	1/8 (1x)	.022	I	6	1/8	1-1/2	806662	41.70	806662-C3	46.30
	.062 (1/16)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22162	41.70	22162-C3	46.30
	.062 (1/16)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43562	48.90	43562-C3	53.50
	.078 (5/64)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22178	41.70	22178-C3	46.30
.078 (5/64)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43578	48.90	43578-C3	53.50	
.093 (3/32)	.040	1/16 (.5x)	.032	II	6	1/8	1-1/2	982593	52.10	982593-C3	56.70	
.093 (3/32)	.040	1/8 (1x)	.032	II	6	1/8	1-1/2	893393	53.20	893393-C3	57.80	
.093 (3/32)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22193	41.70	22193-C3	46.30	
.093 (3/32)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43593	48.90	43593-C3	53.50	
.100	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22182	41.70	22182-C3	46.30	
.125 (1/8)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	22195	41.70	22195-C3	46.30	
.125 (1/8)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	43595	48.90	43595-C3	53.50	

NEW

\*Radial DOC accounts for max transition radius at neck

continued on next page



# KEYSEAT CUTTERS

Square (cont.)

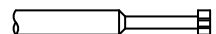
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CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AIIIN COATED		
									TOOL #	PRICE	TOOL #	PRICE	
5/32	D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.005"</sup> / <sub>-.0005"</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	
	.010	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69410	46.00	69410-C3	51.00	
	.015 (1/64)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69415	43.70	69415-C3	48.70	
	.015 (1/64)	5/64	1/2 (3x)	.029	I	6	3/16	2	956215	50.80	956215-C3	55.80	
	.020	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69420	43.70	69420-C3	48.70	
	.020	5/64	1/2 (3x)	.029	I	6	3/16	2	956220	50.80	956220-C3	55.80	
	.025	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69425	43.70	69425-C3	48.70	
	.025	5/64	1/2 (3x)	.029	I	6	3/16	2	956225	50.80	956225-C3	55.80	
	.031 (1/32)	.050	5/64 (.5x)	.043	II	6	3/16	2	900331	54.00	900331-C3	59.00	
	.031 (1/32)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69431	43.70	69431-C3	48.70	
	.031 (1/32)	5/64	1/2 (3x)	.029	I	6	3/16	2	956231	50.80	956231-C3	55.80	
	.039 (1 mm)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69439	43.70	69439-C3	48.70	
	.040	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69440	43.70	69440-C3	48.70	
	.047 (3/64)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69447	43.70	69447-C3	48.70	
	.047 (3/64)	5/64	1/2 (3x)	.029	I	6	3/16	2	956247	50.80	956247-C3	55.80	
	.050	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69450	43.70	69450-C3	48.70	
	.060	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69460	43.70	69460-C3	48.70	
	.062 (1/16)	.050	5/64 (.5x)	.043	II	6	3/16	2	900362	54.00	900362-C3	59.00	
	.062 (1/16)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69462	43.70	69462-C3	48.70	
	.062 (1/16)	5/64	1/2 (3x)	.029	I	6	3/16	2	956262	50.80	956262-C3	55.80	
	.078 (5/64)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69478	43.70	69478-C3	48.70	
	.078 (5/64)	5/64	1/2 (3x)	.029	I	6	3/16	2	956278	50.80	956278-C3	55.80	
	.093 (3/32)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69493	43.70	69493-C3	48.70	
	.093 (3/32)	5/64	1/2 (3x)	.029	I	6	3/16	2	956293	50.80	956293-C3	55.80	
	.125 (1/8)	5/64	1/4 (1.5x)	.029	I	6	3/16	2	69495	43.70	69495-C3	48.70	
	.125 (1/8)	5/64	1/2 (3x)	.029	I	6	3/16	2	956295	50.80	956295-C3	55.80	
	3/16	.010	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22210	45.90	22210-C3	50.90
		.015 (1/64)	1/16	3/32 (.5x)	.052	II	6	3/16	2	980015	53.30	980015-C3	58.30
.015 (1/64)		3/32	9/32 (1.5x)	.037	I	6	3/16	2	22215	43.00	22215-C3	48.00	
.015 (1/64)		3/32	9/16 (3x)	.037	I	6	3/16	2	43715	54.00	43715-C3	59.00	
.018		Please see page 317 for Retaining Ring sizes.											
.020		1/16	3/32 (.5x)	.052	II	6	3/16	2	980020	53.30	980020-C3	58.30	
.020		3/32	9/32 (1.5x)	.037	I	6	3/16	2	22220	43.00	22220-C3	48.00	
.020		3/32	9/16 (3x)	.037	I	6	3/16	2	43720	54.00	43720-C3	59.00	
.025		1/16	3/32 (.5x)	.052	II	6	3/16	2	980025	53.30	980025-C3	58.30	
.025		3/32	9/32 (1.5x)	.037	I	6	3/16	2	22225	43.00	22225-C3	48.00	
.025		3/32	9/16 (3x)	.037	I	6	3/16	2	43725	54.00	43725-C3	59.00	
.029		Please see page 317 for Retaining Ring sizes.											
.030		3/32	9/32 (1.5x)	.037	I	6	3/16	2	22230	43.00	22230-C3	48.00	
.030		3/32	9/16 (3x)	.037	I	6	3/16	2	43730	54.00	43730-C3	59.00	
.031 (1/32)		1/16	3/32 (.5x)	.052	II	6	3/16	2	980031	53.30	980031-C3	58.30	
.031 (1/32)		1/16	3/16 (1x)	.052	II	6	3/16	2	928931	53.30	928931-C3	58.30	
.031 (1/32)		3/32	9/32 (1.5x)	.037	I	6	3/16	2	22231	43.00	22231-C3	48.00	
.031 (1/32)		3/32	9/16 (3x)	.037	I	6	3/16	2	43731	54.00	43731-C3	59.00	
.035		3/32	9/32 (1.5x)	.037	I	6	3/16	2	22235	43.00	22235-C3	48.00	
.035		3/32	9/16 (3x)	.037	I	6	3/16	2	43735	54.00	43735-C3	59.00	
.039 (1 mm)		3/32	9/32 (1.5x)	.037	I	6	3/16	2	22239	43.00	22239-C3	48.00	
.039 (1 mm)		3/32	9/16 (3x)	.037	I	6	3/16	2	43739	54.00	43739-C3	59.00	

KEYSEAT CUTTERS

\*Radial DOC accounts for max transition radius at neck

continued on next page



# KEYSEAT CUTTERS

Square (cont.)

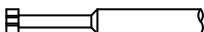
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CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AIIIN COATED	
									TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.005"</sup> / <sub>-.0005"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
3/16	.040	1/16	3/32 (.5x)	.052	II	6	3/16	2	980040	53.30	980040-C3	58.30
	.040	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22240	43.00	22240-C3	48.00
	.040	3/32	9/16 (3x)	.037	I	6	3/16	2	43740	54.00	43740-C3	59.00
	.045	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22246	43.00	22246-C3	48.00
	.045	3/32	9/16 (3x)	.037	I	6	3/16	2	43745	54.00	43745-C3	59.00
	.047 (3/64)	1/16	3/32 (.5x)	.052	II	6	3/16	2	980047	53.30	980047-C3	58.30
	.047 (3/64)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22247	43.00	22247-C3	48.00
	.047 (3/64)	3/32	9/16 (3x)	.037	I	6	3/16	2	43747	54.00	43747-C3	59.00
	.050	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22250	43.00	22250-C3	48.00
	.050	3/32	9/16 (3x)	.037	I	6	3/16	2	43750	54.00	43750-C3	59.00
	.055	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22255	43.00	22255-C3	48.00
	.055	3/32	9/16 (3x)	.037	I	6	3/16	2	43755	54.00	43755-C3	59.00
	.060	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22261	43.00	22261-C3	48.00
	.060	3/32	9/16 (3x)	.037	I	6	3/16	2	43760	54.00	43760-C3	59.00
	.062 (1/16)	1/16	3/32 (.5x)	.052	II	6	3/16	2	980062	53.30	980062-C3	58.30
	.062 (1/16)	1/16	3/16 (1x)	.052	II	6	3/16	2	928962	53.30	928962-C3	58.30
	.062 (1/16)	3/32	3/16 (1x)	.037	I	6	3/16	2	806562	43.00	806562-C3	48.00
	.062 (1/16)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22262	43.00	22262-C3	48.00
	.062 (1/16)	3/32	9/16 (3x)	.037	I	6	3/16	2	43762	54.00	43762-C3	59.00
	.078 (5/64)	1/16	3/32 (.5x)	.052	II	6	3/16	2	980078	53.30	980078-C3	58.30
	.078 (5/64)	1/16	3/16 (1x)	.052	II	6	3/16	2	928978	53.30	928978-C3	58.30
	.078 (5/64)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22278	43.00	22278-C3	48.00
	.078 (5/64)	3/32	9/16 (3x)	.037	I	6	3/16	2	43778	54.00	43778-C3	59.00
	.093 (3/32)	1/16	3/32 (.5x)	.052	II	6	3/16	2	980093	53.30	980093-C3	58.30
	.093 (3/32)	1/16	3/16 (1x)	.052	II	6	3/16	2	928993	53.30	928993-C3	58.30
	.093 (3/32)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22293	43.00	22293-C3	48.00
	.093 (3/32)	3/32	9/16 (3x)	.037	I	6	3/16	2	43793	54.00	43793-C3	59.00
	.125 (1/8)	1/16	3/32 (.5x)	.052	II	6	3/16	2	980095	53.30	980095-C3	58.30
.125 (1/8)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22295	43.00	22295-C3	48.00	
.125 (1/8)	3/32	9/16 (3x)	.037	I	6	3/16	2	43795	54.00	43795-C3	59.00	
.156 (5/32)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	22297	43.00	22297-C3	48.00	
6 mm	.031 (1/32)	3 mm	9 mm (1.5x)	.049	I	6	1/4	2-1/2	947531	49.60	947531-C3	56.40
	.039 (1 mm)	3 mm	9 mm (1.5x)	.049	I	6	1/4	2-1/2	947539	49.60	947539-C3	56.40
	.062 (1/16)	3 mm	9 mm (1.5x)	.049	I	6	1/4	2-1/2	947562	49.60	947562-C3	56.40
	.093 (3/32)	3 mm	9 mm (1.5x)	.049	I	6	1/4	2-1/2	947593	49.60	947593-C3	56.40
	.118 (3 mm)	3 mm	9 mm (1.5x)	.049	I	6	1/4	2-1/2	947588	49.60	947588-C3	56.40
	.125 (1/8)	3 mm	9 mm (1.5x)	.049	I	6	1/4	2-1/2	947595	49.60	947595-C3	56.40
1/4	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22310	51.70	22310-C3	58.50
	.010	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43910	61.90	43910-C3	68.70
	.015 (1/64)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70815	59.00	70815-C3	65.80
	.015 (1/64)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986115	60.30	986115-C3	67.10
	.015 (1/64)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22315	48.70	22315-C3	55.50
	.015 (1/64)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43915	59.40	43915-C3	66.20
	.020	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70820	51.50	70820-C3	58.30
	.020	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986120	52.70	986120-C3	59.50
	.020	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22320	48.70	22320-C3	55.50
.020	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43920	59.40	43920-C3	66.20	

NEW

\*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
1/4	D <sub>1</sub> <sup>+0.005"</sup> / <sub>-0.002"</sub>	L <sub>2</sub> <sup>+0.005"</sup> / <sub>-0.005"</sub>	L <sub>3</sub> <sup>+0.020"</sup> / <sub>-0.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
	.025	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70825	51.50	70825-C3	58.30
	.025	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986125	52.70	986125-C3	59.50
	.025	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22325	48.70	22325-C3	55.50
	.025	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43925	59.40	43925-C3	66.20
	.030	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70830	51.50	70830-C3	58.30
	.030	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22330	48.70	22330-C3	55.50
	.030	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43930	59.40	43930-C3	66.20
	.031 (1/32)	.050	5/64 (.3x)	.092	III	8	1/4	2-1/2	964731	84.70	964731-C3	91.50
	.031 (1/32)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70831	51.50	70831-C3	58.30
	.031 (1/32)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986131	67.30	986131-C3	74.10
	.031 (1/32)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22331	48.70	22331-C3	55.50
	.031 (1/32)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43931	59.40	43931-C3	66.20
	.035	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22335	48.70	22335-C3	55.50
	.035	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43935	59.40	43935-C3	66.20
	.039 (1 mm)	Please see page 317 for Retaining Ring sizes.										
	.039 (1 mm)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22339	48.70	22339-C3	55.50
	.040	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70840	51.50	70840-C3	58.30
	.040	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22340	48.70	22340-C3	55.50
	.040	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43940	59.40	43940-C3	66.20
	.045	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22346	48.70	22346-C3	55.50
	.046	Please see page 317 for Retaining Ring sizes.										
	.047 (3/64)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70847	51.50	70847-C3	58.30
	.047 (3/64)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986147	67.30	986147-C3	74.10
	.047 (3/64)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22347	48.70	22347-C3	55.50
	.047 (3/64)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43947	59.40	43947-C3	66.20
	.050	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70850	51.50	70850-C3	58.30
	.050	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22350	48.70	22350-C3	55.50
	.050	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43950	59.40	43950-C3	66.20
	.055	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22355	48.70	22355-C3	55.50
	.055	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43955	59.40	43955-C3	66.20
	.060	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70860	51.50	70860-C3	58.30
	.060	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22361	48.70	22361-C3	55.50
	.060	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43961	59.40	43961-C3	66.20
	.062 (1/16)	.050	5/64 (.3x)	.092	III	8	1/4	2-1/2	964762	84.70	964762-C3	91.50
	.062 (1/16)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70862	51.50	70862-C3	58.30
	.062 (1/16)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986162	67.30	986162-C3	74.10
	.062 (1/16)	1/8	1/4 (1x)	.053	I	6	1/4	2-1/2	806462	48.70	806462-C3	55.50
	.062 (1/16)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22362	48.70	22362-C3	55.50
	.062 (1/16)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43962	59.40	43962-C3	66.20
	.062 (1/16)	1/8	1 (4x)	.053	I	6	1/4	2-1/2	984262	68.70	984262-C3	75.50
	.078 (5/64)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70878	51.50	70878-C3	58.30
	.078 (5/64)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986178	67.30	986178-C3	74.10
	.078 (5/64)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22378	48.70	22378-C3	55.50
	.078 (5/64)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43978	59.40	43978-C3	66.20
.093 (3/32)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70893	51.50	70893-C3	58.30	
.093 (3/32)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986193	67.30	986193-C3	74.10	
.093 (3/32)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22393	48.70	22393-C3	55.50	
.093 (3/32)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43993	59.40	43993-C3	66.20	

NEW

KEYSEAT CUTTERS

continued on next page

\*Radial DOC accounts for max transition radius at neck

# KEYSEAT CUTTERS

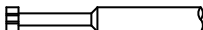
Square (cont.)

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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>+0.005"</sup> <sub>-.0005"</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	
1/4	.100	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22382	48.70	22382-C3	55.50	
	.100	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43982	59.40	43982-C3	66.20	
	.109 (7/64)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22384	48.70	22384-C3	55.50	
	.118 (3 mm)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22388	48.70	22388-C3	55.50	
	.125 (1/8)	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	70895	51.50	70895-C3	58.30	
	.125 (1/8)	5/64	1/4 (1x)	.076	II	6	1/4	2-1/2	986195	67.30	986195-C3	74.10	
	.125 (1/8)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22395	48.70	22395-C3	55.50	
	.125 (1/8)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43995	59.40	43995-C3	66.20	
	.125 (1/8)	1/8	1 (4x)	.053	I	6	1/4	2-1/2	984295	68.70	984295-C3	75.50	
	.156 (5/32)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22397	48.70	22397-C3	55.50	
	.156 (5/32)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43997	59.40	43997-C3	66.20	
	.187 (3/16)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22398	48.70	22398-C3	55.50	
	.187 (3/16)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	43998	59.40	43998-C3	66.20	
	.250 (1/4)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	22399	48.70	22399-C3	55.50	
5/16	.010	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22401	68.10	22401-C3	76.00	
	.015 (1/64)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22403	64.30	22403-C3	72.20	
	.020	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22405	64.30	22405-C3	72.20	
	.025	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22407	64.30	22407-C3	72.20	
	.030	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22409	64.30	22409-C3	72.20	
	.031 (1/32)	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	973410	71.70	973410-C3	79.60	
	.031 (1/32)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22410	64.30	22410-C3	72.20	
	.031 (1/32)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69710	76.00	69710-C3	83.90	
	.039 (1 mm)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22414	64.30	22414-C3	72.20	
	.039 (1 mm)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69714	76.00	69714-C3	83.90	
	.040	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22415	64.30	22415-C3	72.20	
	.047 (3/64)	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	973420	71.70	973420-C3	79.60	
	.047 (3/64)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22420	64.30	22420-C3	72.20	
	.050	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22422	64.30	22422-C3	72.20	
	.056	Please see page 317 for Retaining Ring sizes.											
	.060	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22428	64.30	22428-C3	72.20	
	.062 (1/16)	.063	3/32 (.3x)	.116	III	10	5/16	2-1/2	959430	95.90	959430-C3	103.80	
	.062 (1/16)	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	973430	71.70	973430-C3	79.60	
	.062 (1/16)	7/64	3/8 (1x)	.091	II	6	5/16	2-1/2	907930	87.20	907930-C3	95.10	
	.062 (1/16)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22430	64.30	22430-C3	72.20	
	.062 (1/16)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69730	76.00	69730-C3	83.90	
	.078 (5/64)	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	973440	71.70	973440-C3	79.60	
	.078 (5/64)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22440	64.30	22440-C3	72.20	
	.078 (5/64)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69740	76.00	69740-C3	83.90	
	.093 (3/32)	.063	3/32 (.3x)	.116	III	10	5/16	2-1/2	959450	95.90	959450-C3	103.80	
	.093 (3/32)	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	973450	71.70	973450-C3	79.60	
	.093 (3/32)	7/64	3/8 (1x)	.091	II	6	5/16	2-1/2	907950	87.20	907950-C3	95.10	
	.093 (3/32)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22450	64.30	22450-C3	72.20	
	.093 (3/32)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69750	76.00	69750-C3	83.90	
	.100	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22452	64.30	22452-C3	72.20	
	.125 (1/8)	7/64	3/16 (.5x)	.091	II	6	5/16	2-1/2	973460	71.70	973460-C3	79.60	
	.125 (1/8)	7/64	3/8 (1x)	.091	II	6	5/16	2-1/2	907960	87.20	907960-C3	95.10	
	.125 (1/8)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22455	64.30	22455-C3	72.20	
	.125 (1/8)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69760	76.00	69760-C3	83.90	

\*Radial DOC accounts for max transition radius at neck

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# KEYSEAT CUTTERS

Square (cont.)

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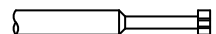
CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AII <sup>n</sup> COATED	
									TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> <sup>+ .000"</sup> <sub>-.002"</sub>	L <sub>2</sub> <sup>+ .0005"</sup> <sub>-.0005"</sub>		L <sub>3</sub> <sup>+ .020"</sup> <sub>-.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
<b>5/16</b>	.156 (5/32)	7/64	3/16 (.5x)	<b>.091</b>	II	6	5/16	2-1/2	973465	71.70	973465-C3	79.60
	.156 (5/32)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22465	64.30	22465-C3	72.20
	.156 (5/32)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69765	76.00	69765-C3	83.90
	.187 (3/16)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22470	64.30	22470-C3	72.20
	.187 (3/16)	5/32	1 (3x)	.068	I	6	5/16	2-1/2	69770	76.00	69770-C3	83.90
	.250 (1/4)	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	22480	64.30	22480-C3	72.20
<b>3/8</b>	.015 (1/64)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22503	75.10	22503-C3	84.10
	.020	1/8	3/16 (.5x)	<b>.115</b>	II	8	3/8	2-1/2	71105	76.10	71105-C3	85.10
	.020	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22505	75.10	22505-C3	84.10
	.020	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70305	84.90	70305-C3	93.90
	.025	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22507	75.10	22507-C3	84.10
	.025	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70307	84.90	70307-C3	93.90
	.030	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22509	75.10	22509-C3	84.10
	.031 (1/32)	.075	7/64 (.3x)	<b>.142</b>	III	10	3/8	2-1/2	991310	99.30	991310-C3	108.30
	.031 (1/32)	1/8	3/16 (.5x)	<b>.115</b>	II	8	3/8	2-1/2	71110	76.10	71110-C3	85.10
	.031 (1/32)	1/8	3/8 (1x)	<b>.115</b>	II	8	3/8	2-1/2	958910	91.80	958910-C3	100.80
	.031 (1/32)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22510	72.50	22510-C3	81.50
	.031 (1/32)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70310	84.90	70310-C3	93.90
	.035	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22512	72.50	22512-C3	81.50
	.035	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70312	84.90	70312-C3	93.90
	.039 (1 mm)	1/8	3/16 (.5x)	<b>.115</b>	II	8	3/8	2-1/2	71114	76.10	71114-C3	85.10
	.039 (1 mm)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22514	72.50	22514-C3	81.50
	.039 (1 mm)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70314	84.90	70314-C3	93.90
	.040	1/8	3/16 (.5x)	<b>.115</b>	II	8	3/8	2-1/2	71115	76.10	71115-C3	85.10
	.040	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22515	72.50	22515-C3	81.50
	.040	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70315	84.90	70315-C3	93.90
	.045	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22518	72.50	22518-C3	81.50
	.047 (3/64)	1/8	3/16 (.5x)	<b>.115</b>	II	8	3/8	2-1/2	71120	76.10	71120-C3	85.10
	.047 (3/64)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22520	72.50	22520-C3	81.50
	.047 (3/64)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70320	84.90	70320-C3	93.90
	.050	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22522	72.50	22522-C3	81.50
	.055	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22525	72.50	22525-C3	81.50
	.060	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22528	72.50	22528-C3	81.50
	.060	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70328	84.90	70328-C3	93.90
	.062 (1/16)	.075	7/64 (.3x)	<b>.142</b>	III	10	3/8	2-1/2	991330	99.30	991330-C3	108.30
	.062 (1/16)	1/8	3/16 (.5x)	<b>.115</b>	II	8	3/8	2-1/2	71130	76.10	71130-C3	85.10
	.062 (1/16)	1/8	3/8 (1x)	<b>.115</b>	II	8	3/8	2-1/2	958930	91.80	958930-C3	100.80
	.062 (1/16)	3/16	3/8 (1x)	.084	I	8	3/8	2-1/2	<b>806330</b>	72.50	<b>806330-C3</b>	81.50
.062 (1/16)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22530	72.50	22530-C3	81.50	
.062 (1/16)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70330	84.90	70330-C3	93.90	
.068	Please see page 317 for Retaining Ring sizes.											
.078 (5/64)	1/8	3/16 (.5x)	<b>.115</b>	II	8	3/8	2-1/2	71140	76.10	71140-C3	85.10	
.078 (5/64)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22540	72.50	22540-C3	81.50	
.078 (5/64)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70340	72.50	70340-C3	81.50	
.086	Please see page 317 for Retaining Ring sizes.											

NEW

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.	OAL	UNCOATED		AIIIN COATED	
									TOOL #	PRICE	TOOL #	PRICE
3/8	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				
	.093 (3/32)	.075	7/64 (.3x)	.142	III	10	3/8	2-1/2	991350	99.30	991350-C3	108.30
	.093 (3/32)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71150	76.10	71150-C3	85.10
	.093 (3/32)	1/8	3/8 (1x)	.115	II	8	3/8	2-1/2	958950	91.80	958950-C3	100.80
	.093 (3/32)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22550	72.50	22550-C3	81.50
	.093 (3/32)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70350	84.90	70350-C3	93.90
	.100	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22552	72.50	22552-C3	81.50
	.125 (1/8)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71160	76.10	71160-C3	85.10
	.125 (1/8)	1/8	3/8 (1x)	.115	II	8	3/8	2-1/2	958960	91.80	958960-C3	100.80
	.125 (1/8)	3/16	3/8 (1x)	.084	I	8	3/8	2-1/2	806360	72.50	806360-C3	81.50
	.125 (1/8)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22560	72.50	22560-C3	81.50
	.125 (1/8)	3/16	1-1/8 (3x)	.084	I	8	3/8	2-1/2	70360	84.90	70360-C3	93.90
	.156 (5/32)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71165	76.10	71165-C3	85.10
	.156 (5/32)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22565	72.50	22565-C3	81.50
	.156 (5/32)	3/16	1-1/8 (3x)	.084	I	8	3/8	3	70365	84.90	70365-C3	93.90
	.187 (3/16)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71170	76.10	71170-C3	85.10
	.187 (3/16)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22570	72.50	22570-C3	81.50
	.187 (3/16)	3/16	1-1/8 (3x)	.084	I	8	3/8	3	70370	84.90	70370-C3	93.90
	.250 (1/4)	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	71180	76.10	71180-C3	85.10
	.250 (1/4)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22580	72.50	22580-C3	81.50
.250 (1/4)	3/16	1-1/8 (3x)	.084	I	8	3/8	3	70380	84.90	70380-C3	93.90	
.312 (5/16)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	22585	72.50	22585-C3	81.50	
7/16	.031 (1/32)	7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71810	96.80	71810-C3	108.00
	.047 (3/64)	7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71820	96.80	71820-C3	108.00
	.062 (1/16)	7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71830	96.80	71830-C3	108.00
	.078 (5/64)	7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71840	96.80	71840-C3	108.00
	.093 (3/32)	7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71850	96.80	71850-C3	108.00
	.125 (1/8)	7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71860	96.80	71860-C3	108.00
	.125 (1/8)	7/32	1-5/16 (3x)	.099	I	8	7/16	2-3/4	892960	109.50	892960-C3	120.70
	.156 (5/32)	7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71865	96.80	71865-C3	108.00
	.187 (3/16)	7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71870	96.80	71870-C3	108.00
	.187 (3/16)	7/32	1-5/16 (3x)	.099	I	8	7/16	2-3/4	892970	109.50	892970-C3	120.70
	.250 (1/4)	7/32	5/8 (1.5x)	.099	I	8	7/16	2-3/4	71880	96.80	71880-C3	108.00
	.250 (1/4)	7/32	1-5/16 (3x)	.099	I	8	7/16	2-3/4	892980	109.50	892980-C3	120.70
1/2	.015 (1/64)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22603	98.50	22603-C3	111.90
	.020	5/32	1/4 (.5x)	.162	II	8	1/2	3	71205	102.30	71205-C3	115.70
	.020	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22605	98.50	22605-C3	111.90
	.025	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22607	98.50	22607-C3	111.90
	.025	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71507	110.70	71507-C3	124.10
	.030	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22609	98.50	22609-C3	111.90
	.031 (1/32)	5/32	1/4 (.5x)	.162	II	8	1/2	3	71210	99.20	71210-C3	112.60
	.031 (1/32)	5/32	1/2 (1x)	.162	II	8	1/2	3	975710	100.50	975710-C3	113.90
	.031 (1/32)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22610	95.30	22610-C3	108.70
	.031 (1/32)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71510	107.70	71510-C3	121.10
	.035	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22612	95.30	22612-C3	108.70
	.039 (1 mm)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22614	95.30	22614-C3	108.70
	.040	5/32	1/4 (.5x)	.162	II	8	1/2	3	71215	99.20	71215-C3	112.60
	.040	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22615	95.30	22615-C3	108.70
	.040	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71515	107.70	71515-C3	121.10

NEW

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.	OAL	UNCOATED		AISI COATED	
									TOOL #	PRICE	TOOL #	PRICE
1/2	D <sub>1</sub> <sup>+0.005"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.005"</sup> / <sub>-.0005"</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
	.045	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22618	95.30	22618-C3	108.70
	.045	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71518	107.70	71518-C3	121.10
	.047 (3/64)	5/32	1/4 (.5x)	.162	II	8	1/2	3	71220	99.20	71220-C3	112.60
	.047 (3/64)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22620	95.30	22620-C3	108.70
	.047 (3/64)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71520	107.70	71520-C3	121.10
	.050	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22622	95.30	22622-C3	108.70
	.050	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71522	107.70	71522-C3	121.10
	.055	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22625	95.30	22625-C3	108.70
	.055	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71525	107.70	71525-C3	121.10
	.060	5/32	1/4 (.5x)	.162	II	8	1/2	3	71228	99.20	71228-C3	112.60
	.060	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22628	95.30	22628-C3	108.70
	.062 (1/16)	.100	5/32 (.3x)	.192	III	12	1/2	3	985230	124.10	985230-C3	137.50
	.062 (1/16)	5/32	1/4 (.5x)	.162	II	8	1/2	3	71230	99.20	71230-C3	112.60
	.062 (1/16)	5/32	1/2 (1x)	.162	II	8	1/2	3	975730	117.60	975730-C3	131.00
	.062 (1/16)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22630	95.30	22630-C3	108.70
	.062 (1/16)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71530	107.70	71530-C3	121.10
	.070	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22635	95.30	22635-C3	108.70
	.078 (5/64)	5/32	1/4 (.5x)	.162	II	8	1/2	3	71240	99.20	71240-C3	112.60
	.078 (5/64)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22640	95.30	22640-C3	108.70
	.078 (5/64)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71540	107.70	71540-C3	121.10
	.080	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22642	95.30	22642-C3	108.70
	.090	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22647	95.30	22647-C3	108.70
	.093 (3/32)	.100	5/32 (.3x)	.192	III	12	1/2	3	985250	124.10	985250-C3	137.50
	.093 (3/32)	5/32	1/4 (.5x)	.162	II	8	1/2	3	71250	99.20	71250-C3	112.60
	.093 (3/32)	5/32	1/2 (1x)	.162	II	8	1/2	3	975750	117.60	975750-C3	131.00
	.093 (3/32)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22650	95.30	22650-C3	108.70
	.093 (3/32)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71550	107.70	71550-C3	121.10
	.100	5/32	1/4 (.5x)	.162	II	8	1/2	3	71252	99.20	71252-C3	112.60
	.100	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22652	95.30	22652-C3	108.70
	.100	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71552	107.70	71552-C3	121.10
	.103	Please see page 317 for Retaining Ring sizes.										
	.109 (7/64)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22654	95.30	22654-C3	108.70
	.118 (3 mm)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22657	95.30	22657-C3	108.70
	.118 (3 mm)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71557	107.70	71557-C3	121.10
	.120	Please see page 317 for Retaining Ring sizes.										
	.125 (1/8)	.100	5/32 (.3x)	.192	III	12	1/2	3	985260	124.10	985260-C3	137.50
	.125 (1/8)	5/32	1/4 (.5x)	.162	II	8	1/2	3	71260	99.20	71260-C3	112.60
	.125 (1/8)	5/32	1/2 (1x)	.162	II	8	1/2	3	975760	117.60	975760-C3	131.00
	.125 (1/8)	1/4	1/2 (1x)	.115	I	8	1/2	3	806260	95.30	806260-C3	108.70
	.125 (1/8)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22660	95.30	22660-C3	108.70
	.125 (1/8)	1/4	1-1/2 (3x)	.115	I	8	1/2	3	71560	107.70	71560-C3	121.10
	.125 (1/8)	1/4	2 (4x)	.115	I	8	1/2	4	933160	160.80	933160-C3	174.20
	.140 (9/64)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22662	95.30	22662-C3	108.70
	.156 (5/32)	5/32	1/4 (.5x)	.162	II	8	1/2	3	71265	99.20	71265-C3	112.60
.156 (5/32)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22665	95.30	22665-C3	108.70	
.156 (5/32)	1/4	1-1/2 (3x)	.115	I	8	1/2	3-1/2	71565	107.70	71565-C3	121.10	
.187 (3/16)	5/32	1/4 (.5x)	.162	II	8	1/2	3	71270	99.20	71270-C3	112.60	
.187 (3/16)	5/32	1/2 (1x)	.162	II	8	1/2	3	975770	117.60	975770-C3	131.00	

KEYSEAT CUTTERS

NEW

\*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		AIIIN COATED		
									TOOL #	PRICE	TOOL #	PRICE	
D <sub>1</sub> <sup>+0.001"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.005"</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	.187 (3/16)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22670	95.30	22670-C3	108.70	
	.187 (3/16)	1/4	1-1/2 (3x)	.115	I	8	1/2	3-1/2	71570	107.70	71570-C3	121.10	
	.250 (1/4)	5/32	1/4 (.5x)	.162	II	8	1/2	3	71280	99.20	71280-C3	112.60	
	.250 (1/4)	5/32	1/2 (1x)	.162	II	8	1/2	3	975780	117.60	975780-C3	131.00	
	.250 (1/4)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22680	95.30	22680-C3	108.70	
	.250 (1/4)	1/4	1-1/2 (3x)	.115	I	8	1/2	3-1/2	71580	107.70	71580-C3	121.10	
	.312 (5/16)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22685	95.30	22685-C3	108.70	
	.312 (5/16)	1/4	1-1/2 (3x)	.115	I	8	1/2	3-1/2	71585	107.70	71585-C3	121.10	
	.375 (3/8)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	22687	95.30	22687-C3	108.70	
5/8	.031 (1/32)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70910	149.30	70910-C3	162.70	
	.031 (1/32)	5/16	2 (3x)	.146	I	8	5/8	3-1/2	972910	193.10	972910-C3	206.50	
	.047 (3/64)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70920	149.30	70920-C3	162.70	
	.062 (1/16)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70930	149.30	70930-C3	162.70	
	.078 (5/64)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70940	149.30	70940-C3	162.70	
	.093 (3/32)	13/64	5/16 (.5x)	.201	II	8	5/8	3-1/2	950650	201.00	950650-C3	214.40	
	.093 (3/32)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70950	149.30	70950-C3	162.70	
	.093 (3/32)	5/16	2 (3x)	.146	I	8	5/8	4	972950	193.10	972950-C3	207.60	
	.120	Please see page 317 for Retaining Ring sizes.											
	.125 (1/8)	13/64	5/16 (.5x)	.201	II	8	5/8	3-1/2	950660	201.00	950660-C3	214.40	
	.125 (1/8)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70960	149.30	70960-C3	162.70	
	.125 (1/8)	5/16	2 (3x)	.146	I	8	5/8	4	972960	193.10	972960-C3	207.60	
	.139	Please see page 317 for Retaining Ring sizes.											
	.156 (5/32)	13/64	5/16 (.5x)	.201	II	8	5/8	3-1/2	950665	201.00	950665-C3	214.40	
	.156 (5/32)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70965	149.30	70965-C3	162.70	
	.156 (5/32)	5/16	2 (3x)	.146	I	8	5/8	4	972965	193.10	972965-C3	207.60	
	.187 (3/16)	13/64	5/16 (.5x)	.201	II	8	5/8	3-1/2	950670	201.00	950670-C3	214.40	
	.187 (3/16)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70970	149.30	70970-C3	162.70	
	.187 (3/16)	5/16	2 (3x)	.146	I	8	5/8	4	972970	193.10	972970-C3	207.60	
	.250 (1/4)	13/64	5/16 (.5x)	.201	II	8	5/8	3-1/2	950680	201.00	950680-C3	214.40	
	.250 (1/4)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70980	149.30	70980-C3	162.70	
	.250 (1/4)	5/16	2 (3x)	.146	I	8	5/8	4	972980	193.10	972980-C3	207.60	
	.312 (5/16)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70985	149.30	70985-C3	162.70	
.375 (3/8)	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	70987	149.30	70987-C3	162.70		

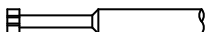
\*Radial DOC accounts for max transition radius at neck

**For reduced shank and greater radial depths of cut, please see Reduced Shank Keyseat Cutters on pages 314, 322, & 329.**



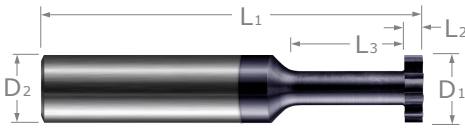
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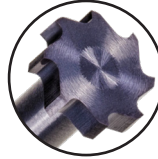


# KEYSEAT CUTTERS

## Square for Hardened Steels

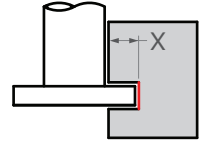


- Optimized for hardened steels 45-68Rc with high flute count and specialized internal geometry
- Latest generation AlTiN Nano coating offers superior hardness and heat resistance
- Both sides of cutter are dished for clearance
- Solid carbide
- CNC ground in the USA 



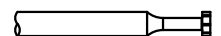
High Flute Count and Specialized Internal Geometry

Standard Slotting  
(Type I)



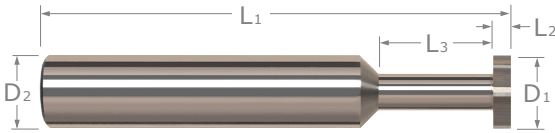
CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	AlTiN NANO COATED	
									TOOL #	PRICE
D1 $\pm .000''$ $-.002''$	L2 $\pm .0005''$ $-.0005''$		L3 $\pm .020''$ $-.000''$	X			D2	L1		
<b>1/8</b>	.015 (1/64)	1/16	3/16 (1.5x)	.022	I	8	1/8	1-1/2	867415-C6	52.00
	.031 (1/32)	1/16	3/16 (1.5x)	.022	I	8	1/8	1-1/2	867431-C6	52.00
	.062 (1/16)	1/16	3/16 (1.5x)	.022	I	8	1/8	1-1/2	867462-C6	52.00
	.093 (3/32)	1/16	3/16 (1.5x)	.022	I	8	1/8	1-1/2	867493-C6	52.00
<b>3/16</b>	.031 (1/32)	3/32	9/32 (1.5x)	.037	I	8	3/16	2	875931-C6	54.00
	.062 (1/16)	3/32	9/32 (1.5x)	.037	I	8	3/16	2	875962-C6	54.00
	.093 (3/32)	3/32	9/32 (1.5x)	.037	I	8	3/16	2	875993-C6	54.00
<b>1/4</b>	.015 (1/64)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860115-C6	61.00
	.031 (1/32)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860131-C6	61.00
	.047 (3/64)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860147-C6	61.00
	.062 (1/16)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860162-C6	61.00
	.078 (5/64)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860178-C6	61.00
	.093 (3/32)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860193-C6	61.00
	.125 (1/8)	1/8	3/8 (1.5x)	.048	I	8	1/4	2-1/2	860195-C6	61.00
<b>5/16</b>	.062 (1/16)	5/32	15/32 (1.5x)	.063	I	8	5/16	2-1/2	855630-C6	80.70
	.093 (3/32)	5/32	15/32 (1.5x)	.063	I	8	5/16	2-1/2	855650-C6	80.70
	.125 (1/8)	5/32	15/32 (1.5x)	.063	I	8	5/16	2-1/2	855660-C6	80.70
<b>3/8</b>	.031 (1/32)	3/16	9/16 (1.5x)	.074	I	10	3/8	2-1/2	894710-C6	90.90
	.062 (1/16)	3/16	9/16 (1.5x)	.074	I	10	3/8	2-1/2	894730-C6	90.90
	.093 (3/32)	3/16	9/16 (1.5x)	.074	I	10	3/8	2-1/2	894750-C6	90.90
	.125 (1/8)	3/16	9/16 (1.5x)	.074	I	10	3/8	2-1/2	894760-C6	90.90
	.187 (3/16)	3/16	9/16 (1.5x)	.074	I	10	3/8	2-1/2	894770-C6	90.90
	.250 (1/4)	3/16	9/16 (1.5x)	.074	I	10	3/8	2-1/2	894780-C6	90.90
<b>1/2</b>	.031 (1/32)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891310-C6	123.40
	.047 (3/64)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891320-C6	123.40
	.062 (1/16)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891330-C6	123.40
	.078 (5/64)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891340-C6	123.40
	.093 (3/32)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891350-C6	123.40
	.125 (1/8)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891360-C6	123.40
	.156 (5/32)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891365-C6	123.40
	.187 (3/16)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891370-C6	123.40
.250 (1/4)	1/4	3/4 (1.5x)	.105	I	10	1/2	3	891380-C6	123.40	

\*Radial DOC accounts for max transition radius at neck

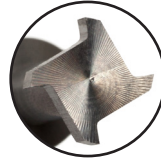


# KEYSEAT CUTTERS

## Square for Non-Ferrous Materials

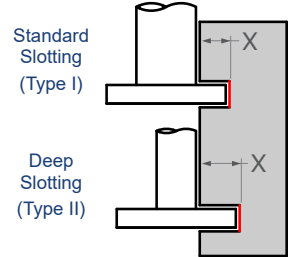


- ⚡ Optimized for aluminum and aluminum alloys with excellent performance in copper, brass, and bronze alloys
- ⚡ Large flute opening and sharper cutting edge
- ⚡ Offered with TiB<sub>2</sub> coating to minimize galling
- ⚡ Both sides of cutter are dished for clearance
- ⚡ Solid carbide
- ⚡ CNC ground in the USA



Large Flute Opening & Sharper Cutting Edge

Stocked in Multiple Radial Depths of Cut!



KEYSEAT CUTTERS

CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK		UNCOATED		TiB <sub>2</sub> COATED	
							DIA.	OAL	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>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-0.000"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
<b>3/32</b>	.015 (1/64)	3/64	9/64 (1.5x)	.021	I	3	1/8	1-1/2	849815	47.00	849815-C8	53.80
	.031 (1/32)	3/64	9/64 (1.5x)	.021	I	3	1/8	1-1/2	849831	47.00	849831-C8	53.80
	.062 (1/16)	3/64	9/64 (1.5x)	.021	I	3	1/8	1-1/2	849862	47.00	849862-C8	53.80
<b>1/8</b>	.015 (1/64)	1/16	3/16 (1.5x)	.022	I	4	1/8	1-1/2	962915	47.00	962915-C8	53.80
	.031 (1/32)	1/16	3/16 (1.5x)	.022	I	4	1/8	1-1/2	962931	47.00	962931-C8	53.80
	.062 (1/16)	1/16	3/16 (1.5x)	.022	I	4	1/8	1-1/2	962962	47.00	962962-C8	53.80
	.093 (3/32)	1/16	3/16 (1.5x)	.022	I	4	1/8	1-1/2	962993	47.00	962993-C8	53.80
<b>3/16</b>	.031 (1/32)	3/32	9/32 (1.5x)	.037	I	4	3/16	2	998031	48.70	998031-C8	55.50
	.047 (3/64)	3/32	9/32 (1.5x)	.037	I	4	3/16	2	998047	48.70	998047-C8	55.50
	.062 (1/16)	3/32	9/32 (1.5x)	.037	I	4	3/16	2	998062	48.70	998062-C8	55.50
	.125 (1/8)	3/32	9/32 (1.5x)	.037	I	4	3/16	2	998095	48.70	998095-C8	55.50
<b>1/4</b>	.015 (1/64)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970315	54.00	970315-C8	61.30
	.020	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970320	54.00	970320-C8	61.30
	.025	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970325	54.00	970325-C8	61.30
	.031 (1/32)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970331	54.00	970331-C8	61.30
	.040	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970340	54.00	970340-C8	61.30
	.047 (3/64)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970347	54.00	970347-C8	61.30
	.060	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970360	54.00	970360-C8	61.30
	.062 (1/16)	5/64	1/8 (.5x)	.076	II	4	1/4	2-1/2	909262	56.90	909262-C8	64.20
	.062 (1/16)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970362	54.00	970362-C8	61.30
	.078 (5/64)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970378	54.00	970378-C8	61.30
	.093 (3/32)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970393	54.00	970393-C8	61.30
	.125 (1/8)	5/64	1/8 (.5x)	.076	II	4	1/4	2-1/2	909295	56.90	909295-C8	64.20
	.125 (1/8)	1/8	3/8 (1.5x)	.053	I	4	1/4	2-1/2	970395	54.00	970395-C8	61.30
<b>5/16</b>	.031 (1/32)	5/32	15/32 (1.5x)	.068	I	4	5/16	2-1/2	984310	74.00	984310-C8	89.50
	.062 (1/16)	5/32	15/32 (1.5x)	.068	I	4	5/16	2-1/2	984330	74.00	984330-C8	89.50
	.093 (3/32)	5/32	15/32 (1.5x)	.068	I	4	5/16	2-1/2	984350	74.00	984350-C8	89.50
	.125 (1/8)	5/32	15/32 (1.5x)	.068	I	4	5/16	2-1/2	984360	74.00	984360-C8	89.50

\*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	
							D <sub>2</sub>	L <sub>1</sub>	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								
<b>3/8</b>	.031 (1/32)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975210	82.80	975210-C8	101.60
	.047 (3/64)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975220	82.80	975220-C8	101.60
	.062 (1/16)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975230	82.80	975230-C8	101.60
	.078 (5/64)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975240	82.80	975240-C8	101.60
	.093 (3/32)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975250	82.80	975250-C8	101.60
	.125 (1/8)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975260	82.80	975260-C8	101.60
	.187 (3/16)	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	975270	82.80	975270-C8	101.60
<b>1/2</b>	.031 (1/32)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988910	109.10	988910-C8	131.20
	.047 (3/64)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988920	109.10	988920-C8	131.20
	.062 (1/16)	5/32	1/4 (.5x)	.162	II	6	1/2	3	917530	113.20	917530-C8	135.30
	.062 (1/16)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988930	109.10	988930-C8	131.20
	.078 (5/64)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988940	109.10	988940-C8	131.20
	.093 (3/32)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988950	109.10	988950-C8	131.20
	.125 (1/8)	5/32	1/4 (.5x)	.162	II	6	1/2	3	917560	113.20	917560-C8	135.30
	.125 (1/8)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988960	109.10	988960-C8	131.20
	.156 (5/32)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988965	109.10	988965-C8	131.20
	.187 (3/16)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988970	109.10	988970-C8	131.20
.250 (1/4)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	988980	109.10	988980-C8	131.20	
<b>5/8</b>	.062 (1/16)	5/16	1 (1.5x)	.146	I	6	5/8	3-1/2	891730	156.30	891730-C8	188.50
	.078 (5/64)	5/16	1 (1.5x)	.146	I	6	5/8	3-1/2	891740	156.30	891740-C8	188.50
	.093 (3/32)	5/16	1 (1.5x)	.146	I	6	5/8	3-1/2	891750	156.30	891750-C8	188.50
	.125 (1/8)	5/16	1 (1.5x)	.146	I	6	5/8	3-1/2	891760	156.30	891760-C8	188.50
	.187 (3/16)	5/16	1 (1.5x)	.146	I	6	5/8	3-1/2	891770	156.30	891770-C8	188.50
	.250 (1/4)	5/16	1 (1.5x)	.146	I	6	5/8	3-1/2	891780	156.30	891780-C8	188.50

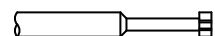
\*Radial DOC accounts for max transition radius at neck



"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."

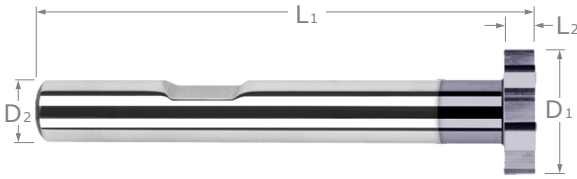
— @hdhmfng

Follow us on Instagram @harveytool!



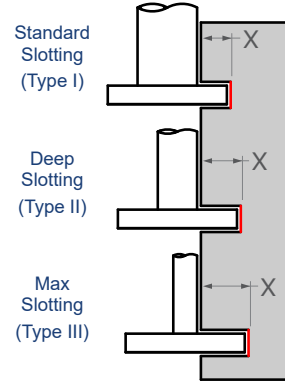
# KEYSEAT CUTTERS

## 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!

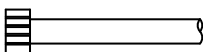


KEYSEAT CUTTERS

CUTTER DIAMETER	CUTTER WIDTH	RADIAL DOC**	TYPE	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED		
							TOOL #	PRICE	TOOL #	PRICE	
$D_1 \begin{smallmatrix} +.000'' \\ - .002'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.001'' \\ - .001'' \end{smallmatrix}$	X			$D_2$	$L_1$					
<b>1/2</b>	.031 (1/32)	.115	I	8	1/4*	3-1/32	849305	84.80	849305-C3	98.20	
	.062 (1/16)	.115	I	8	1/4*	3-1/16	849320	84.80	849320-C3	98.20	
	.093 (3/32)	.115	I	8	1/4*	3-3/32	849340	84.80	849340-C3	98.20	
	.125 (1/8)	.115	I	8	1/4*	3-1/8	849350	84.80	849350-C3	98.20	
	.187 (3/16)	.115	I	8	1/4*	3-3/16	849360	84.80	849360-C3	98.20	
	.250 (1/4)	.115	I	8	1/4*	3-1/4	849370	84.80	849370-C3	98.20	
<b>3/4</b>	.031 (1/32)	<b>.240</b>	III	10	1/4*	3-1/32	899805	111.30	899805-C3	125.80	
	.031 (1/32)	<b>.177</b>	II	10	3/8	3-1/32	984505	105.20	984505-C3	119.70	
	.031 (1/32)	.115	I	10	1/2	3-1/32	52005	102.00	52005-C3	116.50	
	.040	<b>.177</b>	II	10	3/8	3.040	984508	105.20	984508-C3	119.70	
	.040	.115	I	10	1/2	3.040	52008	102.00	52008-C3	116.50	
	.047 (3/64)	<b>.240</b>	III	10	1/4*	3-3/64	899810	111.30	899810-C3	125.80	
	.047 (3/64)	<b>.177</b>	II	10	3/8	3-3/64	984510	105.20	984510-C3	119.70	
	.047 (3/64)	.115	I	10	1/2	3-3/64	52010	102.00	52010-C3	116.50	
	.050	.115	I	10	1/2	3.050	52011	102.00	52011-C3	116.50	
	.060	.115	I	10	1/2	3.060	52019	102.00	52019-C3	116.50	
	.062 (1/16)	<b>.240</b>	III	10	1/4*	3-1/16	899820	111.30	899820-C3	125.80	
	.062 (1/16)	<b>.177</b>	II	10	3/8	3-1/16	984520	105.20	984520-C3	119.70	
	.062 (1/16)	.115	I	10	1/2	3-1/16	52020	102.00	52020-C3	116.50	
	.078 (5/64)	<b>.177</b>	II	10	3/8	3-5/64	984530	105.20	984530-C3	119.70	
	.078 (5/64)	.115	I	10	1/2	3-5/64	52030	102.00	52030-C3	116.50	
	.093 (3/32)	<b>.240</b>	III	10	1/4*	3-3/32	899840	111.30	899840-C3	125.80	
	.093 (3/32)	<b>.177</b>	II	10	3/8	3-3/32	984540	105.20	984540-C3	119.70	
	.093 (3/32)	.115	I	10	1/2	3-3/32	52040	102.00	52040-C3	116.50	
	.100	.115	I	10	1/2	3.100	52045	102.00	52045-C3	116.50	
	.118 (3 mm)	.115	I	10	1/2	3.118	52048	102.00	52048-C3	116.50	
	.125 (1/8)	<b>.177</b>	II	10	3/8	3-1/8	984550	105.20	984550-C3	119.70	
	.125 (1/8)	.115	I	10	1/2	3-1/8	52050	102.00	52050-C3	116.50	
	.156 (5/32)	<b>.177</b>	II	10	3/8	3-5/32	984555	105.20	984555-C3	119.70	
	.156 (5/32)	.115	I	10	1/2	3-5/32	52055	102.00	52055-C3	116.50	
	.174	Please see page 317 for Retaining Ring sizes.									
	.187 (3/16)	<b>.177</b>	II	10	3/8	3-3/16	984560	105.20	984560-C3	119.70	
	.187 (3/16)	.115	I	10	1/2	3-3/16	52060	102.00	52060-C3	116.50	

\*No Weldon Flat \*\*Radial DOC Accounts for max transition radius at neck

continued on next page



# KEYSEAT CUTTERS

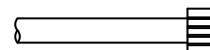
## Square – Reduced Shank (cont.)

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> - .002"	L <sub>2</sub> <sup>+0.001"</sup> - .001"	X			D <sub>2</sub>	L <sub>1</sub>					
3/4	.236 (6 mm)	.115	I	10	1/2	3.236	52066	110.70	52066-C3	125.20	
	.250 (1/4)	.177	II	10	3/8	3-1/4	984570	118.00	984570-C3	132.50	
	.250 (1/4)	.115	I	10	1/2	3-1/4	52070	115.10	52070-C3	129.60	
	.312 (5/16)	.115	I	10	1/2	3-5/16	52080	135.70	52080-C3	157.80	
	.375 (3/8)	.115	I	10	1/2	3-3/8	52090	141.40	52090-C3	163.50	
7/8	.062 (3/16)	.177	I	12	1/2	3-1/16	961020	109.10	961020-C3	123.60	
	.093 (3/32)	.177	I	12	1/2	3-3/32	961040	109.10	961040-C3	123.60	
	.125 (1/8)	.240	II	12	3/8	3-1/8	890650	111.80	890650-C3	126.30	
	.125 (1/8)	.177	I	12	1/2	3-1/8	961050	109.10	961050-C3	123.60	
	.187 (3/16)	.240	II	12	3/8	3-3/16	890660	111.80	890660-C3	126.30	
	.187 (3/16)	.177	I	12	1/2	3-3/16	961060	109.10	961060-C3	123.60	
	.250 (1/4)	.240	II	12	3/8	3-1/4	890670	124.30	890670-C3	138.80	
	.250 (1/4)	.177	I	12	1/2	3-1/4	961070	121.40	961070-C3	135.90	
	.312 (5/16)	.177	I	12	1/2	3-5/16	961080	135.70	961080-C3	157.80	
	.375 (3/8)	.177	I	12	1/2	3-3/8	961090	141.40	961090-C3	163.50	
1	.031 (1/32)	.365	III	12	1/4*	3-1/32	914905	129.70	914905-C3	151.80	
	.031 (1/32)	.302	II	12	3/8	3-1/32	982005	117.60	982005-C3	139.70	
	.031 (1/32)	.240	I	12	1/2	3-1/32	55905	114.70	55905-C3	136.80	
	.040	.240	I	12	1/2	3.040	55908	114.70	55908-C3	136.80	
	.047 (3/64)	.365	III	12	1/4*	3-3/64	914910	129.70	914910-C3	151.80	
	.047 (3/64)	.302	II	12	3/8	3-3/64	982010	117.60	982010-C3	139.70	
	.047 (3/64)	.240	I	12	1/2	3-3/64	55910	114.70	55910-C3	136.80	
	.062 (1/16)	.365	III	12	1/4*	3-1/16	914920	129.70	914920-C3	151.80	
	.062 (1/16)	.302	II	12	3/8	3-1/16	982020	117.60	982020-C3	139.70	
	.062 (1/16)	.240	I	12	1/2	3-1/16	55920	114.70	55920-C3	136.80	
	.078 (5/64)	.365	III	12	1/4*	3-5/64	914930	129.70	914930-C3	151.80	
	.078 (5/64)	.302	II	12	3/8	3-5/64	982030	117.60	982030-C3	139.70	
	.078 (5/64)	.240	I	12	1/2	3-5/64	55930	114.70	55930-C3	136.80	
	.093 (3/32)	.365	III	12	1/4*	3-3/32	914940	129.70	914940-C3	151.80	
	.093 (3/32)	.302	II	12	3/8	3-3/32	982040	117.60	982040-C3	139.70	
	.093 (3/32)	.240	I	12	1/2	3-3/32	55940	114.70	55940-C3	136.80	
	.125 (1/8)	.365	III	12	1/4*	3-1/8	914950	129.70	914950-C3	151.80	
	.125 (1/8)	.302	II	12	3/8	3-1/8	982050	117.60	982050-C3	139.70	
	.125 (1/8)	.240	I	12	1/2	3-1/8	55950	114.70	55950-C3	136.80	
	.156 (5/32)	.302	II	12	3/8	3-5/32	982055	117.60	982055-C3	139.70	
	.156 (5/32)	.240	I	12	1/2	3-5/32	55955	114.70	55955-C3	136.80	
	.187 (3/16)	.302	II	12	3/8	3-3/16	982060	117.60	982060-C3	139.70	
	.187 (3/16)	.240	I	12	1/2	3-3/16	55960	114.70	55960-C3	136.80	
	.209	Please see page 317 for Retaining Ring sizes.									
	.250 (1/4)	.302	II	12	3/8	3-1/4	982070	130.40	982070-C3	152.50	
	.250 (1/4)	.240	I	12	1/2	3-1/4	55970	127.30	55970-C3	149.40	
	.312 (5/16)	.302	II	12	3/8	3-5/16	982080	139.10	982080-C3	161.20	
	.312 (5/16)	.240	I	12	1/2	3-5/16	55980	135.70	55980-C3	157.80	
	.375 (3/8)	.302	II	12	3/8	3-3/8	982090	131.70	982090-C3	152.50	
	.375 (3/8)	.240	I	12	1/2	3-3/8	55990	141.40	55990-C3	163.50	
.500 (1/2)	.240	I	12	1/2	3-1/2	55995	147.10	55995-C3	169.20		

\*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>+0.001"</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>1-1/4</b>	.093 (3/32)	.240	I	14	3/4	3-11/32	973940	142.50	973940-C3	164.60
	.125 (1/8)	<b>.365</b>	II	14	1/2	3-1/8	879950	146.00	879950-C3	169.70
	.125 (1/8)	.240	I	14	3/4	3-3/8	973950	142.50	973950-C3	164.60
	.250 (1/4)	<b>.365</b>	II	14	1/2	3-1/4	879970	147.40	879970-C3	169.70
	.250 (1/4)	.240	I	14	3/4	3-1/2	973970	158.50	973970-C3	173.00
	.375 (3/8)	.240	I	14	3/4	3-5/8	973990	170.90	973990-C3	198.50
	.500 (1/2)	.240	I	14	3/4	3-3/4	973995	170.90	973995-C3	198.50
<b>1-1/2</b>	.062 (1/16)	<b>.490</b>	II	16	1/2	3-1/16	887020	155.40	887020-C3	183.00
	.062 (1/16)	.365	I	16	3/4	3-5/16	962020	151.80	962020-C3	179.40
	.093 (3/32)	.365	I	16	3/4	3-11/32	962040	151.80	962040-C3	179.40
	.125 (1/8)	<b>.552</b>	III	16	3/8	3-1/8	868750	160.00	868750-C3	187.60
	.125 (1/8)	<b>.490</b>	II	16	1/2	3-1/8	887050	155.40	887050-C3	183.00
	.125 (1/8)	.365	I	16	3/4	3-3/8	962050	151.80	962050-C3	179.40
	.187 (3/16)	<b>.552</b>	III	16	3/8	3-3/16	868760	160.00	868760-C3	187.60
	.187 (3/16)	<b>.490</b>	II	16	1/2	3-3/16	887060	155.40	887060-C3	183.00
	.187 (3/16)	.365	I	16	3/4	3-7/16	962060	151.80	962060-C3	179.40
	.250 (1/4)	<b>.490</b>	II	16	1/2	3-1/4	887070	167.20	887070-C3	194.80
	.250 (1/4)	.365	I	16	3/4	3-1/2	962070	163.20	962070-C3	190.80
	.312 (5/16)	.365	I	16	3/4	3-9/16	962080	184.10	962080-C3	211.70
	.375 (3/8)	.365	I	16	3/4	3-5/8	962090	210.70	962090-C3	238.30
	.437 (7/16)	.365	I	16	3/4	3-11/16	962093	228.00	962093-C3	255.60
	.500 (1/2)	.365	I	16	3/4	3-3/4	962095	245.00	962095-C3	272.60

\*No Weldon Flat \*\*Radial DOC Accounts for max transition radius at neck

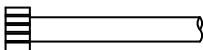
KEYSEAT CUTTERS



"Best Tool ever! [Back Corner Rounding End Mill] No more second ops! (making iPad/tablet display frames for kiosks)."

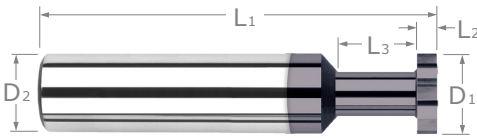
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## KEYSEAT CUTTERS

## 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 

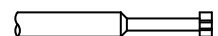
CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC**	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D1 $\begin{matrix} +.000" \\ -.002" \end{matrix}$	L2 $\begin{matrix} +.002" \\ -.000" \end{matrix}$		L3 $\begin{matrix} +.020" \\ -.000" \end{matrix}$			D2	L1				
<b>3/16</b>	.018	1/8	1/8	.021	6	3/16	2	23504	46.00	23504-C3	51.00
	.029	1/8	1/8	.021	6	3/16	2	23508	46.00	23508-C3	51.00
<b>1/4</b>	.039	5/32	5/32	.037	6	1/4	2-1/2	23512	54.50	23512-C3	61.30
	.046	5/32	5/32	.037	6	1/4	2-1/2	23516	54.50	23516-C3	61.30
<b>5/16</b>	.056	3/16	3/16	.052	6	5/16	2-1/2	23520	65.20	23520-C3	73.10
<b>3/8</b>	.068	3/16	1/4	.084	8	3/8	2-1/2	23524	76.00	23524-C3	85.00
	.086	3/16	1/4	.084	8	3/8	2-1/2	23528	76.00	23528-C3	85.00
<b>1/2</b>	.103	1/4	5/16	.115	8	1/2	3	23532	83.70	23532-C3	97.10
	.120	1/4	3/8	.115	8	1/2	3	23536	83.70	23536-C3	97.10
<b>5/8</b>	.120	5/16	1/2	.146	8	5/8	3-1/2	23540	155.70	23540-C3	169.10
	.139	5/16	1/2	.146	8	5/8	3-1/2	23544	155.70	23544-C3	169.10
<b>3/4</b>	.174	-	-	.177	10	3/8	3.174	23548*	112.40	23548-C3*	131.90
<b>1</b>	.209	-	-	.240	12	1/2	3.209	23564*	134.60	23564-C3*	156.70

\*Carbide head with reduced steel shank \*\*Radial DOC accounts for max transition at neck



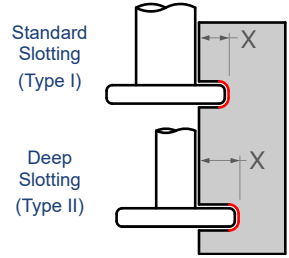
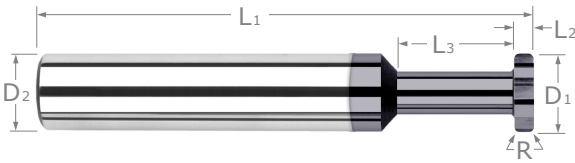
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# KEYSEAT CUTTERS

## Corner Radius

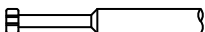


- ↻ Both sides of cutter are dished for clearance
- ↻ Corner radius for improved strength
- ↻ Solid carbide
- ↻ CNC ground in the USA

CUTTER DIA.	CUTTER WIDTH	CORNER RADIUS	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AIIIN COATED	
										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			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	54.50	910615-C3	59.10
	.031 (1/32)	<b>.005</b>	1/32	3/32 (1.5x)	.012	I	4	1/8	1-1/2	910631	54.50	910631-C3	59.10
<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	53.10	902531-C3	57.70
	.062 (1/16)	<b>.005</b>	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	902562	53.10	902562-C3	57.70
	.062 (1/16)	<b>.010</b>	3/64	9/64 (1.5x)	.021	I	4	1/8	1-1/2	909162	53.10	909162-C3	57.70
<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	51.70	965115-C3	56.30
	.020	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	965120	51.70	965120-C3	56.30
	.025	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	965125	51.70	965125-C3	56.30
	.031 (1/32)	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	965131	51.70	965131-C3	56.30
	.031 (1/32)	<b>.010</b>	.040	1/16 (.5x)	<b>.032</b>	II	6	1/8	1-1/2	837631	60.80	837631-C3	65.40
	.040	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	965140	51.70	965140-C3	56.30
	.047 (3/64)	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	965147	51.70	965147-C3	56.30
	.062 (1/16)	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	965162	51.70	965162-C3	56.30
	.062 (1/16)	<b>.010</b>	.040	1/16 (.5x)	<b>.032</b>	II	6	1/8	1-1/2	837662	60.80	837662-C3	65.40
	.062 (1/16)	<b>.010</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	985962	51.70	985962-C3	56.30
	.078 (5/64)	<b>.010</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	985978	51.70	985978-C3	56.30
	.093 (3/32)	<b>.010</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	985993	51.70	985993-C3	56.30
.093 (3/32)	<b>.015</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	960793	51.70	960793-C3	56.30	
<b>3/16</b>	.015 (1/64)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954715	53.40	954715-C3	58.40
	.020	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954720	53.40	954720-C3	58.40
	.025	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954725	53.40	954725-C3	58.40
	.031 (1/32)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954731	53.40	954731-C3	58.40
	.040	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954740	53.40	954740-C3	58.40
	.047 (3/64)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954747	53.40	954747-C3	58.40
	.062 (1/16)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	954762	53.40	954762-C3	58.40
	.062 (1/16)	<b>.010</b>	1/16	3/32 (.5x)	<b>.052</b>	II	6	3/16	2	837262	63.00	837262-C3	68.00
	.062 (1/16)	<b>.010</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	949962	53.40	949962-C3	58.40
	.062 (1/16)	<b>.015</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	937762	53.40	937762-C3	58.40
	.078 (5/64)	<b>.010</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	949978	53.40	949978-C3	58.40
	.093 (3/32)	<b>.010</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	949993	53.40	949993-C3	58.40
	.093 (3/32)	<b>.015</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	937793	53.40	937793-C3	58.40
	.125 (1/8)	<b>.010</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	949995	53.40	949995-C3	58.40
.125 (1/8)	<b>.015</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	937795	53.40	937795-C3	58.40	

\*Radial DOC accounts for max transition radius at neck

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## KEYSEAT CUTTERS

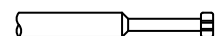
Corner Radius (cont.)

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CUTTER DIA.	CUTTER WIDTH	CORNER RADIUS	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AIIIN COATED	
										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			D <sub>2</sub>	L <sub>1</sub>				
1/4	.015 (1/64)	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981115	59.00	981115-C3	65.80
	.020	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981120	59.00	981120-C3	65.80
	.025	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981125	59.00	981125-C3	65.80
	.031 (1/32)	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981131	59.00	981131-C3	65.80
	.031 (1/32)	.005	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	916631	69.70	916631-C3	76.50
	.031 (1/32)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972631	59.00	972631-C3	65.80
	.040	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981140	59.00	981140-C3	65.80
	.047 (3/64)	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981147	59.00	981147-C3	65.80
	.047 (3/64)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972647	59.00	972647-C3	65.80
	.050	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981150	59.00	981150-C3	65.80
	.060	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972660	59.00	972660-C3	65.80
	.062 (1/16)	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981162	57.90	981162-C3	64.70
	.062 (1/16)	.010	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	911762	68.40	911762-C3	75.20
	.062 (1/16)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972662	57.90	972662-C3	64.70
	.062 (1/16)	.010	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	900062	68.60	900062-C3	75.40
	.062 (1/16)	.015	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	968462	57.90	968462-C3	64.70
	.078 (5/64)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972678	59.00	972678-C3	65.80
	.093 (3/32)	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981193	57.90	981193-C3	64.70
	.093 (3/32)	.010	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	911793	68.40	911793-C3	75.20
	.093 (3/32)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972693	57.90	972693-C3	64.70
	.093 (3/32)	.010	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	900093	68.60	900093-C3	75.40
	.093 (3/32)	.015	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	968493	57.90	968493-C3	64.70
	.093 (3/32)	.030	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	904593	57.90	904593-C3	64.70
	.125 (1/8)	.005	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	981195	57.90	981195-C3	64.70
	.125 (1/8)	.010	5/64	1/8 (.5x)	.076	II	6	1/4	2-1/2	911795	68.40	911795-C3	75.20
	.125 (1/8)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972695	57.90	972695-C3	64.70
	.125 (1/8)	.010	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	900095	68.60	900095-C3	75.40
	.125 (1/8)	.015	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	968495	57.90	968495-C3	64.70
.125 (1/8)	.030	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	904595	57.90	904595-C3	64.70	
.187 (3/16)	.010	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972697	57.90	972697-C3	64.70	
.187 (3/16)	.015	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	968497	57.90	968497-C3	64.70	
5/16	.031 (1/32)	.005	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	931610	84.90	931610-C3	92.80
	.031 (1/32)	.010	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	921110	84.90	921110-C3	92.80
	.062 (1/16)	.005	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	931630	84.90	931630-C3	92.80
	.062 (1/16)	.010	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	921130	84.90	921130-C3	92.80
	.093 (3/32)	.010	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	921150	84.90	921150-C3	92.80
	.093 (3/32)	.015	5/32	15/32 (1.5x)	.068	I	6	5/16	2-1/2	927750	84.90	927750-C3	92.80
3/8	.031 (1/32)	.005	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	987210	87.30	987210-C3	96.30
	.047 (3/64)	.005	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	987220	87.30	987220-C3	96.30
	.062 (1/16)	.005	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	836830	89.60	836830-C3	98.60
	.062 (1/16)	.005	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	987230	85.60	987230-C3	94.60
	.062 (1/16)	.010	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	916830	89.60	916830-C3	98.60
	.062 (1/16)	.010	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	981630	85.60	981630-C3	94.60
	.062 (1/16)	.015	1/8	3/16 (.5x)	.115	II	8	3/8	2-1/2	903330	89.60	903330-C3	98.60
	.062 (1/16)	.015	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970030	85.60	970030-C3	94.60

\*Radial DOC accounts for max transition radius at neck

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# 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.		UNCOATED		AITIN COATED	
								D <sub>2</sub>	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>3/8</b>	.078 (5/64)	<b>.010</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	981640	87.30	981640-C3	96.30
	.093 (3/32)	<b>.005</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	987250	85.60	987250-C3	94.60
	.093 (3/32)	<b>.010</b>	1/8	3/16 (.5x)	<b>.115</b>	II	8	3/8	2-1/2	916850	89.60	916850-C3	98.60
	.093 (3/32)	<b>.010</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	981650	85.60	981650-C3	94.60
	.093 (3/32)	<b>.015</b>	1/8	3/16 (.5x)	<b>.115</b>	II	8	3/8	2-1/2	903350	89.60	903350-C3	98.60
	.093 (3/32)	<b>.015</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970050	85.60	970050-C3	94.60
	.093 (3/32)	<b>.030</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	905950	85.60	905950-C3	94.60
	.125 (1/8)	<b>.005</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	987260	85.60	987260-C3	94.60
	.125 (1/8)	<b>.010</b>	1/8	3/16 (.5x)	<b>.115</b>	II	8	3/8	2-1/2	916860	89.60	916860-C3	98.60
	.125 (1/8)	<b>.010</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	981660	85.60	981660-C3	94.60
	.125 (1/8)	<b>.015</b>	1/8	3/16 (.5x)	<b>.115</b>	II	8	3/8	2-1/2	903360	89.60	903360-C3	98.60
	.125 (1/8)	<b>.015</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970060	85.60	970060-C3	94.60
	.125 (1/8)	<b>.030</b>	1/8	3/16 (.5x)	<b>.115</b>	II	8	3/8	2-1/2	857960	89.60	857960-C3	98.60
	.125 (1/8)	<b>.030</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	905960	85.60	905960-C3	94.60
	.156 (5/32)	<b>.015</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970065	88.90	970065-C3	97.90
	.156 (5/32)	<b>.030</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	905965	88.90	905965-C3	97.90
	.187 (3/16)	<b>.010</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	981670	87.30	981670-C3	96.30
	.187 (3/16)	<b>.015</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970070	87.30	970070-C3	96.30
	.187 (3/16)	<b>.030</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	905970	87.30	905970-C3	96.30
	.250 (1/4)	<b>.015</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970080	87.30	970080-C3	96.30
.250 (1/4)	<b>.030</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	905980	87.30	905980-C3	96.30	
<b>1/2</b>	.020	<b>.005</b>	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976005	110.50	976005-C3	123.90
	.025	<b>.005</b>	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976007	110.50	976007-C3	123.90
	.031 (1/32)	<b>.005</b>	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976010	110.50	976010-C3	123.90
	.031 (1/32)	<b>.010</b>	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987710	110.50	987710-C3	123.90
	.040	<b>.005</b>	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976015	110.50	976015-C3	123.90
	.047 (3/64)	<b>.005</b>	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976020	110.50	976020-C3	123.90
	.047 (3/64)	<b>.010</b>	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987720	110.50	987720-C3	123.90
	.062 (1/16)	<b>.005</b>	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976030	108.60	976030-C3	122.00
	.062 (1/16)	<b>.010</b>	5/32	1/4 (.5x)	<b>.162</b>	II	8	1/2	3	901030	112.70	901030-C3	126.10
	.062 (1/16)	<b>.010</b>	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987730	108.60	987730-C3	122.00
	.062 (1/16)	<b>.015</b>	5/32	1/4 (.5x)	<b>.162</b>	II	8	1/2	3	913430	112.70	913430-C3	126.10
	.062 (1/16)	<b>.015</b>	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990330	108.60	990330-C3	122.00
	.062 (1/16)	<b>.020</b>	1/4	3/4 (1.5x)	.115	I	8	1/2	3	933730	108.60	933730-C3	122.00

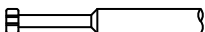
\*Radial DOC accounts for max transition radius at neck

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KEYSEAT CUTTERS



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## 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.		UNCOATED		AIIIN COATED	
								D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> $\begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.0005" \\ -.0005" \end{smallmatrix}$	R $\begin{smallmatrix} +.001" \\ -.001" \end{smallmatrix}$		L <sub>3</sub> $\begin{smallmatrix} +.020" \\ -.000" \end{smallmatrix}$	X								
1/2	.078 (5/64)	.010	5/32	1/4 (.5x)	.162	II	8	1/2	3	901040	114.80	901040-C3	128.20
	.078 (5/64)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987740	110.50	987740-C3	123.90
	.078 (5/64)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990340	110.50	990340-C3	123.90
	.093 (3/32)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976050	108.60	976050-C3	122.00
	.093 (3/32)	.010	5/32	1/4 (.5x)	.162	II	8	1/2	3	901050	112.70	901050-C3	126.10
	.093 (3/32)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987750	108.60	987750-C3	122.00
	.093 (3/32)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990350	108.60	990350-C3	122.00
	.093 (3/32)	.020	1/4	3/4 (1.5x)	.115	I	8	1/2	3	933750	108.60	933750-C3	122.00
	.093 (3/32)	.030	1/4	3/4 (1.5x)	.115	I	8	1/2	3	969150	110.50	969150-C3	123.90
	.125 (1/8)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	976060	108.60	976060-C3	122.00
	.125 (1/8)	.010	5/32	1/4 (.5x)	.162	II	8	1/2	3	901060	112.70	901060-C3	126.10
	.125 (1/8)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987760	108.60	987760-C3	122.00
	.125 (1/8)	.015	5/32	1/4 (.5x)	.162	II	8	1/2	3	913460	112.70	913460-C3	126.10
	.125 (1/8)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990360	108.60	990360-C3	122.00
	.125 (1/8)	.020	1/4	3/4 (1.5x)	.115	I	8	1/2	3	933760	108.60	933760-C3	122.00
	.125 (1/8)	.030	5/32	1/4 (.5x)	.162	II	8	1/2	3	926660	112.70	926660-C3	126.10
	.125 (1/8)	.030	1/4	3/4 (1.5x)	.115	I	8	1/2	3	969160	110.50	969160-C3	123.90
	.125 (1/8)	.040	1/4	3/4 (1.5x)	.115	I	8	1/2	3	838060	110.50	838060-C3	123.90
	.156 (5/32)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987765	113.40	987765-C3	126.80
	.156 (5/32)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990365	113.40	990365-C3	126.80
	.187 (3/16)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987770	110.50	987770-C3	123.90
	.187 (3/16)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990370	110.50	990370-C3	123.90
	.187 (3/16)	.020	1/4	3/4 (1.5x)	.115	I	8	1/2	3	933770	110.50	933770-C3	123.90
	.187 (3/16)	.030	5/32	1/4 (.5x)	.162	II	8	1/2	3	926670	130.50	926670-C3	143.90
	.187 (3/16)	.030	1/4	3/4 (1.5x)	.115	I	8	1/2	3	969170	110.50	969170-C3	123.90
	.187 (3/16)	.060	1/4	3/4 (1.5x)	.115	I	8	1/2	3	926170	112.50	926170-C3	125.90
	.250 (1/4)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	987780	108.60	987780-C3	122.00
	.250 (1/4)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	990380	108.60	990380-C3	122.00
.250 (1/4)	.020	1/4	3/4 (1.5x)	.115	I	8	1/2	3	933780	108.60	933780-C3	122.00	
.250 (1/4)	.030	5/32	1/4 (.5x)	.162	II	8	1/2	3	926680	112.70	926680-C3	126.10	
.250 (1/4)	.030	1/4	3/4 (1.5x)	.115	I	8	1/2	3	969180	108.60	969180-C3	122.00	
.250 (1/4)	.045	1/4	3/4 (1.5x)	.115	I	8	1/2	3	929580	108.60	929580-C3	122.00	
.250 (1/4)	.060	1/4	3/4 (1.5x)	.115	I	8	1/2	3	926180	108.60	926180-C3	122.00	
5/8	.125 (1/8)	.010	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	903960	162.50	903960-C3	175.90
	.125 (1/8)	.015	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	911160	162.50	911160-C3	175.90
	.125 (1/8)	.030	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	908560	162.50	908560-C3	175.90
	.187 (3/16)	.010	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	903970	162.50	903970-C3	175.90
	.187 (3/16)	.015	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	911170	162.50	911170-C3	175.90
	.187 (3/16)	.030	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	908570	162.50	908570-C3	175.90
	.250 (1/4)	.010	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	903980	162.50	903980-C3	175.90
	.250 (1/4)	.015	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	911180	162.50	911180-C3	175.90
.250 (1/4)	.030	5/16	1 (1.5x)	.146	I	8	5/8	3-1/2	908580	162.50	908580-C3	175.90	

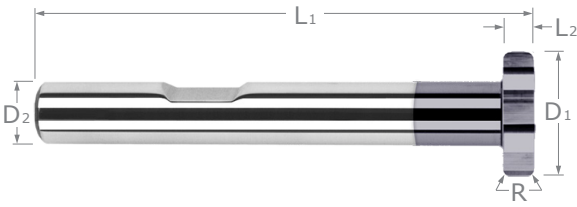
\*Radial DOC accounts for max transition radius at neck

**For reduced shank and greater radial depths of cut, please see  
Reduced Shank Keyseat Cutters on pages 314, 322, & 329.**

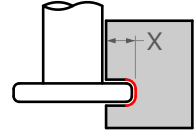


# KEYSEAT CUTTERS

## Corner Radius – Reduced Shank



Standard Slotting (Type I)



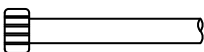
- ✦ Solid carbide head brazed onto a steel shank
- ✦ Both sides of cutter are dished for clearance
- ✦ Corner radius for improved strength
- ✦ Weldon flat
- ✦ CNC ground in the USA

KEYSEAT CUTTERS

CUTTER DIAMETER	CUTTER WIDTH	CORNER RADIUS	RADIAL DOC*	TYPE	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN 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>	R <sup>+0.001"</sup> / <sub>-0.001"</sub>	X			D <sub>2</sub>	L <sub>1</sub>				
<b>3/4</b>	.031 (1/32)	<b>.005</b>	.177	I	10	3/8	3-1/32	841505	115.60	841505-C3	130.10
	.062 (1/16)	<b>.005</b>	.177	I	10	3/8	3-1/16	841520	115.60	841520-C3	130.10
	.062 (1/16)	<b>.010</b>	.177	I	10	3/8	3-1/16	923820	115.60	923820-C3	130.10
	.078 (5/64)	<b>.005</b>	.177	I	10	3/8	3-5/64	841530	115.60	841530-C3	130.10
	.078 (5/64)	<b>.010</b>	.177	I	10	3/8	3-5/64	923830	115.60	923830-C3	130.10
	.093 (3/32)	<b>.005</b>	.177	I	10	3/8	3-3/32	841540	115.60	841540-C3	130.10
	.093 (3/32)	<b>.010</b>	.177	I	10	3/8	3-3/32	923840	115.60	923840-C3	130.10
	.093 (3/32)	<b>.030</b>	.177	I	10	3/8	3-3/32	905240	115.60	905240-C3	130.10
	.125 (1/8)	<b>.005</b>	.177	I	10	3/8	3-1/8	841550	115.60	841550-C3	130.10
	.125 (1/8)	<b>.010</b>	.177	I	10	3/8	3-1/8	923850	115.60	923850-C3	130.10
	.125 (1/8)	<b>.015</b>	.177	I	10	3/8	3-1/8	840950	115.60	840950-C3	130.10
	.125 (1/8)	<b>.030</b>	.177	I	10	3/8	3-1/8	905250	115.60	905250-C3	130.10
	.187 (3/16)	<b>.010</b>	.177	I	10	3/8	3-3/16	923860	122.40	923860-C3	136.90
	.187 (3/16)	<b>.015</b>	.177	I	10	3/8	3-3/16	840960	122.40	840960-C3	136.90
	.187 (3/16)	<b>.030</b>	.177	I	10	3/8	3-3/16	905260	122.40	905260-C3	136.90
	.250 (1/4)	<b>.010</b>	.177	I	10	3/8	3-1/4	923870	128.80	923870-C3	143.30
.250 (1/4)	<b>.015</b>	.177	I	10	3/8	3-1/4	840970	128.80	840970-C3	143.30	
.250 (1/4)	<b>.030</b>	.177	I	10	3/8	3-1/4	905270	128.80	905270-C3	143.30	
.250 (1/4)	<b>.060</b>	.177	I	10	3/8	3-1/4	894070	131.90	894070-C3	146.40	
<b>1</b>	.031 (1/32)	<b>.005</b>	.240	I	12	1/2	3-1/32	840305	128.10	840305-C3	150.20
	.062 (1/16)	<b>.005</b>	.240	I	12	1/2	3-1/16	840320	128.10	840320-C3	150.20
	.062 (1/16)	<b>.010</b>	.240	I	12	1/2	3-1/16	918520	128.10	918520-C3	150.20
	.078 (5/64)	<b>.005</b>	.240	I	12	1/2	3-5/64	840330	128.10	840330-C3	150.20
	.078 (5/64)	<b>.010</b>	.240	I	12	1/2	3-5/64	918530	128.10	918530-C3	150.20
	.093 (3/32)	<b>.005</b>	.240	I	12	1/2	3-3/32	840340	128.10	840340-C3	150.20
	.093 (3/32)	<b>.010</b>	.240	I	12	1/2	3-3/32	918540	128.10	918540-C3	150.20
	.093 (3/32)	<b>.030</b>	.240	I	12	1/2	3-3/32	910040	128.10	910040-C3	150.20
	.125 (1/8)	<b>.005</b>	.240	I	12	1/2	3-1/8	840350	128.10	840350-C3	150.20
	.125 (1/8)	<b>.010</b>	.240	I	12	1/2	3-1/8	918550	128.10	918550-C3	150.20
	.125 (1/8)	<b>.015</b>	.240	I	12	1/2	3-1/8	839750	128.10	839750-C3	150.20
	.125 (1/8)	<b>.030</b>	.240	I	12	1/2	3-1/8	910050	128.10	910050-C3	150.20
	.187 (3/16)	<b>.010</b>	.240	I	12	1/2	3-3/16	918560	135.20	918560-C3	157.30
	.187 (3/16)	<b>.015</b>	.240	I	12	1/2	3-3/16	839760	135.20	839760-C3	157.30
	.187 (3/16)	<b>.030</b>	.240	I	12	1/2	3-3/16	910060	135.20	910060-C3	157.30

\*Radial DOC accounts for max transition radius at neck

continued on next page



## 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 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>	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	140.60	918570-C3	162.70
	.250 (1/4)	<b>.015</b>	.240	I	12	1/2	3-1/4	839770	140.60	839770-C3	162.70
	.250 (1/4)	<b>.030</b>	.240	I	12	1/2	3-1/4	910070	140.60	910070-C3	162.70
	.250 (1/4)	<b>.060</b>	.240	I	12	1/2	3-1/4	897570	140.60	897570-C3	162.70
	.375 (3/8)	<b>.010</b>	.240	I	12	1/2	3-3/8	918590	147.50	918590-C3	169.60
	.375 (3/8)	<b>.015</b>	.240	I	12	1/2	3-3/8	839790	147.50	839790-C3	169.60
	.375 (3/8)	<b>.030</b>	.240	I	12	1/2	3-3/8	910090	147.50	910090-C3	169.60
<b>1-1/2</b>	.125 (1/8)	<b>.010</b>	.365	I	16	3/4	3-3/8	839150	165.30	839150-C3	192.90
	.125 (1/8)	<b>.030</b>	.365	I	16	3/4	3-3/8	838550	165.30	838550-C3	192.90
	.187 (3/16)	<b>.010</b>	.365	I	16	3/4	3-7/16	839160	165.30	839160-C3	192.90
	.187 (3/16)	<b>.030</b>	.365	I	16	3/4	3-7/16	838560	165.30	838560-C3	192.90
	.250 (1/4)	<b>.010</b>	.365	I	16	3/4	3-1/2	839170	177.00	839170-C3	204.60
	.250 (1/4)	<b>.030</b>	.365	I	16	3/4	3-1/2	838570	177.00	838570-C3	204.60
	.375 (3/8)	<b>.010</b>	.365	I	16	3/4	3-5/8	839190	224.30	839190-C3	251.90
	.375 (3/8)	<b>.030</b>	.365	I	16	3/4	3-5/8	838590	224.30	838590-C3	251.90
	.500 (1/2)	<b>.010</b>	.365	I	16	3/4	3-3/4	839195	258.70	839195-C3	286.30
	.500 (1/2)	<b>.030</b>	.365	I	16	3/4	3-3/4	838595	258.70	838595-C3	286.30

\*Radial DOC accounts for max transition radius at neck

## QUICKTURN KEYSEATS

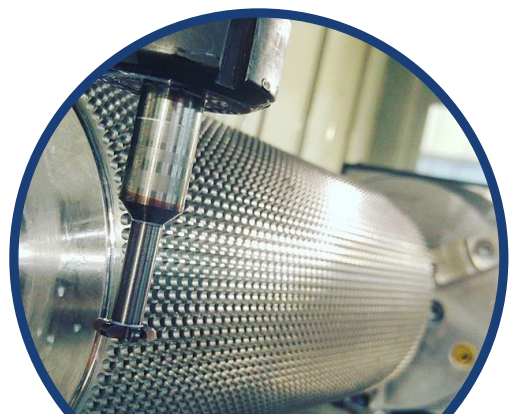
3 Day Turnaround • Instant Pricing Model • Infinite Custom Combinations

## THE PROGRAM

The Quickturn Keyseat Program complements our already expansive line of over 2,000 fully stocked Keyseat Cutters. This program provides instant access to pricing of custom-designed keyseats that will be manufactured and shipped to you within 3 business days, guaranteed!

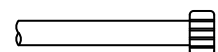
## THE PROCESS

We've established a quick and easy process to ensure your order ships in 3 business days. Download the form at [www.harveytool.com/quickturn](http://www.harveytool.com/quickturn) and send it to [quickturn@harveyperformance.com](mailto:quickturn@harveyperformance.com). We'll send you a quote number within an hour, which you can use to place an order with your preferred distributor.



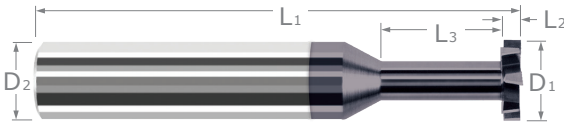
"Machined 3x faster" – Brandon L.

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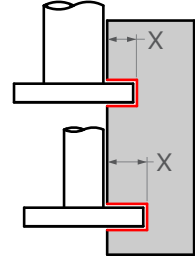
# KEYSEAT CUTTERS

## Staggered Tooth – Square



Stacked in Multiple Radial Depths of Cut!

Standard Slotting (Type I)

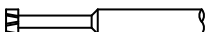


- Staggered tooth design with alternating RH / LH shear flutes, RH cut
- Relieved to allow cutting on both sides of head
- Design improves shearing action and finish while minimizing chip dragging and recutting and decreasing vibration
- Tool can be offset to increase width of groove
- Solid carbide ➤ CNC ground in the USA

KEYSEAT CUTTERS

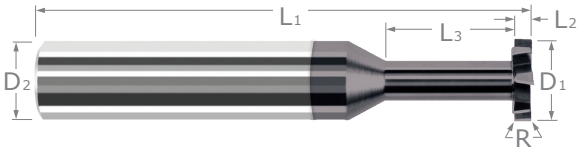
CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		AITIN COATED	
									TOOL #	PRICE	TOOL #	PRICE
D1 <sup>+0.000"</sup> <sub>-.002"</sub>	L2 <sup>+0.005"</sup> <sub>-.0005"</sub>		L3 <sup>+0.020"</sup> <sub>-.000"</sub>				D2	L1				
<b>1/8</b>	.015 (1/64)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	969815	58.70	969815-C3	63.30
	.031 (1/32)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	969831	58.70	969831-C3	63.30
	.047 (3/64)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	969847	58.70	969847-C3	63.30
	.062 (1/16)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	969862	58.70	969862-C3	63.30
<b>3/16</b>	.062 (1/16)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	907062	69.70	907062-C3	74.70
	.093 (3/32)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	907093	69.70	907093-C3	74.70
	.125 (1/8)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	907095	69.70	907095-C3	74.70
<b>1/4</b>	.031 (1/32)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972131	81.20	972131-C3	88.00
	.047 (3/64)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972147	81.20	972147-C3	88.00
	.062 (1/16)	5/64	1/8 (0.5x)	.076	II	6	1/4	2-1/2	878962	88.30	878962-C3	94.20
	.062 (1/16)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972162	81.20	972162-C3	88.00
	.093 (3/32)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972193	81.20	972193-C3	88.00
	.125 (1/8)	5/64	1/8 (0.5x)	.076	II	6	1/4	2-1/2	878995	90.20	878995-C3	97.00
	.125 (1/8)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	972195	81.20	972195-C3	88.00
<b>3/8</b>	.062 (1/16)	1/8	3/16 (0.5x)	.115	II	8	3/8	2-1/2	867330	107.70	867330-C3	116.70
	.062 (1/16)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	915830	100.20	915830-C3	109.20
	.093 (3/32)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	915850	100.20	915850-C3	109.20
	.125 (1/8)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	915860	100.20	915860-C3	109.20
	.187 (3/16)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	915870	100.20	915870-C3	109.20
	.250 (1/4)	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	915880	100.20	915880-C3	109.20
<b>1/2</b>	.062 (1/16)	5/32	1/4 (0.5x)	.162	II	8	1/2	3	895030	140.50	895030-C3	153.90
	.062 (1/16)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	955630	130.50	955630-C3	143.90
	.078 (5/64)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	955640	130.50	955640-C3	143.90
	.093 (3/32)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	955650	130.50	955650-C3	143.90
	.125 (1/8)	5/32	1/4 (0.5x)	.162	II	8	1/2	3	895060	140.50	895060-C3	153.90
	.125 (1/8)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	955660	130.50	955660-C3	143.90
	.187 (3/16)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	955670	130.50	955670-C3	143.90
	.250 (1/4)	5/32	1/4 (0.5x)	.162	II	8	1/2	3	895080	140.50	895080-C3	153.90
	.250 (1/4)	1/4	3/4 (1.5x)	.115	I	8	1/2	3	955680	130.50	955680-C3	143.90
<b>5/8</b>	.125 (1/8)	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	904960	184.50	904960-C3	197.90
	.187 (3/16)	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	904970	184.50	904970-C3	197.90
	.250 (1/4)	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	904980	184.50	904980-C3	197.90

\*Radial DOC accounts for max transition radius at neck



# KEYSEAT CUTTERS

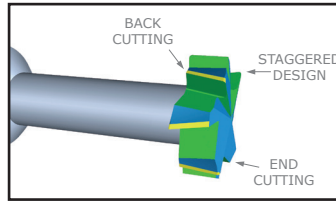
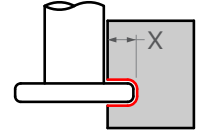
## Staggered Tooth – Corner Radius



**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)



CUTTER DIA.	CUTTER WIDTH	CORNER RADIUS	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>+0.009"</sup> / <sub>-.002"</sub>	L <sub>2</sub> <sup>+0.005"</sup> / <sub>-.005"</sub>	R <sup>+0.01"</sup> / <sub>-.001"</sub>		L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>				D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
<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	60.20	43631-C3	64.80
	.031 (1/32)	<b>.005</b>	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	989931	72.40	989931-C3	77.00
	.047 (3/64)	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	43647	60.20	43647-C3	64.80
	.062 (1/16)	<b>.005</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	43662	60.20	43662-C3	64.80
	.062 (1/16)	<b>.005</b>	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	989962	72.40	989962-C3	77.00
	.062 (1/16)	<b>.010</b>	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	44462	60.20	44462-C3	64.80
<b>3/16</b>	.031 (1/32)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	943531	66.70	943531-C3	71.70
	.047 (3/64)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	943547	66.70	943547-C3	71.70
	.062 (1/16)	<b>.005</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	943562	66.70	943562-C3	71.70
	.062 (1/16)	<b>.010</b>	3/32	9/32 (1.5x)	.037	I	6	3/16	2	951762	66.70	951762-C3	71.70
<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	83.20	43831-C3	90.00
	.031 (1/32)	<b>.010</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	44531	83.20	44531-C3	90.00
	.047 (3/64)	<b>.005</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	43847	83.20	43847-C3	90.00
	.047 (3/64)	<b>.005</b>	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	958047	96.20	958047-C3	103.00
	.062 (1/16)	<b>.005</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	43862	83.20	43862-C3	90.00
	.062 (1/16)	<b>.005</b>	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	958062	96.20	958062-C3	103.00
	.062 (1/16)	<b>.010</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	44562	83.20	44562-C3	90.00
	.093 (3/32)	<b>.005</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	43893	83.20	43893-C3	90.00
	.093 (3/32)	<b>.010</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	44593	83.20	44593-C3	90.00
	.125 (1/8)	<b>.005</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	43895	83.20	43895-C3	90.00
	.125 (1/8)	<b>.010</b>	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	44595	83.20	44595-C3	90.00
	<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	107.90	967210-C3
.062 (1/16)		<b>.005</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	967230	107.90	967230-C3	116.90
.062 (1/16)		<b>.010</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970930	107.90	970930-C3	116.90
.093 (3/32)		<b>.005</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	967250	107.90	967250-C3	116.90
.093 (3/32)		<b>.010</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970950	107.90	970950-C3	116.90
.125 (1/8)		<b>.005</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	967260	107.90	967260-C3	116.90
.125 (1/8)		<b>.010</b>	3/16	9/16 (1.5x)	.084	I	8	3/8	2-1/2	970960	107.90	970960-C3	116.90

\*Radial DOC accounts for max transition radius at neck

continued on next page

KEYSEAT CUTTERS



# 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>-.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>									
1/2	.062 (1/16)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44330	133.60	44330-C3	147.00
	.062 (1/16)	.005	1/4	1-1/2 (3x)	.115	I	8	1/2	3	976730	147.90	976730-C3	161.30
	.062 (1/16)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44630	133.60	44630-C3	147.00
	.062 (1/16)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	921330	133.60	921330-C3	147.00
	.093 (3/32)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44350	133.60	44350-C3	147.00
	.093 (3/32)	.005	1/4	1-1/2 (3x)	.115	I	8	1/2	3	976750	147.90	976750-C3	161.30
	.093 (3/32)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44650	133.60	44650-C3	147.00
	.093 (3/32)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	921350	133.60	921350-C3	147.00
	.125 (1/8)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44360	133.60	44360-C3	147.00
	.125 (1/8)	.005	1/4	1-1/2 (3x)	.115	I	8	1/2	3	976760	147.90	976760-C3	161.30
	.125 (1/8)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44660	133.60	44660-C3	147.00
	.125 (1/8)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	921360	133.60	921360-C3	147.00
	.187 (3/16)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44370	133.60	44370-C3	147.00
	.187 (3/16)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44670	133.60	44670-C3	147.00
	.250 (1/4)	.005	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44380	133.60	44380-C3	147.00
	.250 (1/4)	.010	1/4	3/4 (1.5x)	.115	I	8	1/2	3	44680	133.60	44680-C3	147.00
.250 (1/4)	.015	1/4	3/4 (1.5x)	.115	I	8	1/2	3	921380	133.60	921380-C3	147.00	
5/8	.125 (1/8)	.005	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	860460	188.70	860460-C3	202.10
	.125 (1/8)	.010	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	872960	188.70	872960-C3	202.10
	.187 (3/16)	.005	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	860470	188.70	860470-C3	202.10
	.187 (3/16)	.010	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	872970	188.70	872970-C3	202.10
	.250 (1/4)	.005	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	860480	188.70	860480-C3	202.10
	.250 (1/4)	.010	5/16	15/16 (1.5x)	.146	I	8	5/8	3-1/2	872980	188.70	872980-C3	202.10

\*Radial DOC accounts for max transition radius at neck

KEYSEAT CUTTERS



### Keyseat Cutter Considerations

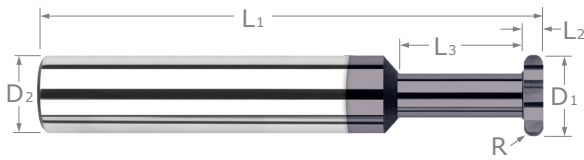
With more than 1,800 individual keyseat cutter in the Harvey Tool catalog, there are certainly many different options to choose from. Learn which style is best for your machining operation in our "In the Loupe" blog post **Keyseat Cutter Considerations**.

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

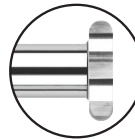


## KEYSEAT CUTTERS

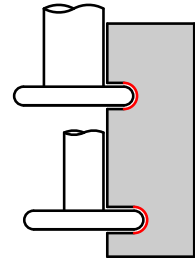
Full Radius



- ↻ Ground form relieved (can be reground without losing radius)
- ↻ Both sides of cutter are dished for clearance
- ↻ Solid carbide    ↻ CNC ground in the USA



Full Radius

Standard  
Slotting  
(Type I)Deep  
Slotting  
(Type II)

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 $\begin{smallmatrix} +.001" \\ -.001" \end{smallmatrix}$	D <sub>1</sub> $\begin{smallmatrix} +.000" \\ -.002" \end{smallmatrix}$	L <sub>2</sub>		L <sub>3</sub> $\begin{smallmatrix} +.020" \\ -.000" \end{smallmatrix}$	X			D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
.0075	<b>3/32</b>	.015 (1/64)	3/64	9/64 (1.5x)	.020	I	4	1/8	1-1/2	976907	73.90	976907-C3	78.50
.0075	<b>1/8</b>	.015 (1/64)	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	67507	76.60	67507-C3	81.20
.0075	<b>1/4</b>	.015 (1/64)	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	67707	94.80	67707-C3	101.60
.0100	<b>3/32</b>	.020	3/64	9/64 (1.5x)	.020	I	4	1/8	1-1/2	976910	71.80	976910-C3	76.40
.0100	<b>1/8</b>	.020	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	67510	74.50	67510-C3	79.10
.0100	<b>5/32</b>	.020	5/64	15/64 (1.5x)	.029	I	6	3/16	2	965310	78.30	965310-C3	83.30
.0100	<b>3/16</b>	.020	3/32	9/32 (1.5x)	.037	I	6	3/16	2	68310	86.00	68310-C3	91.00
.0100	<b>1/4</b>	.020	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	67710	92.60	67710-C3	99.40
.0100	<b>5/16</b>	.020	5/32	1/2 (1.5x)	.068	I	6	5/16	2-1/2	944410	102.40	944410-C3	110.30
.0100	<b>3/8</b>	.020	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	68410	110.00	68410-C3	119.00
.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	64.00	976915-C3	68.60
.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	66.30	67515-C3	70.90
.0156 (1/64)	<b>1/8</b>	.031 (1/32)	1/16	3/8 (3x)	.022	I	6	1/8	1-1/2	895215	70.70	895215-C3	75.30
.0156 (1/64)	<b>5/32</b>	.031 (1/32)	5/64	15/64 (1.5x)	.029	I	6	3/16	2	965315	78.30	965315-C3	83.30
.0156 (1/64)	<b>3/16</b>	.031 (1/32)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	68315	78.50	68315-C3	83.50
.0156 (1/64)	<b>3/16</b>	.031 (1/32)	3/32	9/16 (3x)	.037	I	6	3/16	2	924415	91.80	924415-C3	96.80
.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	87.70	953915-C3	94.50
.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	84.40	43315-C3	91.20
.0156 (1/64)	<b>1/4</b>	.031 (1/32)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	971415	97.80	971415-C3	104.60
.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	93.90	944415-C3	101.80
.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	101.80	68415-C3	110.80
.0156 (1/64)	<b>1/2</b>	.031 (1/32)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67915	104.90	67915-C3	118.30
.0200	<b>1/8</b>	.040	1/16	3/16 (1.5x)	.022	I	6	1/8	1-1/2	67520	66.30	67520-C3	70.90
.0200	<b>5/32</b>	.040	5/64	15/64 (1.5x)	.029	I	6	3/16	2	965320	78.30	965320-C3	83.30
.0200	<b>3/16</b>	.040	3/32	9/32 (1.5x)	.037	I	6	3/16	2	68320	78.50	68320-C3	83.50
.0200	<b>3/16</b>	.040	3/32	9/16 (3x)	.037	I	6	3/16	2	924420	91.80	924420-C3	96.80
.0200	<b>1/4</b>	.040	5/64	1/8 (.5x)	<b>.076</b>	II	6	1/4	2-1/2	953920	87.70	953920-C3	94.50
.0200	<b>1/4</b>	.040	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	67720	85.30	67720-C3	92.10
.0200	<b>1/4</b>	.040	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	971420	97.80	971420-C3	104.60
.0200	<b>5/16</b>	.040	5/32	1/2 (1.5x)	.068	I	6	5/16	2-1/2	944420	93.90	944420-C3	101.80
.0200	<b>3/8</b>	.040	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	68420	102.70	68420-C3	111.70
.0200	<b>3/8</b>	.040	3/16	1-1/8 (3x)	.084	I	6	3/8	3	968520	115.60	968520-C3	124.60
.0200	<b>1/2</b>	.040	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67920	105.40	67920-C3	118.80
.0250	<b>3/16</b>	.050	3/32	9/32 (1.5x)	.037	I	6	3/16	2	68325	78.50	68325-C3	83.50
.0250	<b>1/4</b>	.050	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	67725	85.30	67725-C3	92.10
.0250	<b>3/8</b>	.050	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	68425	102.70	68425-C3	111.70
.0300	<b>5/32</b>	.060	5/64	15/64 (1.5x)	.029	I	6	3/16	2	965330	78.30	965330-C3	83.30
.0300	<b>3/16</b>	.060	3/32	9/32 (1.5x)	.037	I	6	3/16	2	68330	78.50	68330-C3	83.50
.0300	<b>1/4</b>	.060	1/8	3/8 (1.5x)	.053	I	6	1/4	2-1/2	67730	85.30	67730-C3	92.10

\*Radial DOC accounts for max transition radius at neck

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## KEYSEAT CUTTERS

## Full Radius (cont.)

continued from previous page

RADIUS	CUTTER DIA.	CUTTER WIDTH	NECK DIA.	NECK LENGTH	RADIAL DOC*	TYPE	FLUTES	SHANK DIA.	OAL	UNCOATED		A1TiN COATED	
										TOOL #	PRICE	TOOL #	PRICE
R $^{+.001"}$ $_{-.001"}$	D1 $^{+.000"}$ $_{-.002"}$	L2		L3 $^{+.020"}$ $_{-.000"}$	X			D2	L1				
.0312 (1/32)	<b>3/16</b>	.062 (1/16)	3/32	9/32 (1.5x)	.037	I	6	3/16	2	68331	78.50	68331-C3	83.50
.0312 (1/32)	<b>3/16</b>	.062 (1/16)	3/32	9/16 (3x)	.037	I	6	3/16	2	924431	91.80	924431-C3	96.80
.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	87.70	953931-C3	94.50
.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	84.40	43331-C3	91.20
.0312 (1/32)	<b>1/4</b>	.062 (1/16)	1/8	3/4 (3x)	.053	I	6	1/4	2-1/2	971431	97.80	971431-C3	104.60
.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	93.90	944431-C3	101.80
.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	101.80	68431-C3	110.80
.0312 (1/32)	<b>1/2</b>	.062 (1/16)	5/32	1/4 (.5x)	<b>.162</b>	II	6	1/2	3	898531	109.30	898531-C3	122.70
.0312 (1/32)	<b>1/2</b>	.062 (1/16)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67931	104.90	67931-C3	118.30
.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	114.40	942731-C3	127.80
.0312 (1/32)	<b>5/8</b>	.062 (1/16)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	43431	171.80	43431-C3	185.20
.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	85.30	67739-C3	92.10
.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	95.10	944439-C3	103.00
.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	102.70	43339-C3	111.70
.0394 (1 mm)	<b>3/8</b>	.078 (2 mm)	3/16	1-1/8 (3x)	.084	I	6	3/8	3	968539	115.60	968539-C3	124.60
.0394 (1 mm)	<b>1/2</b>	.078 (2 mm)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67939	105.40	67939-C3	118.80
.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	84.40	67747-C3	91.20
.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	93.90	944447-C3	101.80
.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	101.80	43347-C3	110.80
.0469 (3/64)	<b>3/8</b>	.093 (3/32)	3/16	1-1/8 (3x)	.084	I	6	3/8	3	968547	115.60	968547-C3	124.60
.0469 (3/64)	<b>1/2</b>	.093 (3/32)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67947	104.90	67947-C3	118.30
.0469 (3/64)	<b>5/8</b>	.093 (3/32)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	43447	171.80	43447-C3	185.20
.0500	<b>3/8</b>	.100	3/16	9/16 (1.5x)	.084	I	6	3/8	2-1/2	68450	105.20	68450-C3	114.20
.0500	<b>1/2</b>	.100	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67950	119.00	67950-C3	132.40
.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	95.10	944459-C3	103.00
.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	102.70	68459-C3	111.70
.0590 (1.5 mm)	<b>1/2</b>	.118 (3 mm)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67959	105.40	67959-C3	118.80
.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	93.90	944462-C3	101.80
.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	105.70	949262-C3	114.70
.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	101.80	43362-C3	110.80
.0625 (1/16)	<b>3/8</b>	.125 (1/8)	3/16	1-1/8 (3x)	.084	I	6	3/8	3	968562	115.60	968562-C3	124.60
.0625 (1/16)	<b>1/2</b>	.125 (1/8)	5/32	1/4 (.5x)	<b>.162</b>	II	6	1/2	3	898562	109.30	898562-C3	122.70
.0625 (1/16)	<b>1/2</b>	.125 (1/8)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	67962	104.90	67962-C3	118.30
.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	145.90	942762-C3	159.30
.0625 (1/16)	<b>5/8</b>	.125 (1/8)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	43462	171.80	43462-C3	185.20
.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	101.80	68478-C3	110.80
.0781 (5/64)	<b>1/2</b>	.156 (5/32)	5/32	1/4 (.5x)	<b>.162</b>	II	6	1/2	3	898578	109.90	898578-C3	123.30
.0781 (5/64)	<b>1/2</b>	.156 (5/32)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	43378	105.40	43378-C3	118.80
.0781 (5/64)	<b>5/8</b>	.156 (5/32)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	43478	171.80	43478-C3	185.20
.0937 (3/32)	<b>1/2</b>	.187 (3/16)	5/32	1/4 (.5x)	<b>.162</b>	II	6	1/2	3	898593	109.90	898593-C3	123.30
.0937 (3/32)	<b>1/2</b>	.187 (3/16)	1/4	3/4 (1.5x)	.115	I	6	1/2	3	43393	105.40	43393-C3	118.80
.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	123.10	942793-C3	136.50
.0937 (3/32)	<b>5/8</b>	.187 (3/16)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	43493	171.80	43493-C3	185.20
.1181 (3 mm)	<b>5/8</b>	.236 (6 mm)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	4343M	171.80	4343M-C3	185.20
.1250 (1/8)	<b>5/8</b>	.250 (1/4)	.300	1 (1.5x)	.152	I	6	5/8	3-1/2	43408	171.80	43408-C3	185.20
.1250 (1/8)	<b>5/8</b>	.250 (1/4)	.300	2 (3x)	.152	I	6	5/8	4	983008	193.90	983008-C3	208.40

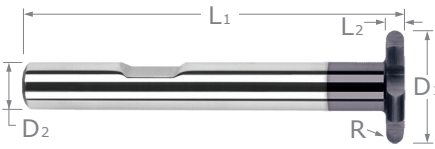
\*Radial DOC accounts for max transition radius at neck





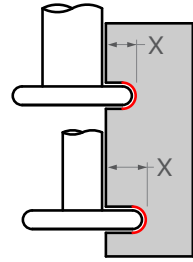
# KEYSEAT CUTTERS

## Full Radius – Reduced Shank



Standard  
Slotting  
(Type I)

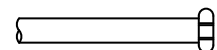
Deep  
Slotting  
(Type II)



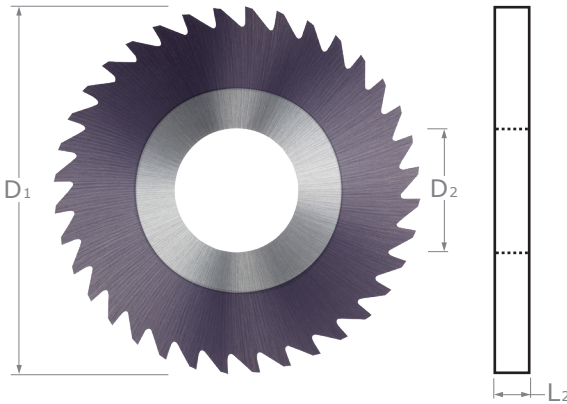
- ↻ Ground form relieved (can be reground without losing radius)
- ↻ 6 flutes    ↻ Both sides of cutter are dished for clearance
- ↻ Solid carbide head with steel shank
- ↻ Weldon flat    ↻ CNC ground in the USA

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	145.00	965415-C3	159.50
.0156 (1/64)	3/4	.031 (1/32)	.115	I	1/2	3-1/32	32901	131.20	32901-C3	145.70
.0156 (1/64)	1	.031 (1/32)	.240	I	1/2	3-1/32	942615	144.00	942615-C3	166.10
.0200	3/4	.040	.115	I	1/2	3.040	959720	131.20	959720-C3	145.70
.0200	1	.040	.240	I	1/2	3.040	942620	144.00	942620-C3	166.10
.0300	3/4	.060	.177	II	3/8	3.060	965430	145.00	965430-C3	159.50
.0312 (1/32)	3/4	.062 (1/16)	.177	II	3/8	3-1/16	965431	145.00	965431-C3	159.50
.0312 (1/32)	3/4	.062 (1/16)	.115	I	1/2	3-1/16	32902	131.20	32902-C3	145.70
.0312 (1/32)	1	.062 (1/16)	.240	I	1/2	3-1/16	942631	144.00	942631-C3	166.10
.0394 (1 mm)	3/4	.078 (2 mm)	.115	I	1/2	3.078	3291M	131.20	3291M-C3	145.70
.0394 (1 mm)	1	.078 (2 mm)	.240	I	1/2	3.078	94261M	144.00	94261M-C3	166.10
.0469 (3/64)	3/4	.093 (3/32)	.177	II	3/8	3-3/32	965447	145.00	965447-C3	159.50
.0469 (3/64)	3/4	.093 (3/32)	.115	I	1/2	3-3/32	32903	131.20	32903-C3	145.70
.0469 (3/64)	1	.093 (3/32)	.240	I	1/2	3-3/32	942647	144.00	942647-C3	166.10
.0590 (1.5 mm)	3/4	.118 (3 mm)	.177	II	3/8	3.118	965459	145.00	965459-C3	159.50
.0625 (1/16)	3/4	.125 (1/8)	.177	II	3/8	3-1/8	965462	145.00	965462-C3	159.50
.0625 (1/16)	3/4	.125 (1/8)	.115	I	1/2	3-1/8	32904	131.20	32904-C3	145.70
.0625 (1/16)	1	.125 (1/8)	.302	II	3/8	3-1/8	937362	145.00	937362-C3	167.10
.0625 (1/16)	1	.125 (1/8)	.240	I	1/2	3-1/8	942662	144.00	942662-C3	166.10
.0781 (5/64)	3/4	.156 (5/32)	.115	I	1/2	3-5/32	959778	131.20	959778-C3	145.70
.0781 (5/64)	1	.156 (5/32)	.302	II	3/8	3-5/32	937378	147.50	937378-C3	169.60
.0781 (5/64)	1	.156 (5/32)	.240	I	1/2	3-5/32	32905	153.90	32905-C3	176.00
.0787 (2 mm)	3/4	.157 (4 mm)	.177	II	3/8	3.157	96542M	145.00	96542M-C3	159.50
.0787 (2 mm)	1	.157 (4 mm)	.240	I	1/2	3.157	3292M	153.90	3292M-C3	176.00
.0937 (3/32)	3/4	.187 (3/16)	.115	I	1/2	3-3/16	959793	131.20	959793-C3	145.70
.0937 (3/32)	1	.187 (3/16)	.302	II	3/8	3-3/16	937393	145.00	937393-C3	167.10
.0937 (3/32)	1	.187 (3/16)	.240	I	1/2	3-3/16	32906	153.90	32906-C3	176.00
.0937 (3/32)	1-1/2	.187 (3/16)	.365	I	3/4	3-11/16	850493	164.50	850493-C3	192.10
.1181 (3 mm)	1	.236 (6 mm)	.240	I	1/2	3.236	942694	153.90	942694-C3	172.80
.1250 (1/8)	1	.250 (1/4)	.302	II	3/8	3-1/4	937395	145.00	937395-C3	167.10
.1250 (1/8)	1	.250 (1/4)	.240	I	1/2	3-1/4	942695	153.90	942695-C3	176.00
.1250 (1/8)	1-1/4	.250 (1/4)	.365	II	1/2	3-1/4	848695	170.00	848695-C3	197.60
.1250 (1/8)	1-1/4	.250 (1/4)	.240	I	3/4	3-1/2	32908	172.80	32908-C3	200.40
.1250 (1/8)	1-1/2	.250 (1/4)	.365	I	3/4	3-3/4	850495	175.20	850495-C3	202.80
.1562 (5/32)	1-1/2	.312 (5/16)	.365	I	3/4	3-13/16	32910	211.80	32910-C3	239.40
.1875 (3/16)	1-3/8	.375 (3/8)	.302	I	3/4	3-5/8	32912	211.80	32912-C3	239.40
.2500 (1/4)	1-1/2	.500 (1/2)	.365	I	3/4	4	32916	234.40	32916-C3	262.00

\*Radial DOC accounts for max transition radius at neck



# SLITTING SAWS



◀ Fully stocked  
uncoated or AITiN  
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

SLITTING SAWS

CUTTER DIAMETER	THICKNESS	INSIDE DIAMETER	NUMBER OF TEETH	UNCOATED		AITiN COATED	
				TOOL #	PRICE	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	20	SAA0100	60.50	SAA0100-C3	79.80
	.0120	3/8	20	SAA0120	60.50	SAA0120-C3	79.80
	.0156 (1/64)	3/8	20	SAA0156	60.50	SAA0156-C3	79.80
	.0180	3/8	20	SAA0180	60.50	SAA0180-C3	79.80
	.0200	3/8	20	SAA0200	60.90	SAA0200-C3	80.20
	.0250	3/8	20	SAA0250	60.90	SAA0250-C3	80.20
	.0312 (1/32)	3/8	20	SAA0312	60.90	SAA0312-C3	80.20
	.0400	3/8	20	SAA0400	60.90	SAA0400-C3	80.20
	.0468 (3/64)	3/8	20	SAA0468	54.10	SAA0468-C3	73.40
.0625 (1/16)	3/8	20	SAA0625	54.10	SAA0625-C3	73.40	
<b>1-1/4</b>	.0100	3/8	24	SAB0100	72.00	SAB0100-C3	101.90
	.0156 (1/64)	3/8	24	SAB0156	72.00	SAB0156-C3	101.90
	.0200	3/8	24	SAB0200	67.50	SAB0200-C3	97.40
	.0312 (1/32)	3/8	24	SAB0312	67.50	SAB0312-C3	97.40
	.0625 (1/16)	3/8	24	SAB0625	67.50	SAB0625-C3	97.40
<b>1-1/2</b>	.0100	1/2	36	SAC0100	77.40	SAC0100-C3	107.30
	.0120	1/2	36	SAC0120	77.40	SAC0120-C3	107.30
	.0156 (1/64)	1/2	36	SAC0156	77.40	SAC0156-C3	107.30
	.0180	1/2	36	SAC0180	77.40	SAC0180-C3	107.30
	.0200	1/2	36	SAC0200	69.70	SAC0200-C3	99.60
	.0250	1/2	36	SAC0250	69.70	SAC0250-C3	99.60
	.0312 (1/32)	1/2	36	SAC0312	69.70	SAC0312-C3	99.60
	.0400	1/2	36	SAC0400	69.70	SAC0400-C3	99.60
	.0468 (3/64)	1/2	36	SAC0468	67.90	SAC0468-C3	97.80
.0625 (1/16)	1/2	36	SAC0625	67.90	SAC0625-C3	97.80	
<b>1-3/4</b>	.0100	1/2	38	SAD0100	92.50	SAD0100-C3	122.40
	.0156 (1/64)	1/2	38	SAD0156	92.50	SAD0156-C3	122.40
	.0200	1/2	38	SAD0200	82.90	SAD0200-C3	112.80
	.0312 (1/32)	1/2	38	SAD0312	82.90	SAD0312-C3	112.80
	.0625 (1/16)	1/2	38	SAD0625	90.30	SAD0625-C3	120.20

continued on next page



## SLITTING SAWS

(cont.)

continued from previous page

CUTTER DIAMETER	THICKNESS	INSIDE DIAMETER	NUMBER OF TEETH	UNCOATED		A1TiN 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> $\begin{matrix} +.0005'' \\ +.0001'' \end{matrix}$					
2	.0100	1/2	40	SAW0100	109.10	SAW0100-C3	139.00
	.0120	1/2	40	SAW0120	109.10	SAW0120-C3	139.00
	.0156 (1/64)	1/2	40	SAW0156	109.10	SAW0156-C3	139.00
	.0180	1/2	40	SAW0180	109.10	SAW0180-C3	139.00
	.0200	1/2	40	SAW0200	109.10	SAW0200-C3	139.00
	.0250	1/2	40	SAW0250	109.10	SAW0250-C3	139.00
	.0312 (1/32)	1/2	40	SAW0312	109.10	SAW0312-C3	139.00
	.0400	1/2	40	SAW0400	109.10	SAW0400-C3	139.00
	.0468 (3/64)	1/2	40	SAW0468	109.10	SAW0468-C3	139.00
	.0625 (1/16)	1/2	40	SAW0625	109.10	SAW0625-C3	139.00
.0937 (3/32)	1/2	40	SAW0937	109.10	SAW0937-C3	139.00	
.1250 (1/8)	1/2	40	SAW1250	137.10	SAW1250-C3	167.00	
3	.0200	1	72	SAE0200	169.30	SAE0200-C3	209.90
	.0312 (1/32)	1	72	SAE0312	169.30	SAE0312-C3	209.90
	.0625 (1/16)	1	72	SAE0625	190.60	SAE0625-C3	231.20
	.0937 (3/32)	1	72	SAE0937	243.90	SAE0937-C3	284.50
	.1250 (1/8)	1	72	SAE1250	278.00	SAE1250-C3	318.60
	.1875 (3/16)	1	72	SAE1875	347.10	SAE1875-C3	387.70
.2500 (1/4)	1	72	SAE2500	409.90	SAE2500-C3	450.50	
4	.0312 (1/32)	1	80	SAF0312	242.30	SAF0312-C3	294.60
	.0625 (1/16)	1	80	SAF0625	247.90	SAF0625-C3	300.20
	.0937 (3/32)	1	80	SAF0937	286.30	SAF0937-C3	338.60
	.1250 (1/8)	1	80	SAF1250	345.80	SAF1250-C3	398.10
	.1875 (3/16)	1	80	SAF1875	439.80	SAF1875-C3	492.10
.2500 (1/4)	1	80	SAF2500	546.20	SAF2500-C3	598.50	

*For Saw Arbors, see page 442.*

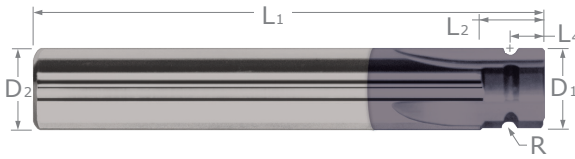


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# CONCAVE RADIUS END MILLS



- ⚡ 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		AISI COATED	
						4 FL	PRICE	4 FL	PRICE
R $^{+.001"}_{-.001"}$	D1 $^{+.000"}_{-.002"}$	L2 $^{+.060"}_{-.000"}$	L4 $^{+.001"}_{-.001"}$	D2	L1				
1/64	1/4	.281	.1406	1/4	2-1/2	45915	56.60	45915-C3	63.40
1/64	1/2	.281	.1406	1/2	3	32801	108.80		
.020	1/4	.281	.1450	1/4	2-1/2	45920	55.60	45920-C3	62.40
1/32	1/4	.312	.1562	1/4	2-1/2	45931	56.60	45931-C3	63.40
1/32	1/2	.312	.1562	1/2	3	32802	108.80		
1 mm	1/4	.329	.1644	1/4	2-1/2	4591M	56.80	4591M-C3	63.60
1 mm	1/2	.329	.1644	1/2	3	3281M	113.40		
3/64	1/4	.344	.1719	1/4	2-1/2	45947	56.60	45947-C3	63.40
3/64	1/2	.344	.1719	1/2	3	32803	110.70		
1/16	3/8	.375	.1875	3/8	2-1/2	45962	70.40	45962-C3	79.40
1/16	1/2	.375	.1875	1/2	3	32804	108.80		
5/64	1/2	.407	.2034	1/2	3	32805	108.80	32805-C3	122.20
2 mm	1/2	.407	.2044	1/2	3	3282M	113.40	3282M-C3	126.80
3/32	1/2	.437	.2187	1/2	3	32806	110.70	32806-C3	124.10
7/64	5/8	.469	.2344	5/8	3-1/2	32807	141.80	32807-C3	155.20
1/8	5/8	.500	.2500	5/8	3-1/2	32808	139.30	32808-C3	152.70
5/32	3/4	.562	.2812	3/4	4	32810	234.60	32810-C3	249.10
3/16	1	.624	.3120	3/4	3-1/2	32812*	190.20	32812-C3*	204.70
1/4	1-1/4	.750	.3750	3/4	4	32816*	223.50	32816-C3*	238.00

\*Solid carbide head with steel shank

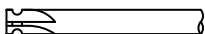
CONCAVE RADIUS END MILLS



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— @cameronbabineaux

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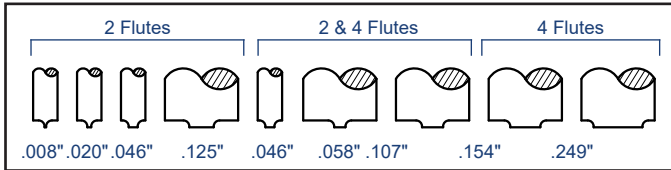


# CORNER ROUNDING END MILLS

## 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

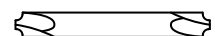


NEW

RADIUS	PILOT DIAMETER	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
					TOOL #	PRICE	TOOL #	PRICE
$R_{+.0005"}_{-.0005"}$	D <sub>1</sub>		D <sub>2</sub>	L <sub>1</sub>				
.003	.046	2	1/8	1-1/2	17003	40.00	17003-C3	45.70
.004	.046	2	1/8	1-1/2	17004	40.00	17004-C3	45.70
.005	.008	2	1/8	1-1/2	67405	50.30	67405-C3	56.00
.005	.020	2	1/8	1-1/2	45305	43.30	45305-C3	49.00
.005	.046	2	1/8	1-1/2	17005	40.00	17005-C3	45.70
.005	.046	2	3/16	4 <b>LONG!</b>	31605	69.70	31605-C3	77.60
.005	.046	4	1/8	1-1/2	<b>806105</b>	54.40	<b>806105-C3</b>	59.00
.005	.058	4	1/8	1-1/2	67605	54.40	67605-C3	60.10
.005	.107	4	1/8	1-1/2	68005	54.40	68005-C3	60.10
.005	.249	4	3/8	2-1/2	21005	63.50	21005-C3	76.90
.006	.020	2	1/8	1-1/2	45306	43.30	45306-C3	49.00
.006	.046	2	1/8	1-1/2	17006	40.00	17006-C3	45.70
.006	.058	4	1/8	1-1/2	67606	54.40	67606-C3	60.10
.006	.107	4	1/8	1-1/2	68006	54.40	68006-C3	60.10
.007	.020	2	1/8	1-1/2	45307	43.30	45307-C3	49.00
.007	.046	2	1/8	1-1/2	17007	40.00	17007-C3	45.70
.007	.058	4	1/8	1-1/2	67607	54.40	67607-C3	60.10
.007	.107	4	1/8	1-1/2	68007	54.40	68007-C3	60.10
.008	.008	2	1/8	1-1/2	67408	50.30	67408-C3	56.00
.008	.020	2	1/8	1-1/2	45308	43.30	45308-C3	49.00
.008	.046	2	1/8	1-1/2	17008	40.00	17008-C3	45.70
.008	.046	2	3/16	4 <b>LONG!</b>	31608	69.70	31608-C3	77.60
.008	.058	4	1/8	1-1/2	67608	54.40	67608-C3	60.10
.008	.249	4	3/8	2-1/2	21008	63.50	21008-C3	76.90
.009	.020	2	1/8	1-1/2	45309	43.30	45309-C3	49.00
.009	.046	2	1/8	1-1/2	17009	40.00	17009-C3	45.70
.010	.008	2	1/8	1-1/2	67410	50.30	67410-C3	56.00
.010	.020	2	1/8	1-1/2	45310	43.30	45310-C3	49.00
.010	.046	2	1/8	1-1/2	17010	40.00	17010-C3	45.70

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CORNER ROUNDING END MILLS



# CORNER ROUNDING END MILLS

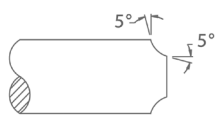
## 2 & 4 Flute – Flared (cont.)

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RADIUS	PILOT DIAMETER	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
					TOOL #	PRICE	TOOL #	PRICE
R <sup>+0.005"</sup> <sub>-.0005"</sub>	D <sub>1</sub>		D <sub>2</sub>	L <sub>1</sub>				
.010	.046	2	3/16	4 <i>LONG!</i>	31610	69.70	31610-C3	77.60
.010	.046	4	1/8	1-1/2	806110	54.50	806110-C3	59.10 <i>NEW</i>
.010	.058	4	1/8	1-1/2	67610	54.40	67610-C3	60.10
.010	.107	4	3/16	2	68010	59.00	68010-C3	65.80
.010	.125	2	3/16	2	941510	59.00	941510-C3	65.80
.010	.249	4	3/8	2-1/2	21010	63.50	21010-C3	76.90
.011	.020	2	1/8	1-1/2	45311	43.30	45311-C3	49.00
.011	.046	2	1/8	1-1/2	17011	40.00	17011-C3	45.70
.012	.020	2	1/8	1-1/2	45312	43.30	45312-C3	49.00
.012	.046	2	1/8	1-1/2	17012	40.00	17012-C3	45.70
.012	.107	4	3/16	2	68012	59.00	68012-C3	65.80
.013	.020	2	1/8	1-1/2	45313	43.30	45313-C3	49.00
.013	.046	2	1/8	1-1/2	17013	40.00	17013-C3	45.70
.014	.020	2	1/8	1-1/2	45314	43.30	45314-C3	49.00
.014	.046	2	1/8	1-1/2	17014	40.00	17014-C3	45.70
.015 (1/64)	.008	2	1/8	1-1/2	67415	50.30	67415-C3	56.00
.015 (1/64)	.020	2	1/8	1-1/2	45315	43.30	45315-C3	49.00
.015 (1/64)	.046	2	1/8	1-1/2	17015	40.00	17015-C3	45.70
.015 (1/64)	.046	2	3/16	4 <i>LONG!</i>	31615	69.70	31615-C3	77.60
.015 (1/64)	.046	4	1/8	1-1/2	806115	54.40	806115-C3	59.00 <i>NEW</i>
.015 (1/64)	.058	4	1/8	1-1/2	67615	54.40	67615-C3	60.10
.015 (1/64)	.107	4	3/16	2	68015	59.00	68015-C3	65.80
.015 (1/64)	.125	2	3/16	2	941515	59.00	941515-C3	65.80
.015 (1/64)	.249	4	3/8	2-1/2	21015	63.50	21015-C3	76.90
.018	.020	2	1/8	1-1/2	45318	43.30	45318-C3	49.00
.018	.046	2	1/8	1-1/2	17018	40.00	17018-C3	45.70
.018	.107	4	3/16	2	68018	59.00	68018-C3	65.80
.020	.008	2	1/8	1-1/2	67420	50.30	67420-C3	56.00
.020	.020	2	1/8	1-1/2	45320	43.30	45320-C3	49.00
.020	.046	2	1/8	1-1/2	17020	40.00	17020-C3	45.70
.020	.046	2	3/16	4 <i>LONG!</i>	31620	69.70	31620-C3	77.60
.020	.046	4	1/8	1-1/2	806120	54.40	806120-C3	59.00 <i>NEW</i>
.020	.058	4	1/8	1-1/2	67620	54.40	67620-C3	60.10
.020	.107	4	3/16	2	68020	59.00	68020-C3	64.70
.020	.125	2	3/16	2	941520	59.00	941520-C3	65.80
.020	.249	4	3/8	2-1/2	21020	63.50	21020-C3	76.90
.022	.020	2	1/8	1-1/2	45322	43.30	45322-C3	49.00
.022	.046	2	1/8	1-1/2	17022	40.00	17022-C3	45.70
.022	.107	4	3/16	2	68022	59.00	68022-C3	65.80

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CORNER ROUNDING END MILLS



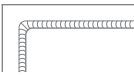
5° Flares at Shoulder and Pilot to Avoid Steps in Workpiece



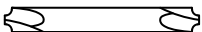
Large Pilots for Profiling, Increasing Strength and Requiring Less Speed



Small Pilots for Narrow Slots and Holes



Small Pilots Allow Milling of Tight Inside Corners



# CORNER ROUNDING END MILLS

2 & 4 Flute – Flared (cont.)

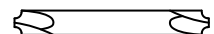
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RADIUS R <sup>+0.0005"</sup> -0.0005"	PILOT DIAMETER D <sub>1</sub>	FLUTES	SHANK DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AISI COATED	
					TOOL #	PRICE	TOOL #	PRICE
.025	.008	2	1/8	1-1/2	67425	50.30	67425-C3	56.00
.025	.020	2	1/8	1-1/2	45325	43.30	45325-C3	49.00
.025	.046	2	1/8	1-1/2	17025	40.00	17025-C3	45.70
.025	.046	2	3/16	4 <i>LONG!</i>	31625	69.70	31625-C3	77.60
.025	.058	4	1/8	1-1/2	67625	54.40	67625-C3	60.10
.025	.107	4	3/16	2	68025	59.00	68025-C3	64.70
.025	.125	2	3/16	2	941525	59.00	941525-C3	65.80
.025	.249	4	3/8	2-1/2	21025	63.50	21025-C3	76.90
.027	.046	2	1/8	1-1/2	17027	40.00	17027-C3	45.70
.027	.107	4	3/16	2	68027	59.00	68027-C3	65.80
.030	.008	2	1/8	1-1/2	67430	50.30	67430-C3	56.00
.030	.020	2	1/8	1-1/2	45330	43.30	45330-C3	49.00
.030	.046	2	1/8	1-1/2	17030	40.00	17030-C3	45.70
.030	.046	2	3/16	4 <i>LONG!</i>	31630	69.70	31630-C3	77.60
.030	.046	4	1/8	1-1/2	806130	54.40	806130-C3	59.00
.030	.058	4	1/8	1-1/2	67630	54.40	67630-C3	60.10
.030	.107	4	3/16	2	68030	59.00	68030-C3	64.70
.030	.125	2	3/16	2	941530	59.00	941530-C3	65.80
.030	.249	4	3/8	2-1/2	21030	69.90	21030-C3	83.30
.031 (1/32)	.008	2	1/8	1-1/2	67431	50.30	67431-C3	56.00
.031 (1/32)	.020	2	1/8	1-1/2	45331	43.30	45331-C3	49.00
.031 (1/32)	.046	2	1/8	1-1/2	17031	40.00	17031-C3	45.70
.031 (1/32)	.046	2	3/16	4 <i>LONG!</i>	31631	69.70	31631-C3	77.60
.031 (1/32)	.058	4	1/8	1-1/2	67631	54.40	67631-C3	60.10
.031 (1/32)	.107	4	3/16	2	68031	59.00	68031-C3	65.80
.031 (1/32)	.125	2	3/16	2	941531	65.90	941531-C3	72.70
.031 (1/32)	.154	4	1/4	2	946631	77.30	946631-C3	86.50
.031 (1/32)	.249	4	3/8	2-1/2	21031	69.90	21031-C3	83.30
.032	.046	2	1/8	1-1/2	17032	40.00	17032-C3	45.70
.032	.249	4	3/8	2-1/2	21032	69.90	21032-C3	83.30
.035	.020	2	1/8	1-1/2	67835	43.30	67835-C3	49.00
.035	.046	2	1/8	1-1/2	17035	40.00	17035-C3	45.70
.035	.046	2	3/16	4 <i>LONG!</i>	31635	69.70	31635-C3	77.60
.035	.058	4	3/16	2	67635	61.00	67635-C3	67.80
.035	.125	2	1/4	2	941535	60.50	941535-C3	67.30
.035	.249	4	3/8	2-1/2	21035	69.90	21035-C3	83.30
.037	.107	4	3/16	2	68037	59.00	68037-C3	65.80
.039 (1 mm)	.020	2	1/8	1-1/2	67839	43.30	67839-C3	49.00
.039 (1 mm)	.046	2	1/8	1-1/2	17039	40.00	17039-C3	45.70
.039 (1 mm)	.046	2	3/16	4 <i>LONG!</i>	31639	69.70	31639-C3	77.60
.039 (1 mm)	.058	4	3/16	2	67639	61.00	67639-C3	67.80
.039 (1 mm)	.100	2	3/16	2	45339	52.60	45339-C3	59.40
.039 (1 mm)	.107	4	3/16	2	68039	52.60	68039-C3	59.40
.039 (1 mm)	.154	4	1/4	2	946639	77.30	946639-C3	86.50
.039 (1 mm)	.249	4	3/8	2-1/2	21039	69.90	21039-C3	83.30

NEW

CORNER ROUNDING END MILLS

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# CORNER ROUNDING END MILLS

## 2 & 4 Flute – Flared (cont.)

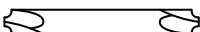
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RADIUS	PILOT DIAMETER	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIRTIN COATED	
					TOOL #	PRICE	TOOL #	PRICE
R <sup>+0.0005"</sup> <sub>-.0005"</sub>	D <sub>1</sub>		D <sub>2</sub>	L <sub>1</sub>				
.040	.020	2	1/8	1-1/2	45340	43.30	45340-C3	49.00
.040	.046	2	3/16	2	17040	51.10	17040-C3	57.90
.040	.107	4	1/4	2	68040	77.30	68040-C3	86.50
.040	.249	4	3/8	2-1/2	21040	84.60	21040-C3	98.00
.043	.046	2	3/16	2	17043	51.10	17043-C3	57.90
.043	.058	4	3/16	2	67643	61.00	67643-C3	67.80
.043	.249	4	3/8	2-1/2	21043	84.60	21043-C3	98.00
.045	.046	2	3/16	2	17045	51.10	17045-C3	57.90
.045	.058	4	3/16	2	67645	61.00	67645-C3	67.80
.047 (3/64)	.020	2	1/8	1-1/2	67847	43.30	67847-C3	49.00
.047 (3/64)	.046	2	3/16	2	17047	51.10	17047-C3	57.90
.047 (3/64)	.046	2	3/16	4 <b>LONG!</b>	31647	69.70	31647-C3	77.60
.047 (3/64)	.058	4	3/16	2	67647	61.00	67647-C3	67.80
.047 (3/64)	.107	4	1/4	2	68047	77.30	68047-C3	86.50
.047 (3/64)	.125	2	1/4	2	45347	60.50	45347-C3	69.70
.047 (3/64)	.249	4	3/8	2-1/2	21047	84.60	21047-C3	98.00
.050	.020	2	1/8	1-1/2	67850	43.30	67850-C3	49.00
.050	.046	2	3/16	2	17050	51.10	17050-C3	57.90
.050	.046	2	1/4	4 <b>LONG!</b>	31650	82.80	31650-C3	90.50
.050	.058	4	3/16	2	67650	61.00	67650-C3	67.80
.050	.107	4	1/4	2	68050	77.30	68050-C3	86.50
.050	.125	2	1/4	2	45350	60.50	45350-C3	69.70
.050	.249	4	3/8	2-1/2	21050	84.60	21050-C3	98.00
.052	.107	4	1/4	2	68052	77.30	68052-C3	86.50
.055	.046	2	3/16	2	17055	51.10	17055-C3	57.90
.055	.058	4	3/16	2	67655	61.00	67655-C3	67.80
.055	.107	4	1/4	2	68055	77.30	68055-C3	86.50
.058	.107	4	1/4	2	68058	77.30	68058-C3	86.50
.060	.020	2	3/16	2	67860	53.10	67860-C3	59.90
.060	.046	2	3/16	2	17060	51.10	17060-C3	57.90
.060	.046	2	1/4	4 <b>LONG!</b>	31660	82.80	31660-C3	90.50
.060	.058	4	3/16	2	67660	61.00	67660-C3	67.80
.060	.107	4	1/4	2	68060	77.30	68060-C3	86.50
.060	.125	2	1/4	2	45360	60.50	45360-C3	69.70
.060	.154	4	5/16	2-1/2	946660	89.20	946660-C3	100.40
.060	.249	4	1/2	3	21060	94.30	21060-C3	108.40
.062 (1/16)	.020	2	3/16	2	67862	53.10	67862-C3	59.90
.062 (1/16)	.046	2	3/16	2	17062	51.10	17062-C3	57.90
.062 (1/16)	.046	2	1/4	4 <b>LONG!</b>	31662	82.80	31662-C3	90.50
.062 (1/16)	.046	4	3/16	2	806062	61.00	806062-C3	66.00
.062 (1/16)	.058	4	3/16	2	67662	61.00	67662-C3	67.80
.062 (1/16)	.107	4	1/4	2	68062	77.30	68062-C3	86.50
.062 (1/16)	.125	2	1/4	2	45362	60.50	45362-C3	69.70
.062 (1/16)	.154	4	5/16	2-1/2	946662	89.20	946662-C3	100.40
.062 (1/16)	.249	4	1/2	3	21062	94.30	21062-C3	112.70
.065	.046	2	3/16	2	17065	51.10	17065-C3	57.90

CORNER ROUNDING END MILLS

NEW

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# CORNER ROUNDING END MILLS

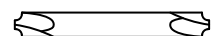
2 & 4 Flute – Flared (cont.)

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RADIUS	PILOT DIAMETER	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
					TOOL #	PRICE	TOOL #	PRICE
R <sup>+.0005"</sup> <sub>-.0005"</sub>	D <sub>1</sub>		D <sub>2</sub>	L <sub>1</sub>				
.070	<b>.046</b>	2	3/16	2	17070	51.10	17070-C3	57.90
.070	<b>.058</b>	4	1/4	2	67670	77.30	67670-C3	86.50
.070	<b>.107</b>	4	1/4	2	68070	77.30	68070-C3	86.50
.072	<b>.046</b>	2	1/4	2	17072	58.60	17072-C3	67.80
.072	<b>.249</b>	4	1/2	3	21072	98.80	21072-C3	117.20
.075	<b>.046</b>	2	1/4	2	17075	58.60	17075-C3	67.80
.078 (5/64)	<b>.020</b>	2	3/16	2	67878	59.00	67878-C3	65.80
.078 (5/64)	<b>.046</b>	2	1/4	2	17078	58.60	17078-C3	67.80
.078 (5/64)	<b>.046</b>	2	1/4	4 <b>LONG!</b>	31678	82.80	31678-C3	90.50
.078 (5/64)	<b>.058</b>	4	1/4	2	67678	77.30	67678-C3	86.50
.078 (5/64)	<b>.107</b>	4	5/16	2-1/2	68078	89.20	68078-C3	100.40
.078 (5/64)	<b>.125</b>	2	5/16	2-1/2	941578	89.20	941578-C3	100.40
.078 (5/64)	<b>.154</b>	4	5/16	2-1/2	946678	89.20	946678-C3	100.40
.078 (5/64)	<b>.249</b>	4	1/2	3	21078	98.80	21078-C3	117.20
.080	<b>.046</b>	2	1/4	2	17080	58.60	17080-C3	67.80
.080	<b>.058</b>	4	1/4	2	67680	77.30	67680-C3	86.50
.080	<b>.107</b>	4	5/16	2-1/2	68080	89.20	68080-C3	100.40
.085	<b>.046</b>	2	1/4	2	17085	58.60	17085-C3	67.80
.089	<b>.045</b>	2	1/4	2	17089	58.60	17089-C3	67.80
.089	<b>.107</b>	4	5/16	2-1/2	68089	89.20	68089-C3	100.40
.089	<b>.248</b>	4	1/2	3	21089	98.80	21089-C3	117.20
.090	<b>.045</b>	2	1/4	2	17090	58.60	17090-C3	67.80
.090	<b>.058</b>	4	1/4	2	67690	77.30	67690-C3	86.50
.090	<b>.107</b>	4	5/16	2-1/2	68090	89.20	68090-C3	100.40
.093 (3/32)	<b>.045</b>	2	1/4	2	17093	58.60	17093-C3	67.80
.093 (3/32)	<b>.045</b>	2	5/16	4 <b>LONG!</b>	31693	109.00	31693-C3	121.50
.093 (3/32)	<b>.058</b>	4	1/4	2	67693	77.30	67693-C3	86.50
.093 (3/32)	<b>.107</b>	4	5/16	2-1/2	68093	89.20	68093-C3	100.40
.093 (3/32)	<b>.125</b>	2	5/16	2-1/2	941593	89.20	941593-C3	100.40
.093 (3/32)	<b>.154</b>	4	3/8	2-1/2	946693	109.30	946693-C3	122.70
.093 (3/32)	<b>.248</b>	4	1/2	3	21093	100.60	21093-C3	119.00
.095	<b>.045</b>	2	1/4	2	17095	58.60	17095-C3	67.80
.100	<b>.045</b>	2	1/4	2	17100	58.60	17100-C3	67.80
.100	<b>.045</b>	2	5/16	4 <b>LONG!</b>	31700	109.00	31700-C3	121.50
.100	<b>.058</b>	4	5/16	2-1/2	77800	89.60	77800-C3	100.80
.100	<b>.107</b>	4	5/16	2-1/2	68100	89.60	68100-C3	100.80
.100	<b>.125</b>	2	3/8	2-1/2	941600	107.50	941600-C3	116.50
.100	<b>.248</b>	4	1/2	3	21100	100.60	21100-C3	119.00
.109 (7/64)	<b>.058</b>	2	5/16	2-1/2	17109	89.60	17109-C3	100.80
.109 (7/64)	<b>.107</b>	4	3/8	2-1/2	68109	109.30	68109-C3	122.70
.118 (3 mm)	<b>.058</b>	2	5/16	2-1/2	17118	89.60	17118-C3	100.80
.118 (3 mm)	<b>.107</b>	4	3/8	2-1/2	68118	109.30	68118-C3	122.70
.118 (3 mm)	<b>.125</b>	2	3/8	2-1/2	941618	107.50	941618-C3	116.50
.118 (3 mm)	<b>.248</b>	4	1/2	3	21118	127.60	21118-C3	146.00

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CORNER ROUNDING END MILLS



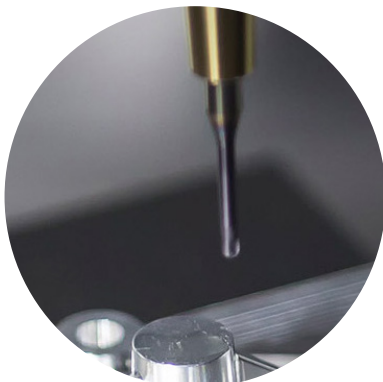
## CORNER ROUNDING END MILLS

## 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 <sup>+0.0005"</sup> <sub>-.0005"</sub>	D <sub>1</sub>		D <sub>2</sub>	L <sub>1</sub>				
.125 (1/8)	.046	2	5/16	2-1/2	948425	87.00	948425-C3	98.20
.125 (1/8)	.046	4	5/16	2-1/2	805908	89.60	805908-C3	97.50
.125 (1/8)	.058	2	5/16	2-1/2	17125	89.60	17125-C3	100.80
.125 (1/8)	.058	2	3/8	4	31725	130.20	31725-C3	137.30
.125 (1/8)	.107	4	3/8	2-1/2	68125	109.30	68125-C3	122.70
.125 (1/8)	.125	2	7/16	2-1/2	941608	145.70	941608-C3	162.70
.125 (1/8)	.154	4	7/16	2-1/2	946725	145.70	946725-C3	162.70
.125 (1/8)	.248	4	5/8	3-1/2	21125	162.00	21125-C3	182.00
.140 (9/64)	.058	2	3/8	2-1/2	17140	107.50	17140-C3	120.90
.140 (9/64)	.107	4	7/16	2-1/2	68140	145.70	68140-C3	162.70
.156 (5/32)	.058	2	3/8	2-1/2	17156	107.50	17156-C3	120.90
.156 (5/32)	.107	4	7/16	2-1/2	68156	145.70	68156-C3	162.70
.156 (5/32)	.248	4	5/8	3-1/2	21156	178.40	21156-C3	198.40
.172 (11/64)	.058	2	7/16	2-1/2	17172	162.00	17172-C3	179.00
.187 (3/16)	.058	2	7/16	2-1/2	17187	162.00	17187-C3	179.00
.187 (3/16)	.107	4	1/2	3	68187	170.00	68187-C3	188.40
.187 (3/16)	.125	2	5/8	3-1/2	941612	193.80	941612-C3	207.20
.187 (3/16)	.248	4	5/8	3-1/2	21187	191.20	21187-C3	211.20
.197 (5 mm)	.058	2	1/2	3	17197	170.00	17197-C3	188.40
.197 (5 mm)	.107	4	5/8	3-1/2	68197	255.20	68197-C3	275.20
.219 (7/32)	.058	2	1/2	3	17219	171.60	17219-C3	190.00
.219 (7/32)	.107	4	5/8	3-1/2	68219	255.20	68219-C3	275.20
.236 (6 mm)	.107	2	5/8	3-1/2	17236	257.80	17236-C3	277.80
.236 (6 mm)	.107	4	5/8	3-1/2	68236	255.20	68236-C3	275.20
.250 (1/4)	.058	2	5/8	3-1/2	17199	257.80	17199-C3	277.80
.250 (1/4)	.107	2	5/8	3-1/2	17250	255.20	17250-C3	275.20
.250 (1/4)	.107	4	5/8	3-1/2	68250	255.20	68250-C3	275.20
.250 (1/4)	.154	4	3/4	4	946750	284.00	946750-C3	307.10
.250 (1/4)	.247	4	3/4	4	21250	284.00	21250-C3	307.10
.312 (5/16)	.247	4	1	4	21312	401.20	21312-C3	434.30
.375 (3/8)	.246	4	1	4	21375	438.00	21375-C3	471.10

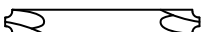
NEW



## 4 Essential Corner Rounding End Mill Decisions

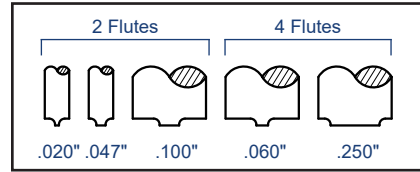
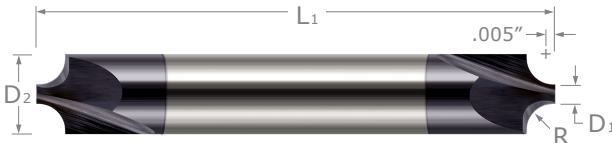
Are you machining the front corner or back corner of your part? Do you need a flared or unflared tool? Our "In the Loupe" blog post **4 Essential Corner Rounding End Mill Decisions** helps you ensure you're selecting the right tool for your job.

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



## 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

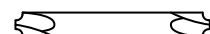
2 Flute 4 Flute



RADIUS	PILOT DIA.	FLUTES	SHANK DIA.	OAL	UNCOATED		TIN COATED		AITIN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
R <sup>+ .0005"</sup> <sub>- .0005"</sub>	D <sub>1</sub>		D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.005	.020	2	1/8	1-1/2	932205	41.70			932205-C3	47.40		
.005	.047	2	1/8	1-1/2	46005	32.10	46005-C1	37.80	46005-C3	37.80	46005-C4	49.30
.008	.047	2	1/8	1-1/2	46008	32.10	46008-C1	37.80	46008-C3	37.80		
.010	.020	2	1/8	1-1/2	932210	41.70			932210-C3	47.40		
.010	.047	2	1/8	1-1/2	46010	31.60	46010-C1	37.30	46010-C3	37.30	46010-C4	48.80
.010	.250	4	3/8	2-1/2	44010	55.30			44010-C3	68.70		
.012	.047	2	1/8	1-1/2	46012	32.10	46012-C1	37.80	46012-C3	37.80		
.015 (1/64)	.020	2	1/8	1-1/2	932215	41.70			932215-C3	47.40		
.015 (1/64)	.047	2	1/8	1-1/2	46015	31.60	46015-C1	37.30	46015-C3	37.30	46015-C4	48.80
.015 (1/64)	.047	2	3/16	4	LONG!	928015	64.00		928015-C3	71.90		
.015 (1/64)	.060	4	1/8	1-1/2	929915	50.30			929915-C3	56.00		
.015 (1/64)	.250	4	3/8	2-1/2	44015	55.30			44015-C3	68.70		
.018	.047	2	1/8	1-1/2	46018	32.10	46018-C1	37.80	46018-C3	37.80		
.020	.020	2	1/8	1-1/2	932220	41.70			932220-C3	47.40		
.020	.047	2	1/8	1-1/2	46020	31.60	46020-C1	37.30	46020-C3	37.30	46020-C4	48.80
.020	.047	2	3/16	4	LONG!	928020	64.00		928020-C3	71.90		
.020	.250	4	3/8	2-1/2	44020	55.30			44020-C3	68.70		
.022	.047	2	1/8	1-1/2	46022	32.10	46022-C1	37.80	46022-C3	37.80		
.025	.020	2	1/8	1-1/2	932225	41.70			932225-C3	47.40		
.025	.047	2	1/8	1-1/2	46025	31.60	46025-C1	37.30	46025-C3	37.30	46025-C4	48.80
.025	.250	4	3/8	2-1/2	44025	55.30			44025-C3	68.70		
.027	.047	2	1/8	1-1/2	46027	32.10	46027-C1	37.80	46027-C3	37.80		
.030	.047	2	1/8	1-1/2	46030	32.10	46030-C1	37.80	46030-C3	37.80	46030-C4	49.30
.030	.250	4	3/8	2-1/2	44030	60.60			44030-C3	74.00		
.031 (1/32)	.020	2	1/8	1-1/2	932231	41.70			932231-C3	47.40		
.031 (1/32)	.047	2	1/8	1-1/2	46031	31.60	46031-C1	37.30	46031-C3	37.30	46031-C4	48.80
.031 (1/32)	.047	2	3/16	4	LONG!	928031	64.00		928031-C3	71.90		
.031 (1/32)	.060	4	1/8	1-1/2	929931	50.30			929931-C3	56.00		
.031 (1/32)	.250	4	3/8	2-1/2	44031	60.60			44031-C3	74.00		
.032	.047	2	1/8	1-1/2	46032	35.70	46032-C1	41.40	46032-C3	41.40		
.035	.047	2	1/8	1-1/2	46035	35.70	46035-C1	41.40	46035-C3	41.40		
.039 (1 mm)	.047	2	1/8	1-1/2	46039	35.70	46039-C1	41.40	46039-C3	41.40	46039-C4	52.90
.039 (1 mm)	.250	4	3/8	2-1/2	44039	60.60			44039-C3	74.00		

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CORNER ROUNDING END MILLS



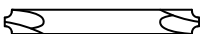
# CORNER ROUNDING END MILLS

## 2 & 4 Flute – Unflared (cont.)

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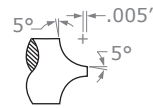
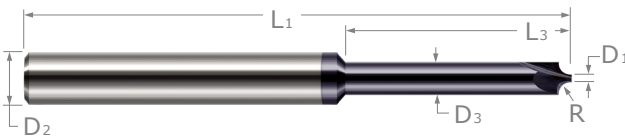
RADIUS	PILOT DIA.	FLUTES	SHANK DIA.	OAL	UNCOATED		TIN COATED		AITIN COATED		AMORPHOUS DIAMOND	
					TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
R $\begin{smallmatrix} +.0005" \\ -.0005" \end{smallmatrix}$	D <sub>1</sub>		D <sub>2</sub>	L <sub>1</sub>								
.043	.047	2	3/16	2	46043	42.30	46043-C1	49.10	46043-C3	49.10		
.047 (3/64)	.047	2	3/16	2	46047	41.70	46047-C1	48.50	46047-C3	48.50	46047-C4	65.50
.047 (3/64)	.250	4	3/8	2-1/2	44047	60.60			44047-C3	74.00		
.050	.047	2	3/16	2	46050	41.70	46050-C1	48.50	46050-C3	48.50	46050-C4	65.50
.050	.250	4	3/8	2-1/2	44050	60.60			44050-C3	74.00		
.055	.047	2	3/16	2	46055	41.70	46055-C1	48.50	46055-C3	48.50		
.060	.047	2	3/16	2	46060	43.00	46060-C1	49.80	46060-C3	49.80	46060-C4	66.80
.060	.250	4	1/2	3	44060	85.60			44060-C3	104.00		
.062 (1/16)	.047	2	3/16	2	46062	42.30	46062-C1	49.10	46062-C3	49.10	46062-C4	66.10
.062 (1/16)	.047	2	1/4	4	LONG!	928062	76.40		928062-C3	85.50		
.062 (1/16)	.060	4	3/16	2	929962	56.60			929962-C3	63.40		
.062 (1/16)	.250	4	1/2	3	44062	85.60			44062-C3	104.00		
.067	.047	2	3/16	2	46067	43.00	46067-C1	49.80	46067-C3	49.80		
.072	.047	2	1/4	2	46072	49.50	46072-C1	58.50	46072-C3	58.70		
.078 (5/64)	.047	2	1/4	2	46078	48.70	46078-C1	57.70	46078-C3	57.90	46078-C4	75.80
.078 (5/64)	.250	4	1/2	3	44078	85.60			44078-C3	104.00		
.089	.047	2	1/4	2	46089	49.50	46089-C1	58.50	46089-C3	58.70		
.093 (3/32)	.047	2	1/4	2	46093	49.50	46093-C1	58.50	46093-C3	58.70	46093-C4	76.60
.093 (3/32)	.047	2	5/16	4	LONG!	928093	89.60		928093-C3	102.10		
.093 (3/32)	.060	4	1/4	2	929993	70.20			929993-C3	79.40		
.093 (3/32)	.250	4	1/2	3	44093	96.30			44093-C3	114.70		
.100	.047	2	1/4	2	46100	48.70	46100-C1	57.70	46100-C3	57.90	46100-C4	75.80
.104	.060	2	5/16	2-1/2	46104	68.70	46104-C1	79.90	46104-C3	79.90		
.109 (7/64)	.060	2	5/16	2-1/2	46109	67.60	46109-C1	78.80	46109-C3	78.80		
.118 (3 mm)	.060	2	5/16	2-1/2	46118	68.70	46118-C1	79.90	46118-C3	79.90	46118-C4	95.80
.118 (3 mm)	.250	4	1/2	3	44118	96.30			44118-C3	114.70		
.125 (1/8)	.060	2	5/16	2-1/2	46125	68.70	46125-C1	79.90	46125-C3	79.90	46125-C4	95.80
.125 (1/8)	.060	2	3/8	4	LONG!	928125	136.10		928125-C3	150.60		
.125 (1/8)	.250	4	5/8	3-1/2	44125	141.20			44125-C3	161.20		
.140 (9/64)	.060	2	3/8	2-1/2	46140	78.90	46140-C1	92.30	46140-C3	92.30		
.156 (5/32)	.060	2	3/8	2-1/2	46156	85.30	46156-C1	98.70	46156-C3	98.70		
.156 (5/32)	.250	4	5/8	3-1/2	44156	151.80			44156-C3	171.80		
.172 (11/64)	.060	2	7/16	2-1/2	46172	140.10	46172-C1	156.80	46172-C3	157.10		
.187 (3/16)	.060	2	7/16	2-1/2	46187	144.40	46187-C1	161.10	46187-C3	161.40		
.187 (3/16)	.250	4	5/8	3-1/2	44187	166.00			44187-C3	186.00		
.197 (5 mm)	.060	2	1/2	3	46197	200.40	46197-C1	218.20	46197-C3	218.80		
.219 (7/32)	.060	2	1/2	3	46219	192.40	46219-C1	210.20	46219-C3	210.80		
.236 (6 mm)	.110	2	5/8	3-1/2	46236	256.90	46236-C1	276.90	46236-C3	276.90		
.250 (1/4)	.110	2	5/8	3-1/2	46250	256.90	46250-C1	276.90	46250-C3	276.90		
.250 (1/4)	.250	4	3/4	4	44250	269.40			44250-C3	292.50		
.312 (5/16)	.250	2	1	4	46312	399.00	46312-C1	432.10	46312-C3	432.10		
.375 (3/8)	.250	2	1	4	46375	434.80	46375-C1	467.90	46375-C3	467.90		

CORNER ROUNDING END MILLS



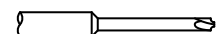
## CORNER ROUNDING END MILLS

Long Reach – Flared



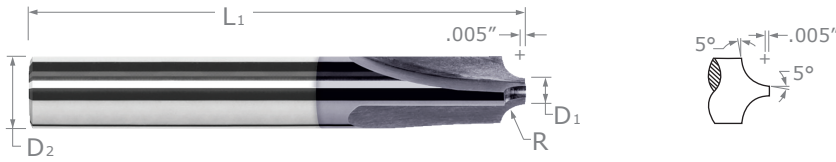
- **Reduced diameter for clearance along walls and in small features**
- Small pilot design for miniature holes, narrow slots and small inside corners
- Flares are tangent to radius (flare is blended to radius to ensure smooth form)
- Axial depth of cut = radius plus .005"    ➤ 2 flutes    ➤ Solid carbide
- CNC ground in the USA

RADIUS	PILOT DIAMETER	NECK DIAMETER	OVERALL REACH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
						2 FL	PRICE	2 FL	PRICE
<b>.005</b>	D1 <sup>+0.000</sup> / <sub>-.001</sub> "	D3	L3 <sup>+0.010</sup> / <sub>-.000</sub> "	D2	L1	2 FL	PRICE	2 FL	PRICE
	.010	<b>.031</b>	.156	1/8	1-1/2	994605	37.50		
	.010	<b>.031</b>	.250	1/8	1-1/2	56905	37.50		
	.010	<b>.031</b>	.375	1/8	1-1/2	57305	38.60		
	.020	<b>.031</b>	.156	1/8	1-1/2	992205	37.50	992205-C3	42.10
	.020	<b>.031</b>	.250	1/8	1-1/2	55705	37.50	55705-C3	42.10
	.020	<b>.031</b>	.375	1/8	1-1/2	56005	38.60		
	.020	<b>.062</b>	.312	1/8	1-1/2	990905	37.50		
	.020	<b>.062</b>	.500	1/8	1-1/2	57505	37.50		
	.020	<b>.062</b>	.750	1/8	2	55305	38.60		
<b>.008</b>	.010	<b>.031</b>	.156	1/8	1-1/2	994608	37.50	994608-C3	42.10
	.010	<b>.031</b>	.250	1/8	1-1/2	56908	37.50		
	.010	<b>.031</b>	.375	1/8	1-1/2	57308	38.60		
<b>.010</b>	.010	<b>.031</b>	.156	1/8	1-1/2	994610	37.50	994610-C3	42.10
	.010	<b>.031</b>	.250	1/8	1-1/2	56910	37.50	56910-C3	42.10
	.010	<b>.031</b>	.375	1/8	1-1/2	57310	38.60		
	.020	<b>.062</b>	.312	1/8	1-1/2	990910	37.50	990910-C3	42.10
	.020	<b>.062</b>	.500	1/8	1-1/2	57510	37.50	57510-C3	42.10
	.020	<b>.062</b>	.750	1/8	2	55310	38.60		
	.020	<b>.093</b>	.750	1/8	2	57410	43.00		
	.020	<b>.093</b>	1.125	1/8	2	54310	43.00		
<b>.015</b>	.020	<b>.062</b>	.312	1/8	1-1/2	990915	37.50	990915-C3	42.10
	.020	<b>.062</b>	.500	1/8	1-1/2	57515	37.50	57515-C3	42.10
	.020	<b>.062</b>	.750	1/8	2	55315	38.60		
	.020	<b>.093</b>	.750	1/8	2	57415	43.00		
	.020	<b>.093</b>	1.125	1/8	2	54315	43.00		
<b>.020</b>	.020	<b>.062</b>	.312	1/8	1-1/2	990920	37.50	990920-C3	42.10
	.020	<b>.062</b>	.500	1/8	1-1/2	57520	37.50	57520-C3	42.10
	.020	<b>.062</b>	.750	1/8	2	55320	38.60		
	.020	<b>.093</b>	.750	1/8	2	57420	43.00		
	.020	<b>.093</b>	1.125	1/8	2	54320	43.00		
<b>.025</b>	.020	<b>.093</b>	.750	1/8	2	57425	43.00		
	.020	<b>.093</b>	1.125	1/8	2	54325	43.00		
<b>.030</b>	.020	<b>.093</b>	.750	1/8	2	57430	43.00	57430-C3	47.60
	.020	<b>.093</b>	1.125	1/8	2	54330	43.00		
<b>.031</b>	.020	<b>.093</b>	.750	1/8	2	57431	43.00	57431-C3	47.60
	.020	<b>.093</b>	1.125	1/8	2	54331	43.00		



## CORNER ROUNDING END MILLS

### 3 Flute – Flared



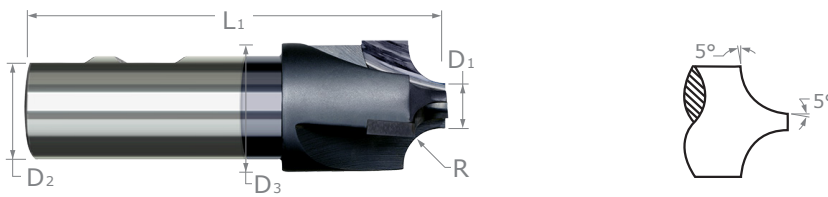
- ↪ Single end
- ↪ Cutting on radius and end only (not center cutting)
- ↪ 5° flares tangent at pilot and shoulder to avoid steps
- ↪ Axial depth of cut ≈ radius plus .005" ↪ 3 flutes
- ↪ Solid carbide ↪ CNC ground in the USA

RADIUS	PILOT DIAMETER	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
				3 FL	PRICE	3 FL	PRICE
R $\pm .0005"$ $-.0005"$	D <sub>1</sub>	D <sub>2</sub>	L <sub>1</sub>				
.015 (1/64)	.058	1/8	1-1/2	933415	30.90	933415-C3	35.50
.031 (1/32)	.058	1/8	1-1/2	933431	30.90	933431-C3	35.50
.062 (1/16)	.058	3/16	2	933462	39.50	933462-C3	44.50
.062 (1/16)	.154	5/16	2-1/2	928262	67.60	928262-C3	75.50
.093 (3/32)	.058	1/4	2	933493	58.00	933493-C3	64.80
.093 (3/32)	.154	3/8	2-1/2	928293	77.10	928293-C3	86.10
.125 (1/8)	.058	5/16	2-1/2	933508	67.60	933508-C3	75.50
.125 (1/8)	.248	5/8	3-1/2	973008	112.90	973008-C3	126.30
.187 (3/16)	.058	7/16	2-1/2	933512	110.70	933512-C3	121.90
.187 (3/16)	.248	5/8	3-1/2	973012	128.00	973012-C3	141.40

## CORNER ROUNDING END MILLS

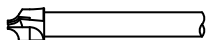
### 3 Flute – Flared – Carbide Tipped

CORNER ROUNDING END MILLS



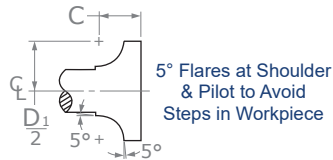
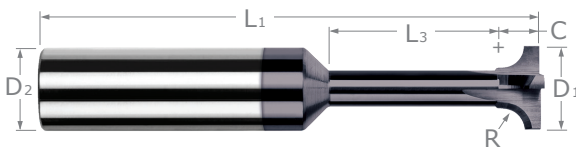
- ↪ Carbide tipped - cutting on radius only
- ↪ 5° flares tangent to radius at pilot and shoulder to avoid steps
- ↪ 3 flutes ↪ Weldon flat
- ↪ CNC ground in the USA

RADIUS	PILOT DIAMETER	HEAD DIAMETER	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
					3 FL	PRICE	3 FL	PRICE
R	D <sub>1</sub>	D <sub>3</sub>	D <sub>2</sub>	L <sub>1</sub>				
1/4	13/32	1	3/4	3-1/4	45016	205.40	45016-C3	227.50
5/16	13/32	1-1/8	7/8	3-1/2	45020	210.50	45020-C3	228.20
3/8	13/32	1-1/4	7/8	3-3/4	45024	218.00	45024-C3	236.60
7/16	13/32	1-3/8	1	4	45028	244.20	45028-C3	271.80
1/2	13/32	1-1/2	1	4	45032	270.10	45032-C3	292.20
5/8	21/32	2	1-1/4	4-1/4	45040	335.00	45040-C3	362.60

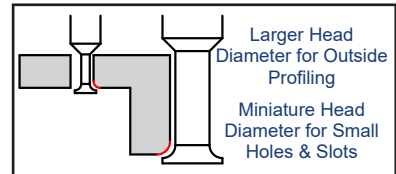


## CORNER ROUNDING END MILLS

## Back Corner Rounding End Mills – Flared



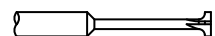
- Designed to mill radius on backside of workpiece
- 5° flares at neck and shoulder to avoid steps
- Flares are tangent to radius (flare is blended to radius to ensure smooth form)
- Cutting on radius and flares only
- Solid carbide
- CNC ground in the USA



RADIUS	HEAD DIAMETER	NECK DIAMETER	NECK LENGTH	RADIUS CENTER	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
R $^{+.0005''}$ $_{-.0005''}$	D1 $^{+.000''}$ $_{-.002''}$		L3	C $^{+.003''}$ $_{-.001''}$ *		D2	L1				
.005	.030	.017	.062	.025	3	1/8	1-1/2	57705	60.50	57705-C3	65.10
.005	.060	.047	.250	.025	3	1/8	1-1/2	58005	60.50	58005-C3	65.10
.005	.115	.102	.875	.025	3	1/8	2	59805	63.00	59805-C3	67.60
.008	.075	.056	.312	.028	3	1/8	1-1/2	58708	60.50	58708-C3	65.10
.008	.187	.144	.500	.070	3	3/16	2	16008	64.20	16008-C3	69.20
.010	.045	.022	.078	.030	3	1/8	1-1/2	60910	60.50	60910-C3	65.10
.010	.075	.052	.281	.030	3	1/8	1-1/2	58710	60.50	58710-C3	65.10
.010	.187	.140	.500	.072	3	3/16	2	16010	64.20	16010-C3	69.20
.012	.075	.048	.250	.032	3	1/8	1-1/2	58712	60.50	58712-C3	65.10
.015 (1/64)	.060	.027	.093	.035	3	1/8	1-1/2	58515	60.50	58515-C3	65.10
.015 (1/64)	.090	.057	.312	.035	3	1/8	1-1/2	59715	60.50	59715-C3	65.10
.015 (1/64)	.187	.130	.500	.077	3	3/16	2	16015	64.20	16015-C3	69.20
.015 (1/64)	.187	.130	1.000	.077	3	3/16	2-1/2	992815	65.20	992815-C3	70.20
.020	.075	.032	.109	.040	3	1/8	1-1/2	59220	60.50	59220-C3	65.10
.020	.115	.072	.375	.040	3	1/8	1-1/2	60420	60.50	60420-C3	65.10
.020	.187	.120	.500	.082	3	3/16	2	16020	64.20	16020-C3	69.20
.022	.187	.116	.500	.084	3	3/16	2	16022	64.20	16022-C3	69.20
.025	.090	.037	.125	.055	3	1/8	1-1/2	60125	60.50	60125-C3	65.10
.025	.187	.110	.500	.087	3	3/16	2	16025	64.20	16025-C3	69.20
.027	.187	.106	.500	.089	3	3/16	2	16027	64.20	16027-C3	69.20
.030	.115	.052	.187	.060	3	1/8	1-1/2	60630	60.50	60630-C3	65.10
.030	.187	.100	.500	.092	3	3/16	2	16030	64.20	16030-C3	69.20
.030	.187	.100	1.000	.092	3	3/16	2-1/2	992830	65.20	992830-C3	70.20
.031 (1/32)	.115	.050	.156	.061	3	1/8	1-1/2	60631	60.50	60631-C3	65.10
.031 (1/32)	.187	.098	.500	.093	3	3/16	2	16031	64.20	16031-C3	69.20
.031 (1/32)	.187	.098	1.000	.093	3	3/16	2-1/2	992831	65.20	992831-C3	70.20
.035	.250	.153	.500	.097	3	1/4	2-1/2	16035	69.90	16035-C3	76.70
.039 (1 mm)	.250	.145	.500	.101	3	1/4	2-1/2	16039	69.90	16039-C3	76.70
.039 (1 mm)	.250	.145	1.000	.101	3	1/4	2-1/2	992839	69.90	992839-C3	76.70
.040	.250	.143	.500	.102	3	1/4	2-1/2	16040	69.90	16040-C3	76.70
.045	.250	.133	.500	.107	3	1/4	2-1/2	16045	69.90	16045-C3	76.70

\*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

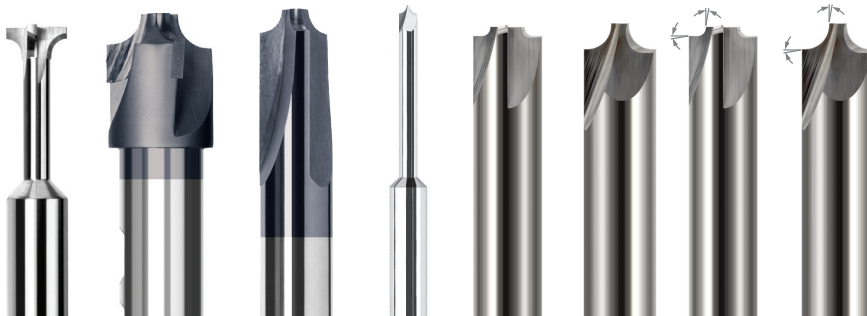
## Back Corner Rounding End Mills – Flared (cont.)

continued from previous page

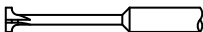
RADIUS	HEAD DIAMETER	NECK DIAMETER	NECK LENGTH	RADIUS CENTER	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI IN COATED	
								TOOL #	PRICE	TOOL #	PRICE
R $\begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$		L <sub>3</sub>	C $\begin{smallmatrix} +.003'' * \\ -.001'' * \end{smallmatrix}$		D <sub>2</sub>	L <sub>1</sub>				
.047 (3/64)	.250	.128	.625	.109	3	1/4	2-1/2	16047	69.90	16047-C3	76.70
.047 (3/64)	.250	.128	1.250	.109	3	1/4	3	992847	76.30	992847-C3	83.10
.050	.250	.122	.375	.112	3	1/4	2-1/2	985050	69.90	985050-C3	76.70
.050	.250	.122	.625	.112	3	1/4	2-1/2	16050	69.90	16050-C3	76.70
.050	.250	.122	1.250	.112	3	1/4	3	992850	76.30	992850-C3	83.10
.055	.250	.113	.625	.117	3	1/4	2-1/2	16055	69.90	16055-C3	76.70
.060	.312	.164	.437	.122	3	5/16	2-1/2	985060	95.70	985060-C3	103.60
.060	.312	.164	.875	.122	3	5/16	2-1/2	16060	95.70	16060-C3	103.60
.062 (1/16)	.312	.160	.437	.124	3	5/16	2-1/2	985062	95.70	985062-C3	103.60
.062 (1/16)	.312	.160	.875	.124	3	5/16	2-1/2	16062	95.70	16062-C3	103.60
.062 (1/16)	.312	.160	1.250	.124	3	5/16	3	992862	101.10	992862-C3	109.00
.070	.375	.207	.875	.132	3	3/8	2-1/2	16070	109.60	16070-C3	118.60
.078 (5/64)	.375	.191	.500	.171	3	3/8	2-1/2	985078	109.60	985078-C3	118.60
.078 (5/64)	.375	.191	1.000	.171	3	3/8	2-1/2	16078	109.60	16078-C3	118.60
.078 (5/64)	.375	.191	1.500	.171	3	3/8	3	992878	117.80	992878-C3	126.80
.080	.375	.187	1.000	.173	3	3/8	2-1/2	16080	109.60	16080-C3	118.60
.090	.375	.167	1.000	.183	3	3/8	2-1/2	16090	109.60	16090-C3	118.60
.093 (3/32)	.375	.161	.500	.186	3	3/8	2-1/2	985093	109.60	985093-C3	118.60
.093 (3/32)	.375	.161	1.000	.186	3	3/8	2-1/2	16093	109.60	16093-C3	118.60
.093 (3/32)	.375	.161	1.500	.186	3	3/8	3	992893	117.80	992893-C3	126.80
.100	.500	.272	.500	.193	4	1/2	3	985100	157.90	985100-C3	171.30
.100	.500	.272	1.000	.193	4	1/2	3	16100	157.90	16100-C3	171.30
.118 (3 mm)	.500	.236	1.000	.211	4	1/2	3	1613M	157.90	1613M-C3	171.30
.125 (1/8)	.500	.222	.500	.218	4	1/2	3	985108	157.90	985108-C3	171.30
.125 (1/8)	.500	.222	1.000	.218	4	1/2	3	16108	157.90	16108-C3	171.30
.125 (1/8)	.500	.222	1.500	.218	4	1/2	3-1/2	992908	163.90	992908-C3	177.30
.156 (5/32)	.625	.284	1.000	.250	4	5/8	3-1/2	16110	213.90	16110-C3	227.30
.187 (3/16)	.625	.222	1.000	.281	4	5/8	3-1/2	16112	213.90	16112-C3	227.30
.250 (1/4)	1.000	.471	1.500	.376	4	1	4	16116	321.10	16116-C3	343.20

\*Radius center is in the same plane as cutter OD (radial component of radius center = D1/2, see above drawing).

CORNER ROUNDING END MILLS

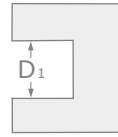
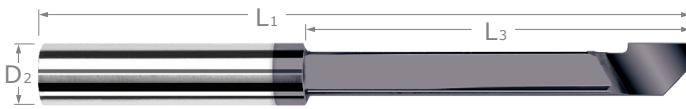


**Check Out All of Our Corner Rounding Solutions!**





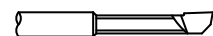
## BORING BARS



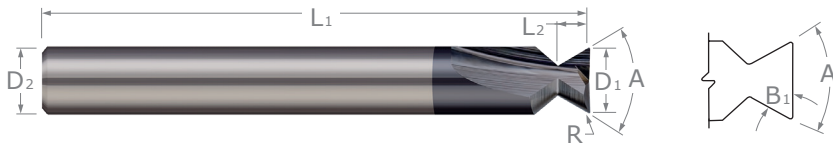
- ✦ Helical back rake flute improves accuracy and chip flow
- ✦ Square neck improves rigidity and has less deflection
- ✦ Tip is ground to sharp corner
- ✦ 70% stronger than round neck design
- ✦ Solid carbide
- ✦ CNC ground in the USA

**Helical Back Rake  
Design!**

MIN. BORE DIAMETER		MAX BORE DEPTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
D <sub>1</sub>	L <sub>3</sub>	D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE	
.031	<b>5/32</b>	1/8	1-1/2	29030	33.20	29030-C3	37.80	
.036	<b>5/32</b>	1/8	1-1/2	29035	33.20			
.042	<b>1/4</b>	1/8	1-1/2	29040	30.30	29040-C3	34.90	
.052	<b>5/16</b>	1/8	1-1/2	29050	29.40	29050-C3	34.00	
.057	<b>5/16</b>	1/8	1-1/2	29055	29.40			
.062	<b>3/8</b>	1/8	1-1/2	29060	29.40	29060-C3	34.00	
.062	<b>1/2</b>	1/8	1-1/2	29060L	31.00	29060L-C3	35.60	
.072	<b>7/16</b>	1/8	1-1/2	29070	29.40	29070-C3	34.00	
.082	<b>1/2</b>	1/8	1-1/2	29080	29.40			
.087	<b>1/2</b>	1/8	1-1/2	29085	29.40			
.087	<b>5/8</b>	1/8	2	29085L	34.60			
.092	<b>1/2</b>	1/8	1-1/2	29090	29.40	29090-C3	34.00	
.092	<b>5/8</b>	1/8	2	29090L	34.60	29090L-C3	39.20	
.102	<b>9/16</b>	1/8	1-1/2	29100	29.40	29100-C3	34.00	
.102	<b>5/8</b>	1/8	2	29100L	34.60	29100L-C3	39.20	
.112	<b>9/16</b>	1/8	1-1/2	29110	29.40	29110-C3	34.00	
.112	<b>5/8</b>	1/8	2	29110L	34.60	29110L-C3	39.20	
.120	<b>5/8</b>	1/8	1-1/2	29120	29.40	29120-C3	34.00	
.120	<b>3/4</b>	1/8	2	29120L	34.60	29120L-C3	39.20	
.135	<b>3/4</b>	5/32	2	29135	32.90	29135-C3	37.90	
.150	<b>3/4</b>	3/16	2	29150	33.80	29150-C3	38.80	
.150	<b>1</b>	3/16	2	29150L	40.30	29150L-C3	45.30	
.150	<b>1-1/2</b>	3/16	2-1/2	29150XL	43.00	29150XL-C3	48.00	
.180	<b>1</b>	3/16	2	29180	33.80	29180-C3	38.80	
.180	<b>1-1/2</b>	3/16	2-1/2	29180L	40.90	29180L-C3	45.90	
.180	<b>2</b>	3/16	3	29180XL	53.40	29180XL-C3	58.40	
.210	<b>1</b>	1/4	2	29210	35.20	29210-C3	42.00	
.210	<b>1-1/2</b>	1/4	2-1/2	29210L	41.50	29210L-C3	48.30	
.210	<b>2</b>	1/4	3	29210XL	51.00	29210XL-C3	57.80	
.240	<b>1</b>	1/4	2	29240	35.20	29240-C3	42.00	
.240	<b>1-1/2</b>	1/4	2-1/2	29240L	41.50	29240L-C3	48.30	
.240	<b>2</b>	1/4	3	29240XL	61.20	29240XL-C3	68.00	
.300	<b>1</b>	5/16	2-1/2	29300	85.10	29300-C3	93.00	
.360	<b>2</b>	3/8	3	29360	111.70	29360-C3	120.70	



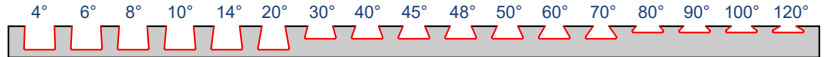
# DOVETAIL CUTTERS



$$B1 = 90 - (A / 2)$$

$$A = 180 - 2B1$$

- Offered with sharp corner, .003", .005", or .010" Corner Radius
- Solid carbide
- CNC ground in the USA

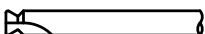


Stocked in *Seventeen* Included Angles!

INCLUDED ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	CORNER RADIUS	FLUTES	SHANK DIA.	OVERALL LENGTH	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
A $\pm 1^\circ$	D1 $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L2 $\begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		R		D2	L1				
4°	1/16	.125	.054	.005	2	1/8	1-1/2	930004	90.40	930004-C3	95.00
	3/32	.187	.081	.010	2	1/8	1-1/2	991406	87.70	991406-C3	92.30
	1/8	.250	.108	<b>SHARP!</b>	2	1/8	1-1/2	883608	90.40	883608-C3	95.00
	1/8	.250	.108	.010	2	1/8	1-1/2	991408	91.90	991408-C3	96.50
	3/16	.375	.161	<b>SHARP!</b>	2	3/16	2	883612	93.10	883612-C3	98.10
	3/16	.375	.162	.010	2	3/16	2	991412	94.60	991412-C3	99.60
	1/4	.500	.215	<b>SHARP!</b>	2	1/4	2	883616	116.50	883616-C3	123.30
	1/4	.500	.216	.010	2	1/4	2	991416	118.50	991416-C3	125.30
	3/8	.750	.323	<b>SHARP!</b>	3	3/8	2-1/2	883624	134.90	883624-C3	143.90
	3/8	.750	.323	.010	3	3/8	2-1/2	991424	136.90	991424-C3	145.90
1/2	1.000	.431	.010	3	1/2	3	991432	185.60	991432-C3	199.00	
6°	1/16	.125	.049	.005	2	1/8	1-1/2	932304	90.40	932304-C3	95.00
	3/32	.187	.074	.010	2	1/8	1-1/2	989206	87.70	989206-C3	92.30
	1/8	.250	.099	<b>SHARP!</b>	2	1/8	1-1/2	891208	88.90	891208-C3	93.50
	1/8	.250	.100	.010	2	1/8	1-1/2	989208	90.40	989208-C3	95.00
	3/16	.375	.148	<b>SHARP!</b>	2	3/16	2	891212	91.40	891212-C3	96.40
	3/16	.375	.149	.010	2	3/16	2	989212	92.90	989212-C3	97.90
	1/4	.500	.198	<b>SHARP!</b>	2	1/4	2	891216	115.30	891216-C3	122.10
	1/4	.500	.199	.010	2	1/4	2	989216	117.20	989216-C3	124.00
	3/8	.750	.296	<b>SHARP!</b>	3	3/8	2-1/2	891224	133.10	891224-C3	142.10
	3/8	.750	.297	.010	3	3/8	2-1/2	989224	135.20	989224-C3	144.20
1/2	1.000	.396	.010	3	1/2	3	989232	183.20	989232-C3	196.60	
8°	1/8	.218	.096	.010	2	1/8	1-1/2	984808	87.70	984808-C3	92.30
	3/16	.281	.150	.010	2	3/16	2	984812	90.30	984812-C3	95.30
	1/4	.375	.199	.010	2	1/4	2	984816	114.60	984816-C3	121.40
10°	1/32	.047	.023	<b>SHARP!</b>	2	1/8	1-1/2	990102	85.60	990102-C3	90.20
	1/16	.093	.046	<b>SHARP!</b>	2	1/8	1-1/2	990104	85.60	990104-C3	90.20
	1/16	.093	.047	.005	2	1/8	1-1/2	61504	87.20	61504-C3	91.80
	5/64	.109	.060	.005	2	1/8	1-1/2	61505	87.20	61505-C3	91.80
	3/32	.125	.071	<b>SHARP!</b>	2	1/8	1-1/2	990106	82.80	990106-C3	87.40
	3/32	.125	.073	.010	2	1/8	1-1/2	27006	84.30	27006-C3	88.90
	1/8	.187	.092	<b>SHARP!</b>	2	1/8	1-1/2	990108	82.80	990108-C3	87.40
	1/8	.187	.094	.010	2	1/8	1-1/2	27008	84.30	27008-C3	88.90
	3/16	.250	.144	<b>SHARP!</b>	2	3/16	2	990112	85.30	990112-C3	90.30
	3/16	.250	.146	.010	2	3/16	2	27012	87.00	27012-C3	92.00
	1/4	.312	.195	<b>SHARP!</b>	2	1/4	2	990116	108.20	990116-C3	115.00
	1/4	.312	.197	.010	2	1/4	2	27016	110.40	27016-C3	117.20

\*Diameter measured over radii (not to theoretical sharp corner).

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# DOVETAIL CUTTERS

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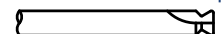
INCLUDED ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	CORNER RADIUS	FLUTES	SHANK DIA.	OVERALL LENGTH	UNCOATED		AISI COATED	
								TOOL #	PRICE	TOOL #	PRICE
A $+1^{\circ}$ $-1^{\circ}$	D <sub>1</sub> $+0.000"$ $-0.002"$	L <sub>2</sub> $+0.020"$ $-0.000"$		R		D <sub>2</sub>	L <sub>1</sub>				
<b>10°</b>	5/16	.375	.247	<b>SHARP!</b>	3	5/16	2-1/2	990120	114.50	990120-C3	122.40
	5/16	.375	.249	.010	3	5/16	2-1/2	27020	116.40	27020-C3	124.30
	3/8	.500	.288	<b>SHARP!</b>	3	3/8	2-1/2	990124	123.20	990124-C3	132.20
	3/8	.500	.289	.010	3	3/8	2-1/2	27024	125.40	27024-C3	134.40
	1/2	.625	.391	<b>SHARP!</b>	3	1/2	3	990132	170.80	990132-C3	184.20
	1/2	.625	.392	.010	3	1/2	3	27032	173.70	27032-C3	187.10
<b>14°</b>	1/16	.093	.040	.005	2	1/8	1-1/2	873404	87.20	873404-C3	91.80
	3/32	.125	.065	.010	2	1/8	1-1/2	979406	84.30	979406-C3	88.90
	1/8	.187	.082	.010	2	1/8	1-1/2	979408	84.30	979408-C3	88.90
	3/16	.250	.129	.010	2	3/16	2	979412	87.00	979412-C3	92.00
	1/4	.312	.176	.010	2	1/4	2	979416	110.40	979416-C3	117.20
	5/16	.375	.223	.010	3	5/16	2-1/2	979420	116.40	979420-C3	124.30
	3/8	.500	.255	.010	3	3/8	2-1/2	979424	125.40	979424-C3	134.40
	1/2	.625	.349	.010	3	1/2	3	979432	173.70	979432-C3	187.10
<b>20°</b>	1/32	.031	.020	<b>SHARP!</b>	2	1/8	1-1/2	986002	72.10	986002-C3	76.70
	1/16	.062	.040	<b>SHARP!</b>	2	1/8	1-1/2	986004	72.10	986004-C3	76.70
	1/16	.062	.042	.005	2	1/8	1-1/2	62304	73.60	62304-C3	78.20
	5/64	.078	.052	.005	2	1/8	1-1/2	62305	73.60	62305-C3	78.20
	3/32	.093	.060	<b>SHARP!</b>	2	1/8	1-1/2	986006	69.10	986006-C3	73.70
	3/32	.093	.064	.010	2	1/8	1-1/2	16406	70.70	16406-C3	75.30
	1/8	.125	.081	<b>SHARP!</b>	2	1/8	1-1/2	986008	69.40	986008-C3	74.00
	1/8	.125	.085	.010	2	1/8	1-1/2	16408	70.70	16408-C3	75.30
	3/16	.187	.122	<b>SHARP!</b>	2	3/16	2	986012	72.00	986012-C3	77.00
	3/16	.187	.125	.010	2	3/16	2	16412	73.20	16412-C3	78.20
	1/4	.250	.162	<b>SHARP!</b>	2	1/4	2	986016	90.70	986016-C3	97.50
	1/4	.250	.163	.005	2	1/4	2	62316	92.40	62316-C3	99.20
	1/4	.250	.166	.010	2	1/4	2	16416	92.40	16416-C3	99.20
	5/16	.312	.202	<b>SHARP!</b>	3	5/16	2-1/2	986020	99.20	986020-C3	107.10
	5/16	.312	.206	.010	3	5/16	2-1/2	16420	101.10	16420-C3	109.00
	3/8	.375	.243	<b>SHARP!</b>	3	3/8	2-1/2	986024	104.50	986024-C3	113.50
	3/8	.375	.247	.010	3	3/8	2-1/2	16424	106.20	16424-C3	115.20
	1/2	.500	.324	<b>SHARP!</b>	3	1/2	3	986032	143.70	986032-C3	157.10
	1/2	.500	.328	.010	3	1/2	3	16432	146.40	16432-C3	159.80
	5/8	.625	.409	.010	4	5/8	3	16440	167.70	16440-C3	181.10
3/4	.750	.489	.010	4	3/4	3	16448	177.00	16448-C3	191.50	
<b>30°</b>	1/32	.020	.020	<b>SHARP!</b>	2	1/8	1-1/2	983302	72.10	983302-C3	76.70
	1/16	.045	.041	<b>SHARP!</b>	2	1/8	1-1/2	983304	72.10	983304-C3	76.70
	1/16	.045	.041	.005	2	1/8	1-1/2	63404	73.60	63404-C3	78.20
	5/64	.055	.052	.005	2	1/8	1-1/2	63405	73.60	63405-C3	78.20
	3/32	.062	.060	<b>SHARP!</b>	2	1/8	1-1/2	983306	69.10	983306-C3	73.70
	3/32	.078	.057	.010	2	1/8	1-1/2	16506	70.70	16506-C3	75.30
	1/8	.082	.081	<b>SHARP!</b>	2	1/8	1-1/2	983308	69.40	983308-C3	74.00
	1/8	.093	.081	.010	2	1/8	1-1/2	16508	70.70	16508-C3	75.30
	3/16	.125	.121	<b>SHARP!</b>	2	3/16	2	983312	70.40	983312-C3	75.40
	3/16	.125	.127	.010	2	3/16	2	16512	71.80	16512-C3	76.80
	1/4	.156	.166	<b>SHARP!</b>	2	1/4	2	983316	89.20	983316-C3	96.00
	1/4	.156	.172	.010	2	1/4	2	16516	90.70	16516-C3	97.50

NEW

DOVETAIL CUTTERS

\*Diameter measured over radii (not to theoretical sharp corner).

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# DOVETAIL CUTTERS

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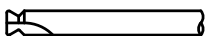
INCLUDED ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	CORNER RADIUS	FLUTES	SHANK DIA.	OVERALL LENGTH	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
A $\pm 1^\circ$	D <sub>1</sub> $\pm \begin{smallmatrix} .000'' \\ -.002'' \end{smallmatrix}$	L <sub>2</sub> $\pm \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		R		D <sub>2</sub>	L <sub>1</sub>				
30°	5/16	.218	.196	<b>SHARP!</b>	3	5/16	2-1/2	983320	97.40	983320-C3	105.30
	5/16	.187	.218	.010	3	5/16	2-1/2	16520	99.30	16520-C3	107.20
	3/8	.250	.241	<b>SHARP!</b>	3	3/8	2-1/2	983324	102.50	983324-C3	111.50
	3/8	.250	.243	.005	3	3/8	2-1/2	63424	104.50	63424-C3	113.50
	3/8	.250	.247	.010	3	3/8	2-1/2	16524	104.50	16524-C3	113.50
	1/2	.312	.333	<b>SHARP!</b>	3	1/2	3	983332	141.20	983332-C3	154.60
	1/2	.312	.339	.010	3	1/2	3	16532	143.70	16532-C3	157.10
	5/8	.375	.430	.010	4	5/8	3	16540	165.00	16540-C3	178.40
3/4	.500	.488	.010	4	3/4	3	16548	174.50	16548-C3	189.00	
40°	1/16	.035	.037	<b>SHARP!</b>	2	1/8	1-1/2	977804	72.10	977804-C3	76.70
	1/16	.040	.037	.005	2	1/8	1-1/2	64604	73.60	64604-C3	78.20
	5/64	.050	.046	.005	2	1/8	1-1/2	64605	73.60	64605-C3	78.20
	3/32	.062	.056	.010	2	1/8	1-1/2	28506	70.70	28506-C3	75.30
	1/8	.078	.068	<b>SHARP!</b>	2	1/8	1-1/2	977808	69.40	977808-C3	74.00
	1/8	.093	.066	.010	2	1/8	1-1/2	28508	70.70	28508-C3	75.30
	3/16	.109	.108	<b>SHARP!</b>	2	3/16	2	977812	72.00	977812-C3	77.00
	3/16	.125	.105	.010	2	3/16	2	28512	73.20	28512-C3	78.20
	1/4	.156	.136	<b>SHARP!</b>	2	1/4	2	977816	90.70	977816-C3	97.50
	1/4	.156	.145	.010	2	1/4	2	28516	92.40	28516-C3	99.20
	5/16	.187	.176	<b>SHARP!</b>	3	5/16	2-1/2	977820	99.20	977820-C3	107.10
	5/16	.187	.185	.010	3	5/16	2-1/2	28520	101.10	28520-C3	109.00
	3/8	.218	.216	<b>SHARP!</b>	3	3/8	2-1/2	977824	104.50	977824-C3	113.50
	3/8	.250	.202	.010	3	3/8	2-1/2	28524	106.20	28524-C3	115.20
	1/2	.312	.273	<b>SHARP!</b>	3	1/2	3	977832	143.70	977832-C3	157.10
	1/2	.312	.281	.010	3	1/2	3	28532	146.40	28532-C3	159.80
5/8	.375	.361	.010	4	5/8	3	28540	167.70	28540-C3	181.10	
3/4	.500	.395	.010	4	3/4	3	28548	177.00	28548-C3	191.50	
45°	1/8	.093	.058	.010	2	1/8	1-1/2	928408	76.90	928408-C3	81.50
	3/16	.125	.094	.010	2	3/16	2	928412	79.50	928412-C3	84.50
	1/4	.156	.121	<b>SHARP!</b>	2	1/4	2	874516	97.70	874516-C3	104.50
	1/4	.156	.131	.010	2	1/4	2	928416	99.20	928416-C3	106.00
	3/8	.250	.168	<b>SHARP!</b>	3	3/8	2-1/2	874524	113.00	874524-C3	122.00
	3/8	.250	.178	.010	3	3/8	2-1/2	928424	114.50	928424-C3	123.50
	1/2	.312	.242	<b>SHARP!</b>	3	1/2	3	874532	154.90	874532-C3	168.30
	1/2	.312	.251	.010	3	1/2	3	928432	157.40	928432-C3	170.80
48°	1/16	.035	.036	.005	2	1/8	1-1/2	896504	71.80	896504-C3	76.40
	5/64	.045	.043	.005	2	1/8	1-1/2	896505	71.80	896505-C3	76.40
	3/32	.050	.059	.010	2	1/8	1-1/2	16606	68.30	16606-C3	72.90
	1/8	.070	.063	<b>SHARP!</b>	2	1/8	1-1/2	973108	66.80	973108-C3	71.40
	1/8	.093	.053	.010	2	1/8	1-1/2	16608	68.30	16608-C3	72.90
	3/16	.109	.090	<b>SHARP!</b>	2	3/16	2	973112	70.20	973112-C3	75.20
	3/16	.125	.087	.010	2	3/16	2	16612	71.60	16612-C3	76.60
	1/4	.156	.111	<b>SHARP!</b>	2	1/4	2	973116	88.30	973116-C3	95.10
	1/4	.156	.122	.010	2	1/4	2	16616	90.00	16616-C3	96.80
	5/16	.187	.157	.010	3	5/16	2-1/2	16620	98.80	16620-C3	106.70

NEW

DOVETAIL CUTTERS

\*Diameter measured over radii (not to theoretical sharp corner).

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# DOVETAIL CUTTERS

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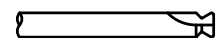
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INCLUDED ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	CORNER RADIUS	FLUTES	SHANK DIA.	OVERALL LENGTH	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
A $+1^{\circ}$ $-1^{\circ}$	D <sub>1</sub> $+0.000"$ $-0.002"$	L <sub>2</sub> $+0.020"$ $-0.000"$		R		D <sub>2</sub>	L <sub>1</sub>				
48°	3/8	.250	.152	<b>SHARP!</b>	3	3/8	2-1/2	973124	102.00	973124-C3	111.00
	3/8	.250	.163	.010	3	3/8	2-1/2	16624	103.80	16624-C3	112.80
	1/2	.312	.222	<b>SHARP!</b>	3	1/2	3	973132	140.60	973132-C3	154.00
	1/2	.312	.233	.010	3	1/2	3	16632	143.00	16632-C3	156.40
50°	1/8	.093	.050	.010	2	1/8	1-1/2	926208	69.90	926208-C3	74.50
	3/16	.125	.082	.010	2	3/16	2	926212	73.40	926212-C3	78.40
	1/4	.156	.116	.010	2	1/4	2	926216	95.10	926216-C3	101.90
	3/8	.250	.153	.010	3	3/8	2-1/2	926224	108.80	926224-C3	117.80
	1/2	.312	.220	.010	3	1/2	3	926232	151.10	926232-C3	164.50
NEW	1/32	.014	.015	<b>SHARP!</b>	2	1/8	1-1/2	995202	68.90	995202-C3	73.50
	1/16	.028	.030	<b>SHARP!</b>	2	1/8	1-1/2	995204	70.40	995204-C3	75.00
	1/16	.032	.028	.003	2	1/8	1-1/2	811404	71.80	811404-C3	76.40
	1/16	.032	.032	.005	2	1/8	1-1/2	65104	71.80	65104-C3	76.40
	5/64	.035	.038	<b>SHARP!</b>	2	1/8	1-1/2	995205	70.40	995205-C3	75.00
	5/64	.040	.039	.005	2	1/8	1-1/2	65105	71.80	65105-C3	76.40
	3/32	.040	.047	<b>SHARP!</b>	2	1/8	1-1/2	995206	66.80	995206-C3	71.40
	3/32	.045	.056	.010	2	1/8	1-1/2	16706	68.30	16706-C3	72.90
	1/8	.056	.060	<b>SHARP!</b>	2	1/8	1-1/2	995208	66.80	995208-C3	71.40
	1/8	.062	.056	.003	2	1/8	1-1/2	811408	68.30	811408-C3	72.90
	1/8	.062	.061	.005	2	1/8	1-1/2	65108	68.30	65108-C3	71.90
	1/8	.062	.068	.010	2	1/8	1-1/2	16708	68.30	16708-C3	72.90
NEW	5/32	.070	.075	<b>SHARP!</b>	2	3/16	2	995210	70.20	995210-C3	75.20
	5/32	.078	.081	.010	2	3/16	2	16710	71.60	16710-C3	76.60
	3/16	.085	.089	<b>SHARP!</b>	2	3/16	2	995212	70.20	995212-C3	75.20
	3/16	.093	.083	.003	2	3/16	2	811412	71.60	811412-C3	76.60
	3/16	.093	.087	.005	2	3/16	2	65112	71.60	65112-C3	76.60
	3/16	.093	.095	.010	2	3/16	2	16712	71.60	16712-C3	76.60
	3/16	.109	.104	.030	2	3/16	2	845112	71.60	845112-C3	76.60
	1/4	.118	.114	<b>SHARP!</b>	2	1/4	2	995216	86.80	995216-C3	93.60
	1/4	.125	.109	.003	2	1/4	2	811416	88.30	811416-C3	95.10
	1/4	.125	.113	.005	2	1/4	2	65116	88.30	65116-C3	94.00
	1/4	.125	.120	.010	2	1/4	2	16716	88.30	16716-C3	95.10
	1/4	.140	.131	.030	2	1/4	2	845116	88.30	845116-C3	95.10
NEW	5/16	.141	.150	<b>SHARP!</b>	3	5/16	2-1/2	995220	95.10	995220-C3	103.00
	5/16	.156	.138	.005	3	5/16	2-1/2	65120	96.80	65120-C3	104.70
	5/16	.156	.147	.010	3	5/16	2-1/2	16720	96.80	16720-C3	104.70
	3/8	.156	.195	<b>SHARP!</b>	3	3/8	2-1/2	995224	99.30	995224-C3	108.30
	3/8	.187	.166	.005	3	3/8	2-1/2	65124	101.40	65124-C3	109.00
	3/8	.187	.174	.010	3	3/8	2-1/2	16724	101.40	16724-C3	110.40
	7/16	.187	.222	<b>SHARP!</b>	3	7/16	2-3/4	995228	107.30	995228-C3	118.50
	7/16	.218	.200	.010	3	7/16	2-3/4	16728	109.90	16728-C3	121.10
	1/2	.218	.248	<b>SHARP!</b>	3	1/2	3	995232	138.00	995232-C3	151.40
	1/2	.250	.219	.005	3	1/2	3	65132	140.60	65132-C3	152.00
	1/2	.250	.226	.010	3	1/2	3	16732	140.60	16732-C3	154.00
	1/2	.250	.255	.030	3	1/2	3	845132	138.50	845132-C3	149.90

\*Diameter measured over radii (not to theoretical sharp corner).

continued on next page

DOVETAIL CUTTERS



# DOVETAIL CUTTERS

(cont.)

continued from previous page

INCLUDED ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	CORNER RADIUS	FLUTES	SHANK DIA.	OVERALL LENGTH	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
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>				
60°	5/8	.281	.301	<b>SHARP!</b>	4	5/8	3	995240	206.20	995240-C3	219.60
	5/8	.312	.279	.010	4	5/8	3	16740	208.80	16740-C3	222.20
	3/4	.343	.354	<b>SHARP!</b>	4	3/4	3	995248	247.80	995248-C3	262.30
	3/4	.375	.332	.010	4	3/4	3	16748	250.30	16748-C3	264.80
	1	.500	.437	.010	4	1	4	16764	443.90	16764-C3	466.00
70°	1/4	.109	.116	.010	2	1/4	2	832316	95.10	832316-C3	101.90
	1/2	.218	.213	.010	3	1/2	3	832332	151.10	832332-C3	164.50
80°	1/4	.093	.117	.010	2	1/4	2	827916	95.10	827916-C3	101.90
	1/2	.187	.209	.010	3	1/2	3	827932	151.10	827932-C3	164.50
90°	1/32	.008	.015	<b>SHARP!</b>	2	1/8	1-1/2	992002	70.40	992002-C3	75.00
	1/16	.023	.030	.005	2	1/8	1-1/2	66304	71.80	66304-C3	76.40
	5/64	.027	.038	.005	2	1/8	1-1/2	66305	71.80	66305-C3	76.40
	3/32	.025	.043	<b>SHARP!</b>	2	1/8	1-1/2	992006	66.80	992006-C3	71.40
	3/32	.031	.059	.010	2	1/8	1-1/2	16806	68.30	16806-C3	72.90
	1/8	.034	.057	<b>SHARP!</b>	2	1/8	1-1/2	992008	65.80	992008-C3	70.40
	1/8	.040	.059	.005	2	1/8	1-1/2	66308	67.20	66308-C3	70.90
	1/8	.040	.073	.010	2	1/8	1-1/2	16808	67.20	16808-C3	71.80
	5/32	.047	.090	.010	2	3/16	2	16810	71.60	16810-C3	76.60
	3/16	.052	.084	<b>SHARP!</b>	2	3/16	2	992012	70.20	992012-C3	75.20
	3/16	.047	.122	.010	2	3/16	2	16812	71.60	16812-C3	76.60
	1/4	.068	.114	<b>SHARP!</b>	2	1/4	2	992016	86.80	992016-C3	93.60
	1/4	.062	.140	.005	2	1/4	2	66316	88.30	66316-C3	94.00
	1/4	.063	.154	.010	2	1/4	2	16816	88.30	16816-C3	95.10
	5/16	.085	.143	<b>SHARP!</b>	3	5/16	2-1/2	992020	95.10	992020-C3	103.00
	5/16	.093	.155	.010	3	5/16	2-1/2	16820	96.80	16820-C3	104.70
	3/8	.105	.165	<b>SHARP!</b>	3	3/8	2-1/2	992024	99.30	992024-C3	108.30
	3/8	.109	.171	.005	3	3/8	2-1/2	66324	101.40	66324-C3	109.00
	3/8	.125	.153	.010	3	3/8	2-1/2	16824	101.40	16824-C3	110.40
	7/16	.141	.185	.010	3	7/16	2-3/4	16828	109.90	16828-C3	121.10
	1/2	.141	.218	<b>SHARP!</b>	3	1/2	3	992032	138.00	992032-C3	151.40
	1/2	.156	.202	.005	3	1/2	3	66332	140.60	66332-C3	152.00
	1/2	.156	.216	.010	3	1/2	3	16832	140.60	16832-C3	154.00
	1/2	.172	.241	.030	3	1/2	3	833932	140.60	833932-C3	152.00
	5/8	.187	.279	.010	4	5/8	3	16840	208.80	16840-C3	222.20
	3/4	.218	.342	.010	4	3/4	3	16848	250.30	16848-C3	264.80
100°	1/8	.040	.065	.010	2	1/8	1-1/2	964408	71.90	964408-C3	76.50
	3/16	.047	.110	.010	2	3/16	2	964412	75.50	964412-C3	80.50
	1/4	.062	.137	.010	2	1/4	2	964416	95.10	964416-C3	101.90
	3/8	.093	.188	.010	3	3/8	2-1/2	964424	108.60	964424-C3	117.60
	1/2	.125	.237	.010	3	1/2	3	964432	150.90	964432-C3	164.30
120°	1/8	.039	.045	.010	2	1/8	1-1/2	959908	71.90	959908-C3	76.50
	3/16	.047	.079	.010	2	3/16	2	959912	75.50	959912-C3	80.50
	1/4	.062	.090	.010	2	1/4	2	959916	95.10	959916-C3	101.90
	3/8	.093	.107	.010	3	3/8	2-1/2	959924	108.60	959924-C3	117.60
	1/2	.109	.177	.010	3	1/2	3	959932	150.90	959932-C3	164.30

\*Diameter measured over radii (not to theoretical sharp corner).

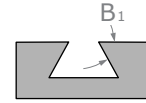
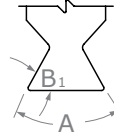
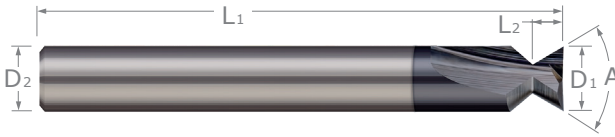
DOVETAIL CUTTERS



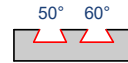
NEW

## DOVETAIL CUTTERS

### Sight Groove Dovetail Cutters



Off the Shoulder Angle  
 $B_1 = 90 - (A / 2)$   
 $A = 180 - 2B_1$



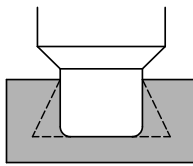
Stocked in *Two* Included Angles!

- Designed for milling dovetail grooves for Sight Attachments
- Diameters match common brand standards
- Offered with sharp corner
- Solid carbide
- CNC ground in the USA

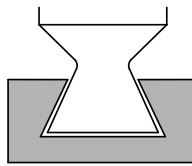
	INCL. ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	FLUTES	SHANK DIA.	OAL	UNCOATED		A1TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
	A $\begin{smallmatrix} +1^\circ \\ -1^\circ \end{smallmatrix}$	D <sub>1</sub> $\begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$			D <sub>2</sub>	L <sub>1</sub>				
NEW	50°	.330	.093	.242	3	3/8	2-1/2	806833	106.70	806833-C3	115.70
NEW		.344	.125	.226	3	3/8	2-1/2	806834	106.70	806834-C3	115.70
NEW		.495	.250	.261	3	1/2	3	806849	149.00	806849-C3	162.40
NEW	60°	.300	.093	.191	3	5/16	2-1/2	806730	95.10	806730-C3	103.00
NEW		.359	.125	.213	3	3/8	2-1/2	806735	99.30	806735-C3	108.30

### RECOMMENDED SIGHT GROOVE DOVETAIL MILLING TECHNIQUES

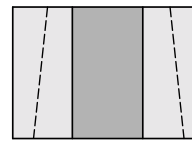
- Use an endmill that is smaller than the top of the groove width to slot.
- With required dovetail, mill groove down the centerline of slot to shape the rest of the dovetail groove
- Since most sights are press fitted, filing or additional adjustments may be required to ensure proper sight fit.
  - 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.



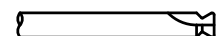
Mill Slot



Mill on Center



Angle Dovetail to Widen One Side

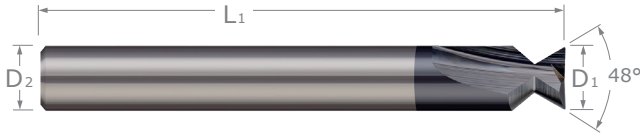




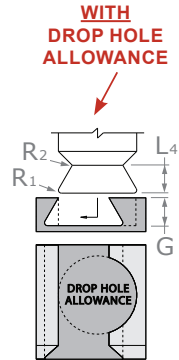
# DOVETAIL CUTTERS

## 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+	70.00	23807-C3+	74.60	23807-C8+	76.80
.070	.084	.054	.015	.056	.005	.050	1/8	1-1/2	56307Δ	70.00	56307-C3Δ	74.60	56307-C8Δ	76.80
.103	.135	.082	.015	.088	.010	.073	3/16	2	23814	72.90	23814-C3	77.90	23814-C8	79.70
.139	.172	.112	.031	.116	.010	.103	3/16	2	23821	72.90	23821-C3	77.90	23821-C8	79.70
.210	.284	.172	.031	.179	.015	.158	5/16	2-1/2	23828	96.40	23828-C3	104.30	23828-C8	111.90
.275	.362	.232	.062	.237	.015	.219	3/8	2-1/2	23835	111.70	23835-C3	120.70	23835-C8	130.50
.375	.488	.317	.093	.327	.020	.299	1/2	3	23842	143.00	23842-C3	156.40	23842-C8	165.10

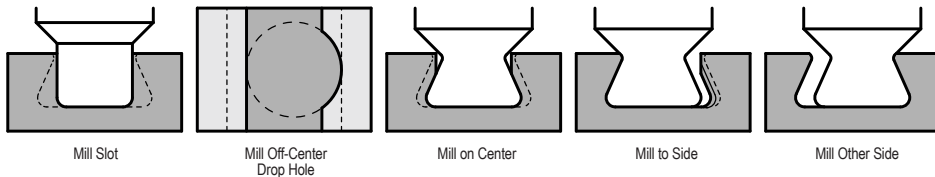
\*Diameter measured over radii (not to theoretical sharp corner). †Meets ORD 5700/USA spec. ΔMeets ORD 5700 spec. All other tools meet BOTH specifications.

### 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 at full axial depth 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, search for keyword ORINGGUIDE on [www.harveytool.com](http://www.harveytool.com)**



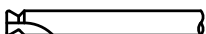
DOVETAIL CUTTERS

#### O-Ring Slotting End Mills



◀ See page 354

- **Ideal for slotting o-ring dovetail grooves!**
- **Achieve the right slot width and shape without radial stepovers!**



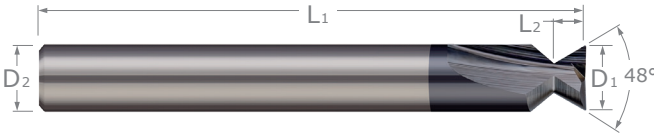


Designed to Parker Hannifin O-Ring Standards

## 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

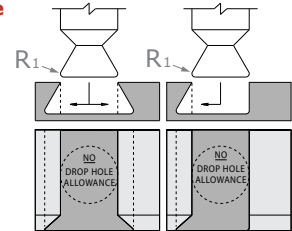
➤ 2 straight flutes

➤ Center cutting

➤ Solid carbide

➤ CNC ground in the USA 

**WITHOUT  
DROP HOLE  
ALLOWANCE**



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>	TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
.070	.055	.054	.015	.023	1/8	1-1/2	23907	68.40	23907-C3	73.00	23907-C8	75.20
.103	.083	.085	.015	.024	1/8	1-1/2	23914	68.40	23914-C3	73.00	23914-C8	75.20
.139	.113	.115	.031	.044	1/8	1-1/2	23921	68.40	23921-C3	73.00	23921-C8	75.20
.210	.171	.176	.031	.048	3/16	2	23928	71.30	23928-C3	76.30	23928-C8	78.60
.275	.231	.238	.062	.086	1/4	2	23935	93.40	23935-C3	100.20	23935-C8	100.70
.375	.315	.323	.093	.128	3/8	2-1/2	23942	109.10	23942-C3	118.10	23942-C8	127.90

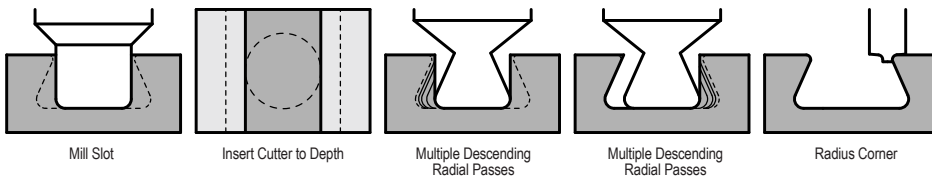
\*Diameter measured over radii (not to theoretical sharp corner). \*\*Diameter at length of cut.

## 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).

**For radial calculations, search for keyword ORINGGUIDE on [www.harveytool.com](http://www.harveytool.com)**

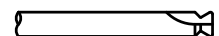


## O-Ring Corner Rounding End Mills



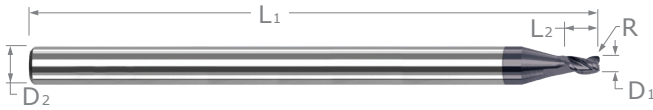
◀ See page 354

- **Ideal for creating radius on top part of o-ring dovetail groove!**
- **Design ensures smooth, blended form on part!**



## DOVETAIL CUTTERS

### O-Ring Slotting End Mills



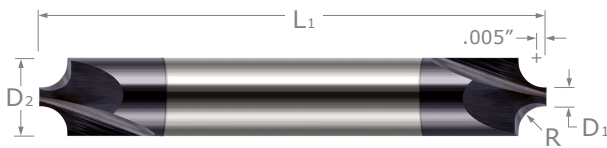
**Ideal for Slotting  
O-Ring Dovetail  
Grooves!**

- ⚡ 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> <sup>+0.000"</sup> / <sub>-0.001"</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>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.055	.015	.065	1/8	1-1/2	56510	25.00	56510-C3	29.60	56510-C8	33.80
.085	.015	.100	1/8	1-1/2	56520	25.00	56520-C3	29.60	56520-C8	33.80
.115	.031	.140	1/8	1-1/2	56530	25.00	56530-C3	29.60	56530-C8	33.80
D <sub>1</sub> <sup>+0.000"</sup> / <sub>-0.002"</sub>	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>	L <sub>1</sub>	3 FL	PRICE	3 FL	PRICE	3 FL	PRICE
.176	.031	.210	3/16	2	56540	27.90	56540-C3	32.90	56540-C8	36.80
.236	.062	.280	1/4	2-1/2	56550	36.80	56550-C3	43.60	56550-C8	50.30
.323	.093	.380	3/8	2-1/2	56560	52.40	56560-C3	61.40	56560-C8	74.30

## DOVETAIL CUTTERS

### O-Ring Corner Rounding End Mills



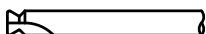
**For Creating Radius  
on Top Part of O-Ring  
Dovetail Groove**

- ⚡ 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



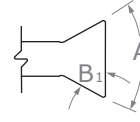
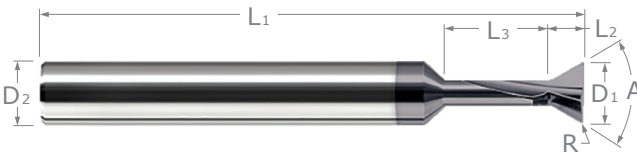
O-RING X-SECTION	RADIUS	PILOT DIAMETER	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
					2 FL	PRICE	2 FL	PRICE
	R <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	D <sub>1</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
.070	.005	.046	1/8	1-1/2	17005	40.00	17005-C3	45.70
.103	.010	.046	1/8	1-1/2	17010	40.00	17010-C3	45.70
.139	.010	.046	1/8	1-1/2	17010	40.00	17010-C3	45.70
.210	.015	.046	1/8	1-1/2	17015	40.00	17015-C3	45.70
.275	.015	.046	1/8	1-1/2	17015	40.00	17015-C3	45.70
.375	.020	.046	1/8	1-1/2	17020	40.00	17020-C3	45.70

DOVETAIL CUTTERS



## DOVETAIL CUTTERS

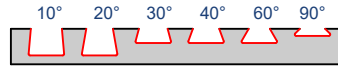
## Long Reach



$$B1 = 90 - (A / 2)$$

$$A = 180 - 2B1$$

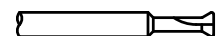
- Reduced neck for long reach machining
- Corner radius for improved strength
- Solid carbide
- CNC ground in the USA



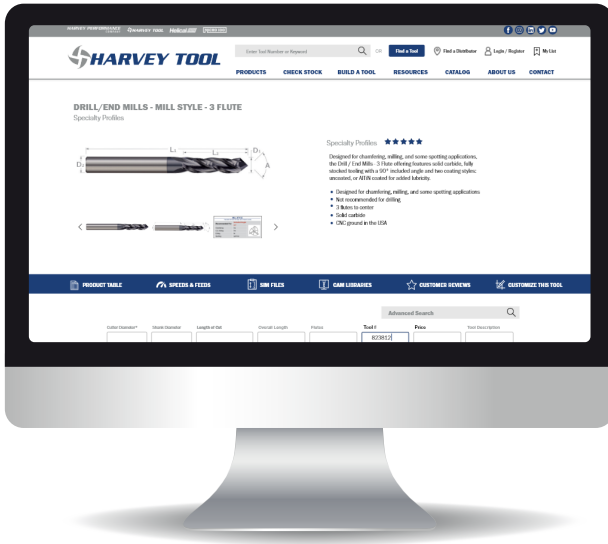
Stocked in Six Included Angles!

INCL. ANGLE	CUTTER DIA.*	LENGTH OF CUT	NECK DIA.	NECK LENGTH	CORNER RADIUS	FLUTES	SHANK DIA.	OAL	UNCOATED		AISI COATED	
									TOOL #	PRICE	TOOL #	PRICE
A $\begin{matrix} +1^\circ \\ -1^\circ \end{matrix}$	D1 $\begin{matrix} +.000'' \\ -.002'' \end{matrix}$	L2 $\begin{matrix} +.020'' \\ -.000'' \end{matrix}$		L3 $\begin{matrix} +.030'' \\ -.000'' \end{matrix}$	R		D2	L1				
10°	1/8	.187	.094	.125	.010	2	1/8	1-1/2	899108	96.20	899108-C3	100.80
	1/4	.312	.197	.250	.010	2	1/4	2	899116	122.40	899116-C3	129.20
	1/2	.625	.392	.250	.010	3	1/2	3	899132	185.80	899132-C3	199.20
20°	1/8	.125	.085	.125	.010	2	1/8	1-1/2	877408	84.20	877408-C3	88.80
	1/4	.250	.166	.250	.010	2	1/4	2	877416	106.70	877416-C3	113.50
	1/2	.500	.328	.250	.010	3	1/2	3	877432	162.00	877432-C3	175.40
30°	1/16	.045	.041	.062	.005	2	1/8	1-1/2	849904	87.20	849904-C3	91.80
	3/32	.078	.057	.093	.010	2	1/8	1-1/2	914806	84.20	914806-C3	88.80
	1/8	.093	.081	.125	.010	2	1/8	1-1/2	914808	84.20	914808-C3	88.80
	3/16	.125	.127	.187	.010	2	3/16	2	914812	87.40	914812-C3	92.40
	1/4	.156	.172	.250	.010	2	1/4	2	914816	104.90	914816-C3	111.70
	3/8	.250	.247	.250	.010	3	3/8	2-1/2	914824	156.90	914824-C3	165.90
40°	1/2	.312	.339	.250	.010	3	1/2	3	914832	159.50	914832-C3	172.90
	1/8	.093	.066	.125	.010	2	1/8	1-1/2	864008	87.20	864008-C3	91.80
	1/4	.156	.145	.250	.010	2	1/4	2	864016	104.90	864016-C3	111.70
60°	1/2	.312	.281	.250	.010	3	1/2	3	864032	159.50	864032-C3	172.90
	1/16	.032	.032	.062	.005	2	1/8	1-1/2	865504	84.60	865504-C3	89.20
	3/32	.045	.056	.093	.010	2	1/8	1-1/2	925306	81.70	925306-C3	86.30
	1/8	.056	.060	.125	<b>SHARP!</b>	2	1/8	1-1/2	865908	80.20	865908-C3	84.80
	1/8	.062	.068	.125	.010	2	1/8	1-1/2	925308	81.70	925308-C3	86.30
	3/16	.093	.095	.187	.010	2	3/16	2	925312	85.20	925312-C3	90.20
	1/4	.118	.114	.250	<b>SHARP!</b>	2	1/4	2	865916	101.10	865916-C3	107.90
	1/4	.125	.120	.250	.010	2	1/4	2	925316	102.70	925316-C3	109.50
	3/8	.187	.174	.250	.010	3	3/8	2-1/2	925324	114.50	925324-C3	123.50
	1/2	.218	.248	.250	<b>SHARP!</b>	3	1/2	3	865932	153.20	865932-C3	166.60
1/2	.250	.226	.250	.010	3	1/2	3	925332	155.70	925332-C3	169.10	
90°	1/16	.023	.030	.062	.005	2	1/8	1-1/2	885704	84.60	885704-C3	89.20
	3/32	.031	.059	.093	.010	2	1/8	1-1/2	931006	81.70	931006-C3	86.30
	1/8	.034	.057	.125	<b>SHARP!</b>	2	1/8	1-1/2	884608	80.20	884608-C3	84.80
	1/8	.040	.073	.125	.010	2	1/8	1-1/2	931008	80.40	931008-C3	85.00
	3/16	.047	.122	.187	.010	2	3/16	2	931012	85.20	931012-C3	90.20
	1/4	.068	.114	.250	<b>SHARP!</b>	2	1/4	2	884616	101.10	884616-C3	107.90
	1/4	.062	.154	.250	.010	2	1/4	2	931016	102.70	931016-C3	109.50
	3/8	.125	.153	.250	.010	3	3/8	2-1/2	931024	114.50	931024-C3	123.50
	1/2	.141	.218	.250	<b>SHARP!</b>	3	1/2	3	884632	153.20	884632-C3	166.60
	1/2	.156	.216	.250	.010	3	1/2	3	931032	155.70	931032-C3	169.10

\*Diameter measured over radii (not to theoretical sharp corner).



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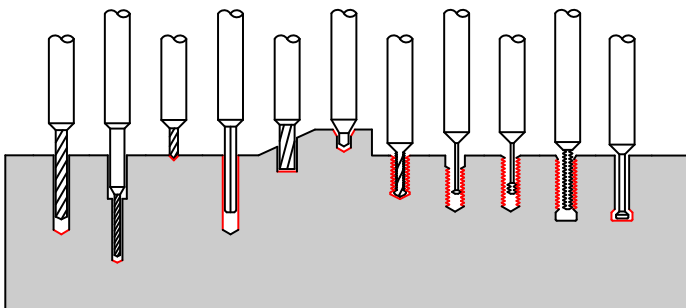
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*Dozens of Solutions from Spotting to Threading!*

# MINIATURE HIGH PERFORMANCE DRILLS

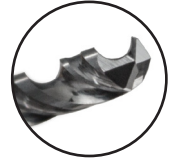
## Hardened Steels



**Available for 3x,  
◀ 5x, 8x, 10x, & 12x  
Hole Depths!**

HARDENED STEELS

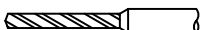
- Optimized for drilling hardened tool, die, and mold steels 46Rc to 68Rc with outstanding performance in high temperature alloys and difficult-to-machine steels
- 140° point angle
- Specialized flute shape for improved chip evacuation and maximum rigidity
- Double margin design for exceptional hole 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



Double Margin Design for Exceptional Hole Accuracy

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AlTiN 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	39.70
.0110	#85	.279 mm	.053	<b>1.35 mm</b>	(3x)	3 mm	50 mm	CSG0110-C6	39.70
.0120	#83	.304 mm	.057	<b>1.45 mm</b>	(3x)	3 mm	50 mm	CSG0120-C6	39.70
.0130	#81	.330 mm	.061	<b>1.55 mm</b>	(3x)	3 mm	50 mm	CSG0130-C6	39.70
.0144	#79	.368 mm	.069	<b>1.75 mm</b>	(3x)	3 mm	50 mm	CSG0144-C6	39.70
.0150		.381 mm	.071	<b>1.80 mm</b>	(3x)	3 mm	50 mm	CSG0150-C6	39.70
.0150		.381 mm	.102	<b>2.60 mm</b>	(5x)	3 mm	50 mm	BGN0150-C6	41.00
.0150		.381 mm	.146	<b>3.70 mm</b>	(8x)	3 mm	50 mm	ARY0150-C6	41.60
.0156 (1/64)		.396 mm	.075	<b>1.90 mm</b>	(3x)	3 mm	50 mm	CSG0156-C6	39.70
.0156 (1/64)		.396 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BGN0156-C6	41.00
.0156 (1/64)		.396 mm	.154	<b>3.90 mm</b>	(8x)	3 mm	50 mm	ARY0156-C6	41.60
.0156 (1/64)		.396 mm	.185	<b>4.70 mm</b>	(10x)	3 mm	50 mm	DXT0156-C6	42.80
.0156 (1/64)		.396 mm	.213	<b>5.40 mm</b>	(12x)	3 mm	50 mm	EFG0156-C6	44.10
.0160	#78	.406 mm	.079	<b>2.00 mm</b>	(3x)	3 mm	50 mm	CSG0160-C6	39.70
.0160	#78	.406 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BGN0160-C6	41.00
.0160	#78	.406 mm	.157	<b>4.00 mm</b>	(8x)	3 mm	50 mm	ARY0160-C6	41.60
.0160	#78	.406 mm	.220	<b>5.60 mm</b>	(12x)	3 mm	50 mm	EFG0160-C6	44.10
.0170		.431 mm	.083	<b>2.10 mm</b>	(3x)	3 mm	50 mm	CSG0170-C6	39.70
.0170		.431 mm	.165	<b>4.20 mm</b>	(8x)	3 mm	50 mm	ARY0170-C6	41.60
.0180	#77	.457 mm	.087	<b>2.20 mm</b>	(3x)	3 mm	50 mm	CSG0180-C6	39.70
.0180	#77	.457 mm	.122	<b>3.10 mm</b>	(5x)	3 mm	50 mm	BGN0180-C6	41.00
.0180	#77	.457 mm	.177	<b>4.50 mm</b>	(8x)	3 mm	50 mm	ARY0180-C6	41.60
.0180	#77	.457 mm	.244	<b>6.20 mm</b>	(12x)	3 mm	50 mm	EFG0180-C6	44.10
.0190		.482 mm	.091	<b>2.30 mm</b>	(3x)	3 mm	50 mm	CSG0190-C6	38.40
.0190		.482 mm	.185	<b>4.70 mm</b>	(8x)	3 mm	50 mm	ARY0190-C6	40.20
.0196		.500 mm	.094	<b>2.40 mm</b>	(3x)	3 mm	50 mm	CSG0196-C6	38.40
.0196		.500 mm	.134	<b>3.40 mm</b>	(5x)	3 mm	50 mm	BGN0196-C6	39.20
.0196		.500 mm	.193	<b>4.90 mm</b>	(8x)	3 mm	50 mm	ARY0196-C6	40.20
.0196		.500 mm	.228	<b>5.80 mm</b>	(10x)	3 mm	50 mm	DXT0196-C6	41.50
.0196		.500 mm	.268	<b>6.80 mm</b>	(12x)	3 mm	50 mm	EFG0196-C6	42.80
.0200	#76	.508 mm	.094	<b>2.40 mm</b>	(3x)	3 mm	50 mm	CSG0200-C6	38.40
.0200	#76	.508 mm	.134	<b>3.40 mm</b>	(5x)	3 mm	50 mm	BGN0200-C6	39.20
.0200	#76	.508 mm	.197	<b>5.00 mm</b>	(8x)	3 mm	50 mm	ARY0200-C6	40.20
.0200	#76	.508 mm	.276	<b>7.00 mm</b>	(12x)	3 mm	50 mm	EFG0200-C6	42.80

continued on next page



## MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels (cont.)

continued from previous page

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> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>					
.0210	#75	.533 mm	.098	<b>2.50 mm</b>	(3x)	3 mm	50 mm	CSG0210-C6	38.40
.0210	#75	.533 mm	.142	<b>3.60 mm</b>	(5x)	3 mm	50 mm	BGN0210-C6	39.20
.0210	#75	.533 mm	.205	<b>5.20 mm</b>	(8x)	3 mm	50 mm	ARY0210-C6	40.20
.0210	#75	.533 mm	.291	<b>7.40 mm</b>	(12x)	3 mm	50 mm	EFG0210-C6	42.80
.0220		.558 mm	.106	<b>2.70 mm</b>	(3x)	3 mm	50 mm	CSG0220-C6	38.40
.0220		.558 mm	.213	<b>5.40 mm</b>	(8x)	3 mm	50 mm	ARY0220-C6	40.20
.0225	#74	.571 mm	.106	<b>2.70 mm</b>	(3x)	3 mm	50 mm	CSG0225-C6	38.40
.0225	#74	.571 mm	.154	<b>3.90 mm</b>	(5x)	3 mm	50 mm	BGN0225-C6	39.20
.0225	#74	.571 mm	.220	<b>5.60 mm</b>	(8x)	3 mm	50 mm	ARY0225-C6	40.20
.0225	#74	.571 mm	.307	<b>7.80 mm</b>	(12x)	3 mm	50 mm	EFG0225-C6	42.80
.0230		.584 mm	.110	<b>2.80 mm</b>	(3x)	3 mm	50 mm	CSG0230-C6	38.40
.0230		.584 mm	.220	<b>5.60 mm</b>	(8x)	3 mm	50 mm	ARY0230-C6	40.20
.0236		.600 mm	.114	<b>2.90 mm</b>	(3x)	3 mm	50 mm	CSG0236-C6	38.40
.0236		.600 mm	.228	<b>5.80 mm</b>	(8x)	3 mm	50 mm	ARY0236-C6	40.20
.0240	#73	.609 mm	.114	<b>2.90 mm</b>	(3x)	3 mm	50 mm	CSG0240-C6	38.40
.0240	#73	.609 mm	.165	<b>4.20 mm</b>	(5x)	3 mm	50 mm	BGN0240-C6	39.20
.0240	#73	.609 mm	.236	<b>6.00 mm</b>	(8x)	3 mm	50 mm	ARY0240-C6	40.20
.0240	#73	.609 mm	.331	<b>8.40 mm</b>	(12x)	3 mm	50 mm	EFG0240-C6	42.80
.0250	#72	.635 mm	.118	<b>3.00 mm</b>	(3x)	3 mm	50 mm	CSG0250-C6	38.40
.0250	#72	.635 mm	.165	<b>4.20 mm</b>	(5x)	3 mm	50 mm	BGN0250-C6	39.20
.0250	#72	.635 mm	.244	<b>6.20 mm</b>	(8x)	3 mm	50 mm	ARY0250-C6	40.20
.0250	#72	.635 mm	.346	<b>8.80 mm</b>	(12x)	3 mm	50 mm	EFG0250-C6	42.80
.0260	#71	.660 mm	.122	<b>3.10 mm</b>	(3x)	3 mm	50 mm	CSG0260-C6	38.40
.0260	#71	.660 mm	.173	<b>4.40 mm</b>	(5x)	3 mm	50 mm	BGN0260-C6	39.20
.0260	#71	.660 mm	.252	<b>6.40 mm</b>	(8x)	3 mm	50 mm	ARY0260-C6	40.20
.0260	#71	.660 mm	.354	<b>9.00 mm</b>	(12x)	3 mm	50 mm	EFG0260-C6	42.80
.0270		.685 mm	.130	<b>3.30 mm</b>	(3x)	3 mm	50 mm	CSG0270-C6	38.40
.0270		.685 mm	.260	<b>6.60 mm</b>	(8x)	3 mm	50 mm	ARY0270-C6	40.20
.0275		.700 mm	.130	<b>3.30 mm</b>	(3x)	3 mm	50 mm	CSG0275-C6	38.40
.0275		.700 mm	.268	<b>6.80 mm</b>	(8x)	3 mm	50 mm	ARY0275-C6	40.20
.0280	#70	.711 mm	.134	<b>3.40 mm</b>	(3x)	3 mm	50 mm	CSG0280-C6	38.40
.0280	#70	.711 mm	.189	<b>4.80 mm</b>	(5x)	3 mm	50 mm	BGN0280-C6	39.20
.0280	#70	.711 mm	.276	<b>7.00 mm</b>	(8x)	3 mm	50 mm	ARY0280-C6	40.20
.0280	#70	.711 mm	.386	<b>9.80 mm</b>	(12x)	3 mm	50 mm	EFG0280-C6	42.80
.0292	#69	.741 mm	.138	<b>3.50 mm</b>	(3x)	3 mm	50 mm	CSG0292-C6	38.40
.0292	#69	.741 mm	.197	<b>5.00 mm</b>	(5x)	3 mm	50 mm	BGN0292-C6	39.20
.0292	#69	.741 mm	.283	<b>7.20 mm</b>	(8x)	3 mm	50 mm	ARY0292-C6	40.20
.0292	#69	.741 mm	.394	<b>10.00 mm</b>	(12x)	3 mm	50 mm	EFG0292-C6	42.80
.0300		.762 mm	.142	<b>3.60 mm</b>	(3x)	3 mm	50mm	CSG0300-C6	38.90
.0300		.762 mm	.205	<b>5.20 mm</b>	(5x)	3 mm	50 mm	BGN0300-C6	39.90
.0300		.762 mm	.291	<b>7.40 mm</b>	(8x)	3 mm	50 mm	ARY0300-C6	40.20
.0310	#68	.787 mm	.146	<b>3.70 mm</b>	(3x)	3 mm	50 mm	CSG0310-C6	38.90
.0310	#68	.787 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BGN0310-C6	39.90
.0310	#68	.787 mm	.299	<b>7.60 mm</b>	(8x)	3 mm	50 mm	ARY0310-C6	40.20
.0310	#68	.787 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	EFG0310-C6	43.60

HARDENED STEELS

continued on next page



# MINIATURE HIGH PERFORMANCE DRILLS

## Hardened Steels (cont.)

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DRILL DIAMETER	FLUTE LENGTH		SHANK DIAMETER	OVERALL LENGTH	A1TiN NANO COATED				
	inch	metric			inch	metric	hole depth	2 FL	PRICE
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
		D <sub>1</sub> $\begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		L <sub>2</sub> $\begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$					
.0312 (1/32)		.793 mm	.150	<b>3.80 mm</b> (3x)	(3x)	3 mm	50 mm	CSG0312-C6	38.90
.0312 (1/32)		.793 mm	.213	<b>5.40 mm</b> (5x)	(5x)	3 mm	50 mm	BGN0312-C6	39.90
.0312 (1/32)		.793 mm	.307	<b>7.80 mm</b> (8x)	(8x)	3 mm	50 mm	ARY0312-C6	41.00
.0312 (1/32)		.793 mm	.370	<b>9.40 mm</b> (10x)	(10x)	3 mm	50 mm	DXT0312-C6	42.30
.0312 (1/32)		.793 mm	.433	<b>11.00 mm</b> (12x)	(12x)	3 mm	50 mm	EFG0312-C6	43.60
.0315		.800 mm	.150	<b>3.80 mm</b> (3x)	(3x)	3 mm	50 mm	CSG0315-C6	38.90
.0315		.800 mm	.307	<b>7.80 mm</b> (8x)	(8x)	3 mm	50 mm	ARY0315-C6	41.00
.0320	#67	.812 mm	.154	<b>3.90 mm</b> (3x)	(3x)	3 mm	50 mm	CSG0320-C6	38.90
.0320	#67	.812 mm	.213	<b>5.40 mm</b> (5x)	(5x)	3 mm	50 mm	BGN0320-C6	39.90
.0320	#67	.812 mm	.315	<b>8.00 mm</b> (8x)	(8x)	3 mm	50 mm	ARY0320-C6	41.00
.0320	#67	.812 mm	.433	<b>11.00 mm</b> (12x)	(12x)	3 mm	50 mm	EFG0320-C6	43.60
.0330	#66	.838 mm	.157	<b>4.00 mm</b> (3x)	(3x)	3 mm	50 mm	CSG0330-C6	38.90
.0330	#66	.838 mm	.220	<b>5.60 mm</b> (5x)	(5x)	3 mm	50 mm	BGN0330-C6	39.90
.0330	#66	.838 mm	.323	<b>8.20 mm</b> (8x)	(8x)	3 mm	50 mm	ARY0330-C6	41.00
.0330	#66	.838 mm	.453	<b>11.50 mm</b> (12x)	(12x)	3 mm	50 mm	EFG0330-C6	43.60
.0350	#65	.889 mm	.165	<b>4.20 mm</b> (3x)	(3x)	3 mm	50 mm	CSG0350-C6	38.90
.0350	#65	.889 mm	.236	<b>6.00 mm</b> (5x)	(5x)	3 mm	50 mm	BGN0350-C6	39.90
.0350	#65	.889 mm	.339	<b>8.60 mm</b> (8x)	(8x)	3 mm	50 mm	ARY0350-C6	41.00
.0350	#65	.889 mm	.472	<b>12.00 mm</b> (12x)	(12x)	3 mm	50 mm	EFG0350-C6	43.60
.0354		.900 mm	.165	<b>4.20 mm</b> (3x)	(3x)	3 mm	50 mm	CSG0354-C6	38.90
.0354		.900 mm	.346	<b>8.80 mm</b> (8x)	(8x)	3 mm	50 mm	ARY0354-C6	41.00
.0360	#64	.914 mm	.173	<b>4.40 mm</b> (3x)	(3x)	3 mm	50 mm	CSG0360-C6	38.90
.0360	#64	.914 mm	.244	<b>6.20 mm</b> (5x)	(5x)	3 mm	50 mm	BGN0360-C6	39.90
.0360	#64	.914 mm	.354	<b>9.00 mm</b> (8x)	(8x)	3 mm	50 mm	ARY0360-C6	41.00
.0360	#64	.914 mm	.492	<b>12.50 mm</b> (12x)	(12x)	3 mm	50 mm	EFG0360-C6	43.60
.0370	#63	.939 mm	.173	<b>4.40 mm</b> (3x)	(3x)	3 mm	50 mm	CSG0370-C6	38.90
.0370	#63	.939 mm	.252	<b>6.40 mm</b> (5x)	(5x)	3 mm	50 mm	BGN0370-C6	39.90
.0370	#63	.939 mm	.362	<b>9.20 mm</b> (8x)	(8x)	3 mm	50 mm	ARY0370-C6	41.00
.0370	#63	.939 mm	.512	<b>13.00 mm</b> (12x)	(12x)	3 mm	50 mm	EFG0370-C6	43.60
.0380	#62	.965 mm	.181	<b>4.60 mm</b> (3x)	(3x)	3 mm	50 mm	CSG0380-C6	38.90
.0380	#62	.965 mm	.260	<b>6.60 mm</b> (5x)	(5x)	3 mm	50 mm	BGN0380-C6	39.90
.0380	#62	.965 mm	.370	<b>9.40 mm</b> (8x)	(8x)	3 mm	50 mm	ARY0380-C6	41.00
.0380	#62	.965 mm	.531	<b>13.50 mm</b> (12x)	(12x)	3 mm	50 mm	EFG0380-C6	43.60
.0390	#61	.990 mm	.189	<b>4.80 mm</b> (3x)	(3x)	3 mm	50 mm	CSG0390-C6	38.90
.0390	#61	.990 mm	.260	<b>6.60 mm</b> (5x)	(5x)	3 mm	50 mm	BGN0390-C6	39.90
.0390	#61	.990 mm	.378	<b>9.60 mm</b> (8x)	(8x)	3 mm	50 mm	ARY0390-C6	41.00
.0390	#61	.990 mm	.531	<b>13.50 mm</b> (12x)	(12x)	3 mm	50 mm	EFG0390-C6	43.60
.0393		1.000 mm	.189	<b>4.80 mm</b> (3x)	(3x)	3 mm	50 mm	CSG0393-C6	42.30
.0393		1.000 mm	.268	<b>6.80 mm</b> (5x)	(5x)	3 mm	50 mm	BGN0393-C6	43.30
.0393		1.000 mm	.386	<b>9.80 mm</b> (8x)	(8x)	3 mm	50 mm	ARY0393-C6	43.90
.0393		1.000 mm	.472	<b>12.00 mm</b> (10x)	(10x)	3 mm	50 mm	DXT0393-C6	45.50
.0393		1.000 mm	.551	<b>14.00 mm</b> (12x)	(12x)	3 mm	50 mm	EFG0393-C6	46.80
.0400	#60	1.016 mm	.189	<b>4.80 mm</b> (3x)	(3x)	3 mm	50 mm	CSG0400-C6	42.30
.0400	#60	1.016 mm	.268	<b>6.80 mm</b> (5x)	(5x)	3 mm	50 mm	BGN0400-C6	43.30
.0400	#60	1.016 mm	.394	<b>10.00 mm</b> (8x)	(8x)	3 mm	50 mm	ARY0400-C6	43.90
.0400	#60	1.016 mm	.551	<b>14.00 mm</b> (12x)	(12x)	3 mm	50 mm	EFG0400-C6	46.80

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	AITIN NANO COATED	
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)	$L_1$		
.0410	#59	1.041 mm	.197	<b>5.00 mm</b>	(3x)	3 mm	50 mm	CSG0410-C6	42.30
.0410	#59	1.041 mm	.276	<b>7.00 mm</b>	(5x)	3 mm	50 mm	BGN0410-C6	43.30
.0410	#59	1.041 mm	.394	<b>10.00 mm</b>	(8x)	3 mm	50 mm	ARY0410-C6	43.90
.0410	#59	1.041 mm	.571	<b>14.50 mm</b>	(12x)	3 mm	50 mm	EFG0410-C6	46.80
.0420	#58	1.066 mm	.197	<b>5.00 mm</b>	(3x)	3 mm	50 mm	CSG0420-C6	42.30
.0420	#58	1.066 mm	.283	<b>7.20 mm</b>	(5x)	3 mm	50 mm	BGN0420-C6	43.30
.0420	#58	1.066 mm	.413	<b>10.50 mm</b>	(8x)	3 mm	50 mm	ARY0420-C6	43.90
.0420	#58	1.066 mm	.571	<b>14.50 mm</b>	(12x)	3 mm	50 mm	EFG0420-C6	46.80
.0430	#57	1.092 mm	.205	<b>5.20 mm</b>	(3x)	3 mm	50 mm	CSG0430-C6	42.30
.0430	#57	1.092 mm	.291	<b>7.40 mm</b>	(5x)	3 mm	50 mm	BGN0430-C6	43.30
.0430	#57	1.092 mm	.413	<b>10.50 mm</b>	(8x)	3 mm	50 mm	ARY0430-C6	43.90
.0430	#57	1.092 mm	.591	<b>15.00 mm</b>	(12x)	3 mm	50 mm	EFG0430-C6	46.80
.0450		1.143 mm	.213	<b>5.40 mm</b>	(3x)	3 mm	50 mm	CSG0450-C6	42.30
.0450		1.143 mm	.307	<b>7.80 mm</b>	(5x)	3 mm	50 mm	BGN0450-C6	43.30
.0450		1.143 mm	.433	<b>11.00 mm</b>	(8x)	3 mm	50 mm	ARY0450-C6	43.90
.0465	#56	1.181 mm	.220	<b>5.60 mm</b>	(3x)	3 mm	50 mm	CSG0465-C6	42.30
.0465	#56	1.181 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BGN0465-C6	43.30
.0465	#56	1.181 mm	.453	<b>11.50 mm</b>	(8x)	3 mm	50 mm	ARY0465-C6	43.90
.0465	#56	1.181 mm	.630	<b>16.00 mm</b>	(12x)	3 mm	63 mm	EFG0465-C6	46.80
.0468 (3/64)		1.190 mm	.220	<b>5.60 mm</b>	(3x)	3 mm	50 mm	CSG0468-C6	42.30
.0468 (3/64)		1.190 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BGN0468-C6	43.30
.0468 (3/64)		1.190 mm	.453	<b>11.50 mm</b>	(8x)	3 mm	50 mm	ARY0468-C6	43.90
.0468 (3/64)		1.190 mm	.551	<b>14.00 mm</b>	(10x)	3 mm	50 mm	DXT0468-C6	45.50
.0468 (3/64)		1.190 mm	.650	<b>16.50 mm</b>	(12x)	3 mm	63 mm	EFG0468-C6	46.80
.0492		1.250 mm	.236	<b>6.00 mm</b>	(3x)	3 mm	50 mm	CSG0492-C6	42.30
.0492		1.250 mm	.472	<b>12.00 mm</b>	(8x)	3 mm	50 mm	ARY0492-C6	47.10
.0500		1.270 mm	.236	<b>6.00 mm</b>	(3x)	3 mm	50 mm	CSG0500-C6	42.30
.0500		1.270 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	BGN0500-C6	43.30
.0500		1.270 mm	.492	<b>12.50 mm</b>	(8x)	3 mm	50 mm	ARY0500-C6	43.90
.0500		1.270 mm	.689	<b>17.50 mm</b>	(12x)	3 mm	63 mm	EFG0500-C6	46.80
.0520	#55	1.320 mm	.244	<b>6.20 mm</b>	(3x)	3 mm	50 mm	CSG0520-C6	42.30
.0520	#55	1.320 mm	.354	<b>9.00 mm</b>	(5x)	3 mm	50 mm	BGN0520-C6	43.30
.0520	#55	1.320 mm	.512	<b>13.00 mm</b>	(8x)	3 mm	50 mm	ARY0520-C6	43.90
.0520	#55	1.320 mm	.709	<b>18.00 mm</b>	(12x)	3 mm	63 mm	EFG0520-C6	46.80
.0550	#54	1.397 mm	.260	<b>6.60 mm</b>	(3x)	3 mm	50 mm	CSG0550-C6	42.30
.0550	#54	1.397 mm	.374	<b>9.50 mm</b>	(5x)	3 mm	50 mm	BGN0550-C6	43.30
.0550	#54	1.397 mm	.531	<b>13.50 mm</b>	(8x)	3 mm	50 mm	ARY0550-C6	43.90
.0550	#54	1.397 mm	.748	<b>19.00 mm</b>	(12x)	3 mm	63 mm	EFG0550-C6	46.80
.0590		1.500 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	CSG0590-C6	45.60
.0590		1.500 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BGN0590-C6	46.50
.0590		1.500 mm	.571	<b>14.50 mm</b>	(8x)	3 mm	50 mm	ARY0590-C6	47.10
.0590		1.500 mm	.689	<b>17.50 mm</b>	(10x)	3 mm	63 mm	DXT0590-C6	48.40
.0590		1.500 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	EFG0590-C6	49.80
.0595	#53	1.511 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	CSG0595-C6	45.60
.0595	#53	1.511 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BGN0595-C6	46.50

HARDENED STEELS

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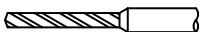
# MINIATURE HIGH PERFORMANCE DRILLS

## Hardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AISI NANO 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
.0595	#53	1.511 mm	.571	<b>14.50 mm</b>	(8x)	3 mm	50 mm	ARY0595-C6	47.10
.0595	#53	1.511 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	EFG0595-C6	49.80
.0600		1.524 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	CSG0600-C6	45.60
.0600		1.524 mm	.591	<b>15.00 mm</b>	(8x)	3 mm	50 mm	ARY0600-C6	47.10
.0625 (1/16)		1.587 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	CSG0625-C6	45.60
.0625 (1/16)		1.587 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	BGN0625-C6	46.50
.0625 (1/16)		1.587 mm	.610	<b>15.50 mm</b>	(8x)	3 mm	50 mm	ARY0625-C6	47.10
.0625 (1/16)		1.587 mm	.728	<b>18.50 mm</b>	(10x)	3 mm	63 mm	DXT0625-C6	48.40
.0625 (1/16)		1.587 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	EFG0625-C6	49.80
.0635	#52	1.612 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	CSG0635-C6	45.60
.0635	#52	1.612 mm	.433	<b>11.00 mm</b>	(5x)	3 mm	50 mm	BGN0635-C6	46.50
.0635	#52	1.612 mm	.610	<b>15.50 mm</b>	(8x)	3 mm	50 mm	ARY0635-C6	47.10
.0635	#52	1.612 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	EFG0635-C6	49.80
.0670	#51	1.701 mm	.315	<b>8.00 mm</b>	(3x)	3 mm	50 mm	CSG0670-C6	45.60
.0670	#51	1.701 mm	.453	<b>11.50 mm</b>	(5x)	3 mm	50 mm	BGN0670-C6	46.50
.0670	#51	1.701 mm	.650	<b>16.50 mm</b>	(8x)	3 mm	63 mm	ARY0670-C6	47.10
.0670	#51	1.701 mm	.906	<b>23.00 mm</b>	(12x)	3 mm	63 mm	EFG0670-C6	49.80
.0700	#50	1.778 mm	.335	<b>8.50 mm</b>	(3x)	3 mm	50 mm	CSG0700-C6	45.60
.0700	#50	1.778 mm	.472	<b>12.00 mm</b>	(5x)	3 mm	50 mm	BGN0700-C6	46.50
.0700	#50	1.778 mm	.689	<b>17.50 mm</b>	(8x)	3 mm	63 mm	ARY0700-C6	47.10
.0700	#50	1.778 mm	.945	<b>24.00 mm</b>	(12x)	3 mm	63 mm	EFG0700-C6	49.80
.0730	#49	1.854 mm	.354	<b>9.00 mm</b>	(3x)	3 mm	50 mm	CSG0730-C6	45.60
.0730	#49	1.854 mm	.492	<b>12.50 mm</b>	(5x)	3 mm	50 mm	BGN0730-C6	46.50
.0730	#49	1.854 mm	.709	<b>18.00 mm</b>	(8x)	3 mm	63 mm	ARY0730-C6	47.10
.0730	#49	1.854 mm	.984	<b>25.00 mm</b>	(12x)	3 mm	63 mm	EFG0730-C6	49.80
.0760	#48	1.930 mm	.354	<b>9.00 mm</b>	(3x)	3 mm	50 mm	CSG0760-C6	45.60
.0760	#48	1.930 mm	.512	<b>13.00 mm</b>	(5x)	3 mm	50 mm	BGN0760-C6	46.50
.0760	#48	1.930 mm	.748	<b>19.00 mm</b>	(8x)	3 mm	63 mm	ARY0760-C6	47.10
.0760	#48	1.930 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	EFG0760-C6	49.80
.0781 (5/64)		1.984 mm	.374	<b>9.50 mm</b>	(3x)	3 mm	50 mm	CSG0781-C6	45.60
.0781 (5/64)		1.984 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BGN0781-C6	46.50
.0781 (5/64)		1.984 mm	.768	<b>19.50 mm</b>	(8x)	3 mm	63 mm	ARY0781-C6	47.10
.0781 (5/64)		1.984 mm	.906	<b>23.00 mm</b>	(10x)	3 mm	63 mm	DXT0781-C6	48.40
.0781 (5/64)		1.984 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	EFG0781-C6	49.80
.0785	#47	1.993 mm	.374	<b>9.50 mm</b>	(3x)	3 mm	50 mm	CSG0785-C6	48.70
.0785	#47	1.993 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BGN0785-C6	50.10
.0785	#47	1.993 mm	.768	<b>19.50 mm</b>	(8x)	3 mm	63 mm	ARY0785-C6	47.10
.0785	#47	1.993 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	EFG0785-C6	54.00
.0787		2.000 mm	.374	<b>9.50 mm</b>	(3x)	4 mm	50 mm	CSG0787-C6	48.70
.0787		2.000 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	BGN0787-C6	50.10
.0787		2.000 mm	.768	<b>19.50 mm</b>	(8x)	4 mm	63 mm	ARY0787-C6	51.30
.0787		2.000 mm	.945	<b>24.00 mm</b>	(10x)	4 mm	63 mm	DXT0787-C6	52.60
.0787		2.000 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	EFG0787-C6	54.00
.0800		2.032 mm	.374	<b>9.50 mm</b>	(3x)	4 mm	50 mm	CSG0800-C6	48.70
.0800		2.032 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	ARY0800-C6	51.30

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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				
		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>	2 FL	PRICE
.0810	#46	2.057 mm	.394	<b>10.00 mm</b>	(3x)	4 mm	50 mm	CSG0810-C6	48.70
.0810	#46	2.057 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BGN0810-C6	50.10
.0810	#46	2.057 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	ARY0810-C6	51.30
.0810	#46	2.057 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	EFG0810-C6	54.00
.0820	#45	2.082 mm	.394	<b>10.00 mm</b>	(3x)	4 mm	50 mm	CSG0820-C6	48.70
.0820	#45	2.082 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BGN0820-C6	50.10
.0820	#45	2.082 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	ARY0820-C6	51.30
.0820	#45	2.082 mm	1.142	<b>29.00 mm</b>	(12x)	4 mm	75 mm	EFG0820-C6	54.00
.0860	#44	2.184 mm	.413	<b>10.50 mm</b>	(3x)	4 mm	50 mm	CSG0860-C6	48.70
.0860	#44	2.184 mm	.571	<b>14.50 mm</b>	(5x)	4 mm	50 mm	BGN0860-C6	50.10
.0860	#44	2.184 mm	.827	<b>21.00 mm</b>	(8x)	4 mm	63 mm	ARY0860-C6	51.30
.0860	#44	2.184 mm	1.181	<b>30.00 mm</b>	(12x)	4 mm	75 mm	EFG0860-C6	54.00
.0890	#43	2.260 mm	.413	<b>10.50 mm</b>	(3x)	4 mm	50 mm	CSG0890-C6	48.70
.0890	#43	2.260 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BGN0890-C6	50.10
.0890	#43	2.260 mm	.866	<b>22.00 mm</b>	(8x)	4 mm	63 mm	ARY0890-C6	51.30
.0890	#43	2.260 mm	1.220	<b>31.00 mm</b>	(12x)	4 mm	75 mm	EFG0890-C6	54.00
.0900		2.286 mm	.433	<b>11.00 mm</b>	(3x)	4 mm	50 mm	CSG0900-C6	48.70
.0900		2.286 mm	.866	<b>22.00 mm</b>	(8x)	4 mm	63 mm	ARY0900-C6	51.30
.0935	#42	2.374 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	CSG0935-C6	48.70
.0935	#42	2.374 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BGN0935-C6	50.10
.0935	#42	2.374 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	ARY0935-C6	51.30
.0935	#42	2.374 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	EFG0935-C6	54.00
.0937 (3/32)		2.381 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	CSG0937-C6	48.70
.0937 (3/32)		2.381 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BGN0937-C6	50.10
.0937 (3/32)		2.381 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	ARY0937-C6	51.30
.0937 (3/32)		2.381 mm	1.102	<b>28.00 mm</b>	(10x)	4 mm	63 mm	DXT0937-C6	52.60
.0937 (3/32)		2.381 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	EFG0937-C6	54.00
.0960	#41	2.438 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	CSG0960-C6	48.70
.0960	#41	2.438 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BGN0960-C6	50.10
.0960	#41	2.438 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	ARY0960-C6	51.30
.0960	#41	2.438 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	EFG0960-C6	54.00
.0980	#40	2.489 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	CSG0980-C6	48.70
.0980	#40	2.489 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BGN0980-C6	50.10
.0980	#40	2.489 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	ARY0980-C6	51.30
.0980	#40	2.489 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	EFG0980-C6	54.00
.0984		2.500 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	CSG0984-C6	51.60
.0984		2.500 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BGN0984-C6	53.20
.0984		2.500 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	ARY0984-C6	54.50
.0984		2.500 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	EFG0984-C6	55.80
.0995	#39	2.527 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	CSG0995-C6	51.60
.0995	#39	2.527 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BGN0995-C6	53.20
.0995	#39	2.527 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	ARY0995-C6	54.50
.0995	#39	2.527 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	EFG0995-C6	57.20
.1000		2.540 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	CSG1000-C6	51.60
.1000		2.540 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BGN1000-C6	53.20
.1000		2.540 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	ARY1000-C6	54.50

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	AISI NANO 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
.1015	#38	2.578 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	CSG1015-C6	51.60
.1015	#38	2.578 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BGN1015-C6	53.20
.1015	#38	2.578 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	ARY1015-C6	54.50
.1015	#38	2.578 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	EFG1015-C6	57.20
.1040	#37	2.641 mm	.492	<b>12.50 mm</b>	(3x)	4 mm	50 mm	CSG1040-C6	51.60
.1040	#37	2.641 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BGN1040-C6	53.20
.1040	#37	2.641 mm	1.024	<b>26.00 mm</b>	(8x)	4 mm	63 mm	ARY1040-C6	54.50
.1040	#37	2.641 mm	1.417	<b>36.00 mm</b>	(12x)	4 mm	75 mm	EFG1040-C6	57.20
.1065	#36	2.705 mm	.512	<b>13.00 mm</b>	(3x)	4 mm	50 mm	CSG1065-C6	51.60
.1065	#36	2.705 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BGN1065-C6	53.20
.1065	#36	2.705 mm	1.024	<b>26.00 mm</b>	(8x)	4 mm	63 mm	ARY1065-C6	54.50
.1065	#36	2.705 mm	1.457	<b>37.00 mm</b>	(12x)	4 mm	75 mm	EFG1065-C6	57.20
.1093 (7/64)		2.778 mm	.512	<b>13.00 mm</b>	(3x)	4 mm	50 mm	CSG1093-C6	51.60
.1093 (7/64)		2.778 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BGN1093-C6	53.20
.1093 (7/64)		2.778 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	ARY1093-C6	54.50
.1093 (7/64)		2.778 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	DXT1093-C6	55.80
.1093 (7/64)		2.778 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	EFG1093-C6	57.20
.1100	#35	2.794 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	CSG1100-C6	51.60
.1100	#35	2.794 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BGN1100-C6	53.20
.1100	#35	2.794 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	ARY1100-C6	54.50
.1100	#35	2.794 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	EFG1100-C6	57.20
.1110	#34	2.819 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	CSG1110-C6	51.60
.1110	#34	2.819 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BGN1110-C6	53.20
.1110	#34	2.819 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	ARY1110-C6	54.50
.1110	#34	2.819 mm	1.535	<b>39.00 mm</b>	(12x)	4 mm	75 mm	EFG1110-C6	57.20
.1130	#33	2.870 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	CSG1130-C6	51.60
.1130	#33	2.870 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BGN1130-C6	53.20
.1130	#33	2.870 mm	1.102	<b>28.00 mm</b>	(8x)	4 mm	63 mm	ARY1130-C6	54.50
.1130	#33	2.870 mm	1.535	<b>39.00 mm</b>	(12x)	4 mm	75 mm	EFG1130-C6	57.20
.1160	#32	2.946 mm	.551	<b>14.00 mm</b>	(3x)	4 mm	50 mm	CSG1160-C6	51.60
.1160	#32	2.946 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BGN1160-C6	53.20
.1160	#32	2.946 mm	1.142	<b>29.00 mm</b>	(8x)	4 mm	63 mm	ARY1160-C6	54.50
.1160	#32	2.946 mm	1.575	<b>40.00 mm</b>	(12x)	4 mm	75 mm	EFG1160-C6	57.20
.1181		3.000 mm	.571	<b>14.50 mm</b>	(3x)	4 mm	50 mm	CSG1181-C6	52.90
.1181		3.000 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BGN1181-C6	54.20
.1181		3.000 mm	1.142	<b>29.00 mm</b>	(8x)	4 mm	63 mm	ARY1181-C6	55.60
.1181		3.000 mm	1.378	<b>35.00 mm</b>	(10x)	4 mm	75 mm	DXT1181-C6	56.80
.1181		3.000 mm	1.654	<b>42.00 mm</b>	(12x)	4 mm	100 mm	EFG1181-C6	58.20
		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
.1200	#31	3.048 mm	.571	<b>14.50 mm</b>	(3x)	6 mm	63 mm	CSG1200-C6	59.30
.1200	#31	3.048 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BGN1200-C6	50.00
.1200	#31	3.048 mm	1.181	<b>30.00 mm</b>	(8x)	6 mm	75 mm	ARY1200-C6	62.40
.1200	#31	3.048 mm	1.654	<b>42.00 mm</b>	(12x)	6 mm	100 mm	EFG1200-C6	64.90
.1250 (1/8)		3.175 mm	.591	<b>15.00 mm</b>	(3x)	6 mm	63 mm	CSG1250-C6	59.30
.1250 (1/8)		3.175 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BGN1250-C6	60.50

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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> <sup>+ .000mm</sup> - .013mm		L <sub>2</sub> <sup>+ .75mm</sup> - .00mm		D <sub>2</sub> (h6)	L <sub>1</sub>		
.1250 (1/8)		3.175 mm	1.220	<b>31.00 mm</b>	(8x)	6 mm	75 mm	ARY1250-C6	62.40
.1250 (1/8)		3.175 mm	1.457	<b>37.00 mm</b>	(10x)	6 mm	100 mm	DXT1250-C6	63.60
.1250 (1/8)		3.175 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	EFG1250-C6	64.90
.1285	#30	3.263 mm	.630	<b>16.00 mm</b>	(3x)	6 mm	63 mm	CSG1285-C6	59.30
.1285	#30	3.263 mm	1.220	<b>32.00 mm</b>	(8x)	6 mm	75 mm	ARY1285-C6	62.40
.1360	#29	3.454 mm	.630	<b>16.00 mm</b>	(3x)	6 mm	63 mm	CSG1360-C6	59.30
.1360	#29	3.454 mm	.906	<b>23.00 mm</b>	(5x)	6 mm	63 mm	BGN1360-C6	60.50
.1360	#29	3.454 mm	1.339	<b>34.00 mm</b>	(8x)	6 mm	75 mm	ARY1360-C6	62.40
.1360	#29	3.454 mm	1.890	<b>48.00 mm</b>	(12x)	6 mm	100 mm	EFG1360-C6	64.90
.1405	#28	3.568 mm	.669	<b>17.00 mm</b>	(3x)	6 mm	63 mm	CSG1405-C6	59.30
.1405	#28	3.568 mm	1.378	<b>35.00 mm</b>	(8x)	6 mm	75 mm	ARY1405-C6	62.40
.1406 (9/64)		3.571 mm	.669	<b>17.00 mm</b>	(3x)	6 mm	63 mm	CSG1406-C6	59.30
.1406 (9/64)		3.571 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BGN1406-C6	60.50
.1406 (9/64)		3.571 mm	1.378	<b>35.00 mm</b>	(8x)	6 mm	75 mm	ARY1406-C6	62.40
.1406 (9/64)		3.571 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	EFG1406-C6	64.90
.1440	#27	3.657 mm	.669	<b>17.00 mm</b>	(3x)	6 mm	63 mm	CSG1440-C6	59.30
.1440	#27	3.657 mm	1.417	<b>36.00 mm</b>	(8x)	6 mm	100 mm	ARY1440-C6	62.40
.1470	#26	3.733 mm	.709	<b>18.00 mm</b>	(3x)	6 mm	63 mm	CSG1470-C6	59.30
.1470	#26	3.733 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BGN1470-C6	60.50
.1470	#26	3.733 mm	1.417	<b>36.00 mm</b>	(8x)	6 mm	100 mm	ARY1470-C6	62.40
.1470	#26	3.733 mm	2.047	<b>52.00 mm</b>	(12x)	6 mm	100 mm	EFG1470-C6	64.90
.1495	#25	3.797 mm	.709	<b>18.00 mm</b>	(3x)	6 mm	63 mm	CSG1495-C6	59.30
.1495	#25	3.797 mm	1.457	<b>37.00 mm</b>	(8x)	6 mm	100 mm	ARY1495-C6	62.40
.1520	#24	3.860 mm	.709	<b>18.00 mm</b>	(3x)	6 mm	63 mm	CSG1520-C6	59.30
.1520	#24	3.860 mm	1.496	<b>38.00 mm</b>	(8x)	6 mm	100 mm	ARY1520-C6	62.40
.1540	#23	3.911 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	CSG1540-C6	59.30
.1540	#23	3.911 mm	1.496	<b>38.00 mm</b>	(8x)	6 mm	100 mm	ARY1540-C6	62.40
.1562 (5/32)		3.968 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	CSG1562-C6	59.30
.1562 (5/32)		3.968 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BGN1562-C6	60.50
.1562 (5/32)		3.968 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ARY1562-C6	62.40
.1562 (5/32)		3.968 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	EFG1562-C6	64.90
.1570	#22	3.987 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	CSG1570-C6	59.30
.1570	#22	3.987 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ARY1570-C6	62.40
.1574		4.000 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	CSG1574-C6	59.30
.1574		4.000 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BGN1574-C6	60.50
.1574		4.000 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ARY1574-C6	62.40
.1590	#21	4.038 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	CSG1590-C6	59.30
.1590	#21	4.038 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BGN1590-C6	60.50
.1590	#21	4.038 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ARY1590-C6	62.40
.1590	#21	4.038 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	EFG1590-C6	64.90
.1610	#20	4.089 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	CSG1610-C6	59.30
.1610	#20	4.089 mm	1.575	<b>40.00 mm</b>	(8x)	6 mm	100 mm	ARY1610-C6	62.40
.1660	#19	4.216 mm	.787	<b>20.00 mm</b>	(3x)	6 mm	63 mm	CSG1660-C6	59.30
.1660	#19	4.216 mm	1.654	<b>42.00 mm</b>	(8x)	6 mm	100 mm	ARY1660-C6	62.40

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HARDENED STEELS



# MINIATURE HIGH PERFORMANCE DRILLS

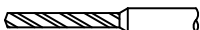
## Hardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AISI NANO COATED	
inch	wire	metric	inch	metric	hole depth				
		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
.1695	#18	4.305 mm	.787	<b>20.00 mm</b>	(3x)	6 mm	63 mm	CSG1695-C6	59.30
.1695	#18	4.305 mm	1.654	<b>42.00 mm</b>	(8x)	6 mm	100 mm	ARY1695-C6	62.40
.1718 (11/64)		4.365 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	CSG1718-C6	59.30
.1718 (11/64)		4.365 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BGN1718-C6	60.50
.1718 (11/64)		4.365 mm	1.654	<b>42.00 mm</b>	(8x)	6 mm	100 mm	ARY1718-C6	62.40
.1730	#17	4.394 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	CSG1730-C6	59.30
.1730	#17	4.394 mm	1.654	<b>42.00 mm</b>	(8x)	6 mm	100 mm	ARY1730-C6	62.40
.1770	#16	4.495 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	CSG1770-C6	59.30
.1770	#16	4.495 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BGN1770-C6	60.50
.1770	#16	4.495 mm	1.732	<b>44.00 mm</b>	(8x)	6 mm	100 mm	ARY1770-C6	62.40
.1770	#16	4.495 mm	2.441	<b>62.00 mm</b>	(12x)	6 mm	125 mm	EFG1770-C6	64.90
.1800	#15	4.572 mm	.866	<b>22.00 mm</b>	(3x)	6 mm	63 mm	CSG1800-C6	59.30
.1800	#15	4.572 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BGN1800-C6	60.50
.1800	#15	4.572 mm	1.732	<b>44.00 mm</b>	(8x)	6 mm	100 mm	ARY1800-C6	62.40
.1800	#15	4.572 mm	2.441	<b>62.00 mm</b>	(12x)	6 mm	125 mm	EFG1800-C6	64.90
.1820	#18	4.622 mm	.866	<b>22.00 mm</b>	(3x)	6 mm	63 mm	CSG1820-C6	59.30
.1820	#18	4.622 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	ARY1820-C6	62.40
.1850	#13	4.700 mm	.866	<b>22.00 mm</b>	(3x)	6 mm	63 mm	CSG1850-C6	59.30
.1850	#13	4.700 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	ARY1850-C6	62.40
.1875 (3/16)		4.762 mm	.906	<b>23.00 mm</b>	(3x)	6 mm	63 mm	CSG1875-C6	59.30
.1875 (3/16)		4.762 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BGN1875-C6	60.50
.1875 (3/16)		4.762 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	ARY1875-C6	62.40
.1875 (3/16)		4.762 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	EFG1875-C6	64.90
.1890	#12	4.800 mm	.906	<b>23.00 mm</b>	(3x)	6 mm	63 mm	CSG1890-C6	59.30
.1890	#12	4.800 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	ARY1890-C6	62.40
.1910	#11	4.851 mm	.906	<b>23.00 mm</b>	(3x)	6 mm	63 mm	CSG1910-C6	59.30
.1910	#11	4.851 mm	1.890	<b>48.00 mm</b>	(8x)	6 mm	100 mm	ARY1910-C6	62.40
.1935	#10	4.914 mm	.906	<b>23.00 mm</b>	(3x)	6 mm	63 mm	CSG1935-C6	59.30
.1935	#10	4.914 mm	1.890	<b>48.00 mm</b>	(8x)	6 mm	100 mm	ARY1935-C6	62.40
.1960	#9	4.978 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG1960-C6	59.30
.1960	#9	4.978 mm	1.890	<b>48.00 mm</b>	(8x)	6 mm	100 mm	ARY1960-C6	62.40
.1968		5.000 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG1968-C6	59.30
.1968		5.000 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BGN1968-C6	60.50
.1968		5.000 mm	1.890	<b>48.00 mm</b>	(8x)	6 mm	100 mm	ARY1968-C6	62.40
.1990	#8	5.054 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG1990-C6	59.30
.1990	#8	5.054 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ARY1990-C6	62.40
.2009	#7	5.105 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG2009-C6	59.30
.2009	#7	5.105 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BGN2009-C6	60.50
.2009	#7	5.105 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ARY2009-C6	62.40
.2031 (13/64)		5.159 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG2031-C6	59.30
.2031 (13/64)		5.159 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BGN2031-C6	60.50
.2031 (13/64)		5.159 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ARY2031-C6	62.40
.2040	#6	5.181 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG2040-C6	59.30
.2040	#6	5.181 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ARY2040-C6	62.40
.2055	#5	5.219 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	CSG2055-C6	59.30
.2055	#5	5.219 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ARY2055-C6	62.40

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	AITIN NANO COATED	
inch	wire	metric	inch	metric	hole depth			2 FL	PRICE
		D <sub>1</sub> +.000mm -.013mm		L <sub>2</sub> +.75mm -.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>		
.2090	#4	5.308 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	CSG2090-C6	59.30
.2090	#4	5.308 mm	2.047	<b>52.00 mm</b>	(8x)	6 mm	100 mm	ARY2090-C6	62.40
.2129	#3	5.410 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	CSG2129-C6	59.30
.2129	#3	5.410 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BGN2129-C6	60.50
.2129	#3	5.410 mm	2.047	<b>52.00 mm</b>	(8x)	6 mm	100 mm	ARY2129-C6	62.40
.2187 (7/32)		5.556 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	CSG2187-C6	59.30
.2187 (7/32)		5.556 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BGN2187-C6	60.50
.2187 (7/32)		5.556 mm	2.126	<b>54.00 mm</b>	(8x)	6 mm	100 mm	ARY2187-C6	62.40
.2210	#2	5.613 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	CSG2210-C6	59.30
.2210	#2	5.613 mm	2.126	<b>54.00 mm</b>	(8x)	6 mm	100 mm	ARY2210-C6	62.40
.2280	#1	5.791 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	CSG2280-C6	59.30
.2280	#1	5.791 mm	2.205	<b>56.00 mm</b>	(8x)	6 mm	100 mm	ARY2280-C6	62.40
.2340	A	5.943 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	CSG2340-C6	59.30
.2340	A	5.943 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	ARY2340-C6	62.40
.2343 (15/64)		5.953 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	CSG2343-C6	59.30
.2343 (15/64)		5.953 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BGN2343-C6	60.50
.2343 (15/64)		5.953 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	ARY2343-C6	62.40
.2362		6.000 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	CSG2362-C6	59.30
.2362		6.000 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BGN2362-C6	60.50
.2362		6.000 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	ARY2362-C6	62.40
.2380	B	6.045 mm	1.102	<b>28.00 mm</b>	(3x)	8 mm	75 mm	CSG2380-C6	61.30
.2380	B	6.045 mm	2.283	<b>58.00 mm</b>	(8x)	8 mm	100 mm	ARY2380-C6	64.20
.2420	C	6.146 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	75 mm	CSG2420-C6	61.30
.2420	C	6.146 mm	2.362	<b>60.00 mm</b>	(8x)	8 mm	100 mm	ARY2420-C6	64.20
.2460	D	6.248 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	75 mm	CSG2460-C6	61.30
.2460	D	6.248 mm	2.362	<b>60.00 mm</b>	(8x)	8 mm	100 mm	ARY2460-C6	64.20
.2500 (1/4)	E	6.350 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	75 mm	CSG2500-C6	61.30
.2500 (1/4)	E	6.350 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BGN2500-C6	62.50
.2500 (1/4)	E	6.350 mm	2.441	<b>62.00 mm</b>	(8x)	8 mm	125 mm	ARY2500-C6	64.20

HARDENED STEELS

## SPEEDS &amp; 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
Hardened Steels	38-45 Rc	150	.00029	.00060	.00090	.00119	.00150	.00179	.00240	.00359	.00480
	46-55 Rc	90	.00022	.00045	.00068	.00089	.00112	.00134	.00180	.00269	.00360
	56-68 Rc	40	.00014	.00030	.00045	.00060	.00075	.00089	.00120	.00180	.00240



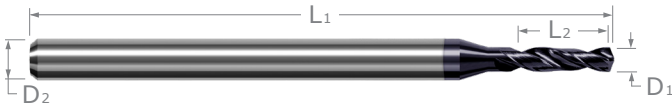
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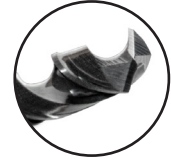
# MINIATURE HIGH PERFORMANCE DRILLS

## 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

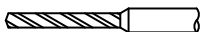


Specialized Flute Shape for Improved Chip Evacuation

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>-0.013mm</sub>	L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-0.00mm</sub>						
.0078	.200 mm	.037	<b>.95 mm</b>	(3x)	3 mm	50 mm	DHE0078-C3	39.70
.0078	.200 mm	.053	<b>1.35 mm</b>	(5x)	3 mm	50 mm	BVT0078-C3	40.80
.0079	.201 mm	.053	<b>1.35 mm</b>	(5x)	3 mm	50 mm	BVT0079-C3	40.80
.0083	#91 .210 mm	.039	<b>1.00 mm</b>	(3x)	3 mm	50 mm	DHE0083-C3	39.70
.0083	#91 .210 mm	.055	<b>1.40 mm</b>	(5x)	3 mm	50 mm	BVT0083-C3	40.80
.0087	#90 .221 mm	.041	<b>1.05 mm</b>	(3x)	3 mm	50 mm	DHE0087-C3	39.70
.0087	#90 .221 mm	.059	<b>1.50 mm</b>	(5x)	3 mm	50 mm	BVT0087-C3	40.80
.0091	#89 .231 mm	.043	<b>1.10 mm</b>	(3x)	3 mm	50 mm	DHE0091-C3	39.70
.0091	#89 .231 mm	.061	<b>1.55 mm</b>	(5x)	3 mm	50 mm	BVT0091-C3	40.80
.0095	#88 .241 mm	.045	<b>1.15 mm</b>	(3x)	3 mm	50 mm	DHE0095-C3	39.70
.0095	#88 .241 mm	.065	<b>1.65 mm</b>	(5x)	3 mm	50 mm	BVT0095-C3	40.80
.0100	#87 .254 mm	.047	<b>1.20 mm</b>	(3x)	3 mm	50 mm	DHE0100-C3	38.70
.0100	#87 .254 mm	.067	<b>1.70 mm</b>	(5x)	3 mm	50 mm	BVT0100-C3	39.70
.0100	#87 .254 mm	.098	<b>2.50 mm</b>	(8x)	3 mm	50 mm	ADS0100-C3	42.60
.0100	#87 .254 mm	.118	<b>3.00 mm</b>	(10x)	3 mm	50 mm	EXP0100-C3	43.90
.0100	#87 .254 mm	.138	<b>3.50 mm</b>	(12x)	3 mm	50 mm	CHT0100-C3	45.50
.0105	#86 .266 mm	.049	<b>1.25 mm</b>	(3x)	3 mm	50 mm	DHE0105-C3	38.70
.0105	#86 .266 mm	.071	<b>1.80 mm</b>	(5x)	3 mm	50 mm	BVT0105-C3	39.70
.0105	#86 .266 mm	.102	<b>2.60 mm</b>	(8x)	3 mm	50 mm	ADS0105-C3	42.60
.0105	#86 .266 mm	.146	<b>3.70 mm</b>	(12x)	3 mm	50 mm	CHT0105-C3	45.50
.0110	#85 .279 mm	.053	<b>1.35 mm</b>	(3x)	3 mm	50 mm	DHE0110-C3	38.70
.0110	#85 .279 mm	.075	<b>1.90 mm</b>	(5x)	3 mm	50 mm	BVT0110-C3	39.70
.0110	#85 .279 mm	.106	<b>2.70 mm</b>	(8x)	3 mm	50 mm	ADS0110-C3	42.60
.0110	#85 .279 mm	.130	<b>3.30 mm</b>	(10x)	3 mm	50 mm	EXP0110-C3	43.90
.0110	#85 .279 mm	.150	<b>3.80 mm</b>	(12x)	3 mm	50 mm	CHT0110-C3	45.50
.0115	#84 .292 mm	.055	<b>1.40 mm</b>	(3x)	3 mm	50 mm	DHE0115-C3	38.70
.0115	#84 .292 mm	.079	<b>2.00 mm</b>	(5x)	3 mm	50 mm	BVT0115-C3	39.70
.0115	#84 .292 mm	.110	<b>2.80 mm</b>	(8x)	3 mm	50 mm	ADS0115-C3	42.60
.0115	#84 .292 mm	.157	<b>4.00 mm</b>	(12x)	3 mm	50 mm	CHT0115-C3	45.50
.0118	.300 mm	.079	<b>2.00 mm</b>	(5x)	3 mm	50 mm	BVT0118-C3	39.70
.0118	.300 mm	.161	<b>4.10 mm</b>	(12x)	3 mm	50 mm	CHT0118-C3	45.50
.0120	#83 .304 mm	.057	<b>1.45 mm</b>	(3x)	3 mm	50 mm	DHE0120-C3	38.70
.0120	#83 .304 mm	.083	<b>2.10 mm</b>	(5x)	3 mm	50 mm	BVT0120-C3	39.70
.0120	#83 .304 mm	.118	<b>3.00 mm</b>	(8x)	3 mm	50 mm	ADS0120-C3	42.60
.0120	#83 .304 mm	.142	<b>3.60 mm</b>	(10x)	3 mm	50 mm	EXP0120-C3	43.90
.0120	#83 .304 mm	.165	<b>4.20 mm</b>	(12x)	3 mm	50 mm	CHT0120-C3	45.50

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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				
		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>	2 FL	PRICE
.0125	#82	.317 mm	.059	<b>1.50 mm</b>	(3x)	3 mm	50 mm	DHE0125-C3	38.70
.0125	#82	.317 mm	.083	<b>2.10 mm</b>	(5x)	3 mm	50 mm	BVT0125-C3	39.70
.0125	#82	.317 mm	.122	<b>3.10 mm</b>	(8x)	3 mm	50 mm	ADS0125-C3	42.60
.0125	#82	.317 mm	.173	<b>4.40 mm</b>	(12x)	3 mm	50 mm	CHT0125-C3	45.50
.0130	#81	.330 mm	.061	<b>1.55 mm</b>	(3x)	3 mm	50 mm	DHE0130-C3	38.70
.0130	#81	.330 mm	.087	<b>2.20 mm</b>	(5x)	3 mm	50 mm	BVT0130-C3	39.70
.0130	#81	.330 mm	.126	<b>3.20 mm</b>	(8x)	3 mm	50 mm	ADS0130-C3	42.60
.0130	#81	.330 mm	.154	<b>3.90 mm</b>	(10x)	3 mm	50 mm	EXP0130-C3	43.90
.0130	#81	.330 mm	.177	<b>4.50 mm</b>	(12x)	3 mm	50 mm	CHT0130-C3	45.50
.0135	#80	.342 mm	.065	<b>1.65 mm</b>	(3x)	3 mm	50 mm	DHE0135-C3	38.70
.0135	#80	.342 mm	.091	<b>2.30 mm</b>	(5x)	3 mm	50 mm	BVT0135-C3	39.70
.0135	#80	.342 mm	.130	<b>3.30 mm</b>	(8x)	3 mm	50 mm	ADS0135-C3	42.60
.0135	#80	.342 mm	.185	<b>4.70 mm</b>	(12x)	3 mm	50 mm	CHT0135-C3	45.50
.0140		.355 mm	.067	<b>1.70 mm</b>	(3x)	3 mm	50 mm	DHE0140-C3	38.70
.0140		.355 mm	.094	<b>2.40 mm</b>	(5x)	3 mm	50 mm	BVT0140-C3	39.70
.0140		.355 mm	.138	<b>3.50 mm</b>	(8x)	3 mm	50 mm	ADS0140-C3	42.60
.0140		.355 mm	.193	<b>4.90 mm</b>	(12x)	3 mm	50 mm	CHT0140-C3	45.50
.0144	#79	.368 mm	.069	<b>1.75 mm</b>	(3x)	3 mm	50 mm	DHE0144-C3	38.70
.0144	#79	.368 mm	.098	<b>2.50 mm</b>	(5x)	3 mm	50 mm	BVT0144-C3	39.70
.0144	#79	.368 mm	.142	<b>3.60 mm</b>	(8x)	3 mm	50 mm	ADS0144-C3	42.60
.0144	#79	.368 mm	.169	<b>4.30 mm</b>	(10x)	3 mm	50 mm	EXP0144-C3	43.90
.0144	#79	.368 mm	.197	<b>5.00 mm</b>	(12x)	3 mm	50 mm	CHT0144-C3	45.50
.0150		.381 mm	.071	<b>1.80 mm</b>	(3x)	3 mm	50 mm	DHE0150-C3	38.70
.0150		.381 mm	.102	<b>2.60 mm</b>	(5x)	3 mm	50 mm	BVT0150-C3	39.70
.0150		.381 mm	.146	<b>3.70 mm</b>	(8x)	3 mm	50 mm	ADS0150-C3	42.60
.0150		.381 mm	.205	<b>5.20 mm</b>	(12x)	3 mm	50 mm	CHT0150-C3	45.50
.0156 (1/64)		.396 mm	.075	<b>1.90 mm</b>	(3x)	3 mm	50 mm	DHE0156-C3	38.70
.0156 (1/64)		.396 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BVT0156-C3	39.70
.0156 (1/64)		.396 mm	.154	<b>3.90 mm</b>	(8x)	3 mm	50 mm	ADS0156-C3	42.60
.0156 (1/64)		.396 mm	.185	<b>4.70 mm</b>	(10x)	3 mm	50 mm	EXP0156-C3	43.90
.0156 (1/64)		.396 mm	.213	<b>5.40 mm</b>	(12x)	3 mm	50 mm	CHT0156-C3	45.50
.0157		.400 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BVT0157-C3	39.70
.0157		.400 mm	.220	<b>5.60 mm</b>	(12x)	3 mm	50 mm	CHT0157-C3	45.50
.0160	#78	.406 mm	.079	<b>2.00 mm</b>	(3x)	3 mm	50 mm	DHE0160-C3	38.70
.0160	#78	.406 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BVT0160-C3	39.70
.0160	#78	.406 mm	.157	<b>4.00 mm</b>	(8x)	3 mm	50 mm	ADS0160-C3	42.60
.0160	#78	.406 mm	.189	<b>4.80 mm</b>	(10x)	3 mm	50 mm	EXP0160-C3	43.90
.0160	#78	.406 mm	.220	<b>5.60 mm</b>	(12x)	3 mm	50 mm	CHT0160-C3	45.50
.0170		.431 mm	.083	<b>2.10 mm</b>	(3x)	3 mm	50 mm	DHE0170-C3	38.70
.0170		.431 mm	.114	<b>2.90 mm</b>	(5x)	3 mm	50 mm	BVT0170-C3	39.70
.0170		.431 mm	.165	<b>4.20 mm</b>	(8x)	3 mm	50 mm	ADS0170-C3	42.60
.0170		.431 mm	.236	<b>6.00 mm</b>	(12x)	3 mm	50 mm	CHT0170-C3	45.50
.0180	#77	.457 mm	.087	<b>2.20 mm</b>	(3x)	3 mm	50 mm	DHE0180-C3	38.70
.0180	#77	.457 mm	.122	<b>3.10 mm</b>	(5x)	3 mm	50 mm	BVT0180-C3	39.70
.0180	#77	.457 mm	.177	<b>4.50 mm</b>	(8x)	3 mm	50 mm	ADS0180-C3	42.90
.0180	#77	.457 mm	.213	<b>5.40 mm</b>	(10x)	3 mm	50 mm	EXP0180-C3	43.90
.0180	#77	.457 mm	.244	<b>6.20 mm</b>	(12x)	3 mm	50 mm	CHT0180-C3	45.50

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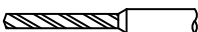
# MINIATURE HIGH PERFORMANCE DRILLS

## Prehardened Steels (cont.)

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DRILL DIAMETER	FLUTE LENGTH		SHANK DIAMETER	OVERALL LENGTH	A1TiN COATED				
	inch	metric			hole depth	2 FL	PRICE		
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>		
		D <sub>1</sub> <sup>+0.00mm</sup> -0.13mm		L <sub>2</sub> <sup>+0.25mm</sup> -0.00mm					
.0190		.482 mm	.091	<b>2.30 mm</b>	(3x)	3 mm	50 mm	DHE0190-C3	38.70
.0190		.482 mm	.130	<b>3.30 mm</b>	(5x)	3 mm	50 mm	BVT0190-C3	39.70
.0190		.482 mm	.185	<b>4.70 mm</b>	(8x)	3 mm	50 mm	ADS0190-C3	42.60
.0190		.482 mm	.260	<b>6.60 mm</b>	(12x)	3 mm	50 mm	CHT0190-C3	45.50
.0196		.500 mm	.094	<b>2.40 mm</b>	(3x)	3 mm	50 mm	DHE0196-C3	38.20
.0196		.500 mm	.134	<b>3.40 mm</b>	(5x)	3 mm	50 mm	BVT0196-C3	39.10
.0196		.500 mm	.193	<b>4.90 mm</b>	(8x)	3 mm	50 mm	ADS0196-C3	42.90
.0196		.500 mm	.228	<b>5.80 mm</b>	(10x)	3 mm	50 mm	EXP0196-C3	44.10
.0196		.500 mm	.268	<b>6.80 mm</b>	(12x)	3 mm	50 mm	CHT0196-C3	44.40
.0200	#76	.508 mm	.094	<b>2.40 mm</b>	(3x)	3 mm	50 mm	DHE0200-C3	38.20
.0200	#76	.508 mm	.134	<b>3.40 mm</b>	(5x)	3 mm	50 mm	BVT0200-C3	39.10
.0200	#76	.508 mm	.197	<b>5.00 mm</b>	(8x)	3 mm	50 mm	ADS0200-C3	42.90
.0200	#76	.508 mm	.228	<b>5.80 mm</b>	(10x)	3 mm	50 mm	EXP0200-C3	44.10
.0200	#76	.508 mm	.276	<b>7.00 mm</b>	(12x)	3 mm	50 mm	CHT0200-C3	44.40
.0210	#75	.533 mm	.098	<b>2.50 mm</b>	(3x)	3 mm	50 mm	DHE0210-C3	38.20
.0210	#75	.533 mm	.142	<b>3.60 mm</b>	(5x)	3 mm	50 mm	BVT0210-C3	39.10
.0210	#75	.533 mm	.205	<b>5.20 mm</b>	(8x)	3 mm	50 mm	ADS0210-C3	42.90
.0210	#75	.533 mm	.244	<b>6.20 mm</b>	(10x)	3 mm	50 mm	EXP0210-C3	44.10
.0210	#75	.533 mm	.291	<b>7.40 mm</b>	(12x)	3 mm	50 mm	CHT0210-C3	44.40
.0220		.558 mm	.106	<b>2.70 mm</b>	(3x)	3 mm	50 mm	DHE0220-C3	38.20
.0220		.558 mm	.150	<b>3.80 mm</b>	(5x)	3 mm	50 mm	BVT0220-C3	39.10
.0220		.558 mm	.213	<b>5.40 mm</b>	(8x)	3 mm	50 mm	ADS0220-C3	42.90
.0220		.558 mm	.299	<b>7.60 mm</b>	(12x)	3 mm	50 mm	CHT0220-C3	44.40
.0225	#74	.571 mm	.106	<b>2.70 mm</b>	(3x)	3 mm	50 mm	DHE0225-C3	38.20
.0225	#74	.571 mm	.154	<b>3.90 mm</b>	(5x)	3 mm	50 mm	BVT0225-C3	39.10
.0225	#74	.571 mm	.220	<b>5.60 mm</b>	(8x)	3 mm	50 mm	ADS0225-C3	42.90
.0225	#74	.571 mm	.268	<b>6.80 mm</b>	(10x)	3 mm	50 mm	EXP0225-C3	44.10
.0225	#74	.571 mm	.307	<b>7.80 mm</b>	(12x)	3 mm	50 mm	CHT0225-C3	44.40
.0230		.584 mm	.110	<b>2.80 mm</b>	(3x)	3 mm	50 mm	DHE0230-C3	38.20
.0230		.584 mm	.154	<b>3.90 mm</b>	(5x)	3 mm	50 mm	BVT0230-C3	39.10
.0230		.584 mm	.220	<b>5.60 mm</b>	(8x)	3 mm	50 mm	ADS0230-C3	42.90
.0230		.584 mm	.315	<b>8.00 mm</b>	(12x)	3 mm	50 mm	CHT0230-C3	44.40
.0236		.600 mm	.157	<b>4.00 mm</b>	(5x)	3 mm	50 mm	BVT0236-C3	39.10
.0236		.600 mm	.323	<b>8.20 mm</b>	(12x)	3 mm	50 mm	CHT0236-C3	44.40
.0240	#73	.609 mm	.114	<b>2.90 mm</b>	(3x)	3 mm	50 mm	DHE0240-C3	38.20
.0240	#73	.609 mm	.165	<b>4.20 mm</b>	(5x)	3 mm	50 mm	BVT0240-C3	39.10
.0240	#73	.609 mm	.236	<b>6.00 mm</b>	(8x)	3 mm	50 mm	ADS0240-C3	42.90
.0240	#73	.609 mm	.283	<b>7.20 mm</b>	(10x)	3 mm	50 mm	EXP0240-C3	44.10
.0240	#73	.609 mm	.331	<b>8.40 mm</b>	(12x)	3 mm	50 mm	CHT0240-C3	44.40
.0250	#72	.635 mm	.118	<b>3.00 mm</b>	(3x)	3 mm	50 mm	DHE0250-C3	38.20
.0250	#72	.635 mm	.165	<b>4.20 mm</b>	(5x)	3 mm	50 mm	BVT0250-C3	39.10
.0250	#72	.635 mm	.244	<b>6.20 mm</b>	(8x)	3 mm	50 mm	ADS0250-C3	42.90
.0250	#72	.635 mm	.291	<b>7.40 mm</b>	(10x)	3 mm	50 mm	EXP0250-C3	44.10
.0250	#72	.635 mm	.346	<b>8.80 mm</b>	(12x)	3 mm	50 mm	CHT0250-C3	44.40
.0260	#71	.660 mm	.122	<b>3.10 mm</b>	(3x)	3 mm	50 mm	DHE0260-C3	38.20
.0260	#71	.660 mm	.173	<b>4.40 mm</b>	(5x)	3 mm	50 mm	BVT0260-C3	39.10
.0260	#71	.660 mm	.252	<b>6.40 mm</b>	(8x)	3 mm	50 mm	ADS0260-C3	42.90

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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>+ .000mm</sup> <sub>-.013mm</sub>		L <sub>2</sub> <sup>+ .25mm</sup> <sub>-.00mm</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.0260	#71	.660 mm	.307	<b>7.80 mm</b>	(10x)	3 mm	50 mm	EXP0260-C3	44.10
.0260	#71	.660 mm	.354	<b>9.00 mm</b>	(12x)	3 mm	50 mm	CHT0260-C3	44.40
.0270		.685 mm	.130	<b>3.30 mm</b>	(3x)	3 mm	50 mm	DHE0270-C3	38.20
.0270		.685 mm	.181	<b>4.60 mm</b>	(5x)	3 mm	50 mm	BVT0270-C3	39.10
.0270		.685 mm	.260	<b>6.60 mm</b>	(8x)	3 mm	50 mm	ADS0270-C3	42.90
.0270		.685 mm	.370	<b>9.40 mm</b>	(12x)	3 mm	50 mm	CHT0270-C3	44.40
.0275		.700 mm	.189	<b>4.80 mm</b>	(5x)	3 mm	50 mm	BVT0275-C3	39.10
.0275		.700 mm	.378	<b>9.60 mm</b>	(12x)	3 mm	50 mm	CHT0275-C3	44.40
.0280	#70	.711 mm	.134	<b>3.40 mm</b>	(3x)	3 mm	50 mm	DHE0280-C3	38.20
.0280	#70	.711 mm	.189	<b>4.80 mm</b>	(5x)	3 mm	50 mm	BVT0280-C3	39.10
.0280	#70	.711 mm	.276	<b>7.00 mm</b>	(8x)	3 mm	50 mm	ADS0280-C3	42.90
.0280	#70	.711 mm	.331	<b>8.40 mm</b>	(10x)	3 mm	50 mm	EXP0280-C3	44.10
.0280	#70	.711 mm	.386	<b>9.80 mm</b>	(12x)	3 mm	50 mm	CHT0280-C3	44.40
.0292	#69	.741 mm	.138	<b>3.50 mm</b>	(3x)	3 mm	50 mm	DHE0292-C3	38.20
.0292	#69	.741 mm	.197	<b>5.00 mm</b>	(5x)	3 mm	50 mm	BVT0292-C3	39.10
.0292	#69	.741 mm	.283	<b>7.20 mm</b>	(8x)	3 mm	50 mm	ADS0292-C3	42.90
.0292	#69	.741 mm	.346	<b>8.80 mm</b>	(10x)	3 mm	50 mm	EXP0292-C3	44.10
.0292	#69	.741 mm	.394	<b>10.00 mm</b>	(12x)	3 mm	50 mm	CHT0292-C3	44.40
.0300		.762 mm	.142	<b>3.60 mm</b>	(3x)	3 mm	50 mm	DHE0300-C3	38.20
.0300		.762 mm	.205	<b>5.20 mm</b>	(5x)	3 mm	50 mm	BVT0300-C3	39.10
.0300		.762 mm	.291	<b>7.40 mm</b>	(8x)	3 mm	50 mm	ADS0300-C3	42.90
.0300		.762 mm	.413	<b>10.50 mm</b>	(12x)	3 mm	50 mm	CHT0300-C3	44.40
.0310	#68	.787 mm	.146	<b>3.70 mm</b>	(3x)	3 mm	50 mm	DHE0310-C3	38.70
.0310	#68	.787 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BVT0310-C3	39.50
.0310	#68	.787 mm	.299	<b>7.60 mm</b>	(8x)	3 mm	50 mm	ADS0310-C3	42.90
.0310	#68	.787 mm	.362	<b>9.20 mm</b>	(10x)	3 mm	50 mm	EXP0310-C3	44.10
.0310	#68	.787 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	CHT0310-C3	45.60
.0312 (1/32)		.793 mm	.150	<b>3.80 mm</b>	(3x)	3 mm	50 mm	DHE0312-C3	38.70
.0312 (1/32)		.793 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BVT0312-C3	39.50
.0312 (1/32)		.793 mm	.307	<b>7.80 mm</b>	(8x)	3 mm	50 mm	ADS0312-C3	42.90
.0312 (1/32)		.793 mm	.370	<b>9.40 mm</b>	(10x)	3 mm	50 mm	EXP0312-C3	44.10
.0312 (1/32)		.793 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	CHT0312-C3	45.60
.0315		.800 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BVT0315-C3	39.50
.0315		.800 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	CHT0315-C3	45.60
.0320	#67	.812 mm	.154	<b>3.90 mm</b>	(3x)	3 mm	50 mm	DHE0320-C3	38.70
.0320	#67	.812 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BVT0320-C3	39.50
.0320	#67	.812 mm	.315	<b>8.00 mm</b>	(8x)	3 mm	50 mm	ADS0320-C3	42.90
.0320	#67	.812 mm	.378	<b>9.60 mm</b>	(10x)	3 mm	50 mm	EXP0320-C3	44.10
.0320	#67	.812 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	CHT0320-C3	45.60
.0330	#66	.838 mm	.157	<b>4.00 mm</b>	(3x)	3 mm	50 mm	DHE0330-C3	38.70
.0330	#66	.838 mm	.220	<b>5.60 mm</b>	(5x)	3 mm	50 mm	BVT0330-C3	39.50
.0330	#66	.838 mm	.323	<b>8.20 mm</b>	(8x)	3 mm	50 mm	ADS0330-C3	42.90
.0330	#66	.838 mm	.386	<b>9.80 mm</b>	(10x)	3 mm	50 mm	EXP0330-C3	44.10
.0330	#66	.838 mm	.453	<b>11.50 mm</b>	(12x)	3 mm	50 mm	CHT0330-C3	45.60
.0350	#65	.889 mm	.165	<b>4.20 mm</b>	(3x)	3 mm	50 mm	DHE0350-C3	38.70
.0350	#65	.889 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	BVT0350-C3	39.50
.0350	#65	.889 mm	.339	<b>8.60 mm</b>	(8x)	3 mm	50 mm	ADS0350-C3	42.90

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PREHARDENED STEELS



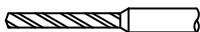
# MINIATURE HIGH PERFORMANCE DRILLS

## Prehardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A TiN 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> $\begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.0350	#65	.889 mm	.413	<b>10.50 mm</b>	(10x)	3 mm	50 mm	EXP0350-C3	44.10
.0350	#65	.889 mm	.472	<b>12.00 mm</b>	(12x)	3 mm	50 mm	CHT0350-C3	45.60
.0354		.900 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	BVT0354-C3	37.60
.0354		.900 mm	.492	<b>12.50 mm</b>	(12x)	3 mm	50 mm	CHT0354-C3	45.60
.0360	#64	.914 mm	.173	<b>4.40 mm</b>	(3x)	3 mm	50 mm	DHE0360-C3	38.70
.0360	#64	.914 mm	.244	<b>6.20 mm</b>	(5x)	3 mm	50 mm	BVT0360-C3	39.50
.0360	#64	.914 mm	.354	<b>9.00 mm</b>	(8x)	3 mm	50 mm	ADS0360-C3	42.90
.0360	#64	.914 mm	.413	<b>10.50 mm</b>	(10x)	3 mm	50 mm	EXP0360-C3	44.10
.0360	#64	.914 mm	.492	<b>12.50 mm</b>	(12x)	3 mm	50 mm	CHT0360-C3	45.60
.0370	#63	.939 mm	.173	<b>4.40 mm</b>	(3x)	3 mm	50 mm	DHE0370-C3	38.70
.0370	#63	.939 mm	.252	<b>6.40 mm</b>	(5x)	3 mm	50 mm	BVT0370-C3	39.50
.0370	#63	.939 mm	.362	<b>9.20 mm</b>	(8x)	3 mm	50 mm	ADS0370-C3	42.90
.0370	#63	.939 mm	.433	<b>11.00 mm</b>	(10x)	3 mm	50 mm	EXP0370-C3	44.10
.0370	#63	.939 mm	.512	<b>13.00 mm</b>	(12x)	3 mm	50 mm	CHT0370-C3	45.60
.0380	#62	.965 mm	.181	<b>4.60 mm</b>	(3x)	3 mm	50 mm	DHE0380-C3	38.70
.0380	#62	.965 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	BVT0380-C3	39.50
.0380	#62	.965 mm	.370	<b>9.40 mm</b>	(8x)	3 mm	50 mm	ADS0380-C3	42.90
.0380	#62	.965 mm	.453	<b>11.50 mm</b>	(10x)	3 mm	50 mm	EXP0380-C3	44.10
.0380	#62	.965 mm	.531	<b>13.50 mm</b>	(12x)	3 mm	50 mm	CHT0380-C3	45.60
.0390	#61	.990 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	DHE0390-C3	38.70
.0390	#61	.990 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	BVT0390-C3	39.50
.0390	#61	.990 mm	.378	<b>9.60 mm</b>	(8x)	3 mm	50 mm	ADS0390-C3	42.90
.0390	#61	.990 mm	.453	<b>11.50 mm</b>	(10x)	3 mm	50 mm	EXP0390-C3	44.10
.0390	#61	.990 mm	.531	<b>13.50 mm</b>	(12x)	3 mm	50 mm	CHT0390-C3	45.60
.0393		1.000 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	DHE0393-C3	42.30
.0393		1.000 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	BVT0393-C3	43.30
.0393		1.000 mm	.386	<b>9.80 mm</b>	(8x)	3 mm	50 mm	ADS0393-C3	45.90
.0393		1.000 mm	.472	<b>12.00 mm</b>	(10x)	3 mm	50 mm	EXP0393-C3	47.30
.0393		1.000 mm	.551	<b>14.00 mm</b>	(12x)	3 mm	50 mm	CHT0393-C3	48.70
.0400	#60	1.016 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	DHE0400-C3	42.30
.0400	#60	1.016 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	BVT0400-C3	43.30
.0400	#60	1.016 mm	.394	<b>10.00 mm</b>	(8x)	3 mm	50 mm	ADS0400-C3	45.90
.0400	#60	1.016 mm	.472	<b>12.00 mm</b>	(10x)	3 mm	50 mm	EXP0400-C3	47.30
.0400	#60	1.016 mm	.551	<b>14.00 mm</b>	(12x)	3 mm	50 mm	CHT0400-C3	48.70
.0410	#59	1.041 mm	.197	<b>5.00 mm</b>	(3x)	3 mm	50 mm	DHE0410-C3	42.30
.0410	#59	1.041 mm	.276	<b>7.00 mm</b>	(5x)	3 mm	50 mm	BVT0410-C3	43.30
.0410	#59	1.041 mm	.394	<b>10.00 mm</b>	(8x)	3 mm	50 mm	ADS0410-C3	45.90
.0410	#59	1.041 mm	.472	<b>12.00 mm</b>	(10x)	3 mm	50 mm	EXP0410-C3	47.30
.0410	#59	1.041 mm	.571	<b>14.50 mm</b>	(12x)	3 mm	50 mm	CHT0410-C3	48.70
.0420	#58	1.066 mm	.197	<b>5.00 mm</b>	(3x)	3 mm	50 mm	DHE0420-C3	42.30
.0420	#58	1.066 mm	.283	<b>7.20 mm</b>	(5x)	3 mm	50 mm	BVT0420-C3	43.30
.0420	#58	1.066 mm	.413	<b>10.50 mm</b>	(8x)	3 mm	50 mm	ADS0420-C3	45.90
.0420	#58	1.066 mm	.492	<b>12.50 mm</b>	(10x)	3 mm	50 mm	EXP0420-C3	47.30
.0420	#58	1.066 mm	.571	<b>14.50 mm</b>	(12x)	3 mm	50 mm	CHT0420-C3	48.70
.0430	#57	1.092 mm	.205	<b>5.20 mm</b>	(3x)	3 mm	50 mm	DHE0430-C3	42.30
.0430	#57	1.092 mm	.291	<b>7.40 mm</b>	(5x)	3 mm	50 mm	BVT0430-C3	43.30
.0430	#57	1.092 mm	.413	<b>10.50 mm</b>	(8x)	3 mm	50 mm	ADS0430-C3	45.90
.0430	#57	1.092 mm	.512	<b>13.00 mm</b>	(10x)	3 mm	50 mm	EXP0430-C3	47.30
.0430	#57	1.092 mm	.591	<b>15.00 mm</b>	(12x)	3 mm	50 mm	CHT0430-C3	48.70

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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	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>+25mm</sup> / <sub>-.00mm</sub>					
.0450		1.143 mm	.307	<b>7.80 mm</b>	(5x)	3 mm	50 mm	BVT0450-C3	43.30
.0450		1.143 mm	.610	<b>15.50 mm</b>	(12x)	3 mm	50 mm	CHT0450-C3	48.70
.0465	#56	1.181 mm	.220	<b>5.60 mm</b>	(3x)	3 mm	50 mm	DHE0465-C3	42.30
.0465	#56	1.181 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BVT0465-C3	43.30
.0465	#56	1.181 mm	.453	<b>11.50 mm</b>	(8x)	3 mm	50 mm	ADS0465-C3	45.90
.0465	#56	1.181 mm	.551	<b>14.00 mm</b>	(10x)	3 mm	50 mm	EXP0465-C3	47.30
.0465	#56	1.181 mm	.630	<b>16.00 mm</b>	(12x)	3 mm	63 mm	CHT0465-C3	48.70
.0468 (3/64)		1.190 mm	.220	<b>5.60 mm</b>	(3x)	3 mm	50 mm	DHE0468-C3	42.30
.0468 (3/64)		1.190 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BVT0468-C3	43.30
.0468 (3/64)		1.190 mm	.453	<b>11.50 mm</b>	(8x)	3 mm	50 mm	ADS0468-C3	45.90
.0468 (3/64)		1.190 mm	.551	<b>14.00 mm</b>	(10x)	3 mm	50 mm	EXP0468-C3	47.30
.0468 (3/64)		1.190 mm	.650	<b>16.50 mm</b>	(12x)	3 mm	63 mm	CHT0468-C3	48.70
.0492		1.250 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	BVT0492-C3	43.30
.0492		1.250 mm	.669	<b>17.00 mm</b>	(12x)	3 mm	63 mm	CHT0492-C3	48.70
.0500		1.270 mm	.236	<b>6.00 mm</b>	(3x)	3 mm	50 mm	DHE0500-C3	42.30
.0500		1.270 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	BVT0500-C3	43.30
.0500		1.270 mm	.492	<b>12.50 mm</b>	(8x)	3 mm	50 mm	ADS0500-C3	45.90
.0500		1.270 mm	.591	<b>15.00 mm</b>	(10x)	3 mm	50 mm	EXP0500-C3	47.30
.0500		1.270 mm	.689	<b>17.50 mm</b>	(12x)	3 mm	63 mm	CHT0500-C3	48.70
.0520	#55	1.320 mm	.244	<b>6.20 mm</b>	(3x)	3 mm	50 mm	DHE0520-C3	42.30
.0520	#55	1.320 mm	.354	<b>9.00 mm</b>	(5x)	3 mm	50 mm	BVT0520-C3	43.30
.0520	#55	1.320 mm	.512	<b>13.00 mm</b>	(8x)	3 mm	50 mm	ADS0520-C3	45.90
.0520	#55	1.320 mm	.610	<b>15.50 mm</b>	(10x)	3 mm	50 mm	EXP0520-C3	47.30
.0520	#55	1.320 mm	.709	<b>18.00 mm</b>	(12x)	3 mm	63 mm	CHT0520-C3	48.70
.0550	#54	1.397 mm	.260	<b>6.60 mm</b>	(3x)	3 mm	50 mm	DHE0550-C3	42.30
.0550	#54	1.397 mm	.374	<b>9.50 mm</b>	(5x)	3 mm	50 mm	BVT0550-C3	43.30
.0550	#54	1.397 mm	.531	<b>13.50 mm</b>	(8x)	3 mm	50 mm	ADS0550-C3	45.90
.0550	#54	1.397 mm	.650	<b>16.50 mm</b>	(10x)	3 mm	63 mm	EXP0550-C3	47.30
.0550	#54	1.397 mm	.748	<b>19.00 mm</b>	(12x)	3 mm	63 mm	CHT0550-C3	48.70
.0590		1.500 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	DHE0590-C3	45.80
.0590		1.500 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BVT0590-C3	46.60
.0590		1.500 mm	.571	<b>14.50 mm</b>	(8x)	3 mm	50 mm	ADS0590-C3	49.30
.0590		1.500 mm	.689	<b>17.50 mm</b>	(10x)	3 mm	63 mm	EXP0590-C3	50.80
.0590		1.500 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	CHT0590-C3	52.20
.0595	#53	1.511 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	DHE0595-C3	45.80
.0595	#53	1.511 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BVT0595-C3	46.60
.0595	#53	1.511 mm	.571	<b>14.50 mm</b>	(8x)	3 mm	50 mm	ADS0595-C3	49.30
.0595	#53	1.511 mm	.709	<b>18.00 mm</b>	(10x)	3 mm	63 mm	EXP0595-C3	50.80
.0595	#53	1.511 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	CHT0595-C3	52.20
.0600		1.524 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	BVT0600-C3	46.60
.0600		1.524 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	CHT0600-C3	52.20
.0625 (1/16)		1.587 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	DHE0625-C3	45.80
.0625 (1/16)		1.587 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	BVT0625-C3	46.60
.0625 (1/16)		1.587 mm	.610	<b>15.50 mm</b>	(8x)	3 mm	50 mm	ADS0625-C3	49.30
.0625 (1/16)		1.587 mm	.728	<b>18.50 mm</b>	(10x)	3 mm	63 mm	EXP0625-C3	50.80
.0625 (1/16)		1.587 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	CHT0625-C3	52.20

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PREHARDENED STEELS



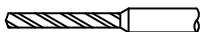
# MINIATURE HIGH PERFORMANCE DRILLS

## Prehardened Steels (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A1TIN COATED	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
		D <sub>1</sub> $\begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		L <sub>2</sub> $\begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$					
.0635	#52	1.612 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	DHE0635-C3	45.80
.0635	#52	1.612 mm	.433	<b>11.00 mm</b>	(5x)	3 mm	50 mm	BVT0635-C3	46.60
.0635	#52	1.612 mm	.610	<b>15.50 mm</b>	(8x)	3 mm	50 mm	ADS0635-C3	49.30
.0635	#52	1.612 mm	.748	<b>19.00 mm</b>	(10x)	3 mm	63 mm	EXP0635-C3	50.80
.0635	#52	1.612 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	CHT0635-C3	52.20
.0670	#51	1.701 mm	.315	<b>8.00 mm</b>	(3x)	3 mm	50 mm	DHE0670-C3	45.80
.0670	#51	1.701 mm	.453	<b>11.50 mm</b>	(5x)	3 mm	50 mm	BVT0670-C3	46.60
.0670	#51	1.701 mm	.650	<b>16.50 mm</b>	(8x)	3 mm	63 mm	ADS0670-C3	49.30
.0670	#51	1.701 mm	.787	<b>20.00 mm</b>	(10x)	3 mm	63 mm	EXP0670-C3	50.80
.0670	#51	1.701 mm	.906	<b>23.00 mm</b>	(12x)	3 mm	63 mm	CHT0670-C3	52.20
.0700	#50	1.778 mm	.335	<b>8.50 mm</b>	(3x)	3 mm	50 mm	DHE0700-C3	45.80
.0700	#50	1.778 mm	.472	<b>12.00 mm</b>	(5x)	3 mm	50 mm	BVT0700-C3	46.60
.0700	#50	1.778 mm	.689	<b>17.50 mm</b>	(8x)	3 mm	63 mm	ADS0700-C3	49.30
.0700	#50	1.778 mm	.827	<b>21.00 mm</b>	(10x)	3 mm	63 mm	EXP0700-C3	50.80
.0700	#50	1.778 mm	.945	<b>24.00 mm</b>	(12x)	3 mm	63 mm	CHT0700-C3	52.20
.0730	#49	1.854 mm	.354	<b>9.00 mm</b>	(3x)	3 mm	50 mm	DHE0730-C3	45.80
.0730	#49	1.854 mm	.492	<b>12.50 mm</b>	(5x)	3 mm	50 mm	BVT0730-C3	46.60
.0730	#49	1.854 mm	.709	<b>18.00 mm</b>	(8x)	3 mm	63 mm	ADS0730-C3	49.30
.0730	#49	1.854 mm	.866	<b>22.00 mm</b>	(10x)	3 mm	63 mm	EXP0730-C3	50.80
.0730	#49	1.854 mm	.984	<b>25.00 mm</b>	(12x)	3 mm	63 mm	CHT0730-C3	52.20
.0760	#48	1.930 mm	.354	<b>9.00 mm</b>	(3x)	3 mm	50 mm	DHE0760-C3	45.80
.0760	#48	1.930 mm	.512	<b>13.00 mm</b>	(5x)	3 mm	50 mm	BVT0760-C3	46.60
.0760	#48	1.930 mm	.748	<b>19.00 mm</b>	(8x)	3 mm	63 mm	ADS0760-C3	49.30
.0760	#48	1.930 mm	.906	<b>23.00 mm</b>	(10x)	3 mm	63 mm	EXP0760-C3	50.80
.0760	#48	1.930 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	CHT0760-C3	52.20
.0781 (5/64)		1.984 mm	.374	<b>9.50 mm</b>	(3x)	3 mm	50 mm	DHE0781-C3	45.80
.0781 (5/64)		1.984 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BVT0781-C3	46.60
.0781 (5/64)		1.984 mm	.768	<b>19.50 mm</b>	(8x)	3 mm	63 mm	ADS0781-C3	49.30
.0781 (5/64)		1.984 mm	.906	<b>23.00 mm</b>	(10x)	3 mm	63 mm	EXP0781-C3	49.50
.0781 (5/64)		1.984 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	CHT0781-C3	52.20
.0785	#47	1.993 mm	.374	<b>9.50 mm</b>	(3x)	3 mm	50 mm	DHE0785-C3	45.80
.0785	#47	1.993 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BVT0785-C3	46.60
.0785	#47	1.993 mm	.768	<b>19.50 mm</b>	(8x)	3 mm	63 mm	ADS0785-C3	49.30
.0785	#47	1.993 mm	.906	<b>23.00 mm</b>	(10x)	3 mm	63 mm	EXP0785-C3	50.80
.0785	#47	1.993 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	CHT0785-C3	52.20
.0787		2.000 mm	.374	<b>9.50 mm</b>	(3x)	4 mm	50 mm	DHE0787-C3	45.80
.0787		2.000 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	BVT0787-C3	50.30
.0787		2.000 mm	.768	<b>19.50 mm</b>	(8x)	4 mm	63 mm	ADS0787-C3	52.90
.0787		2.000 mm	.945	<b>24.00 mm</b>	(10x)	4 mm	63 mm	EXP0787-C3	54.50
.0787		2.000 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	CHT0787-C3	56.00
.0800		2.032 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	BVT0800-C3	50.30
.0800		2.032 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	CHT0800-C3	56.00
.0810	#46	2.057 mm	.394	<b>10.00 mm</b>	(3x)	4 mm	50 mm	DHE0810-C3	45.80
.0810	#46	2.057 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BVT0810-C3	50.30
.0810	#46	2.057 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	ADS0810-C3	52.90
.0810	#46	2.057 mm	.945	<b>24.00 mm</b>	(10x)	4 mm	63 mm	EXP0810-C3	54.50
.0810	#46	2.057 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	CHT0810-C3	56.00

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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>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
		D <sub>1</sub> $\begin{matrix} +.000\text{mm} \\ -.013\text{mm} \end{matrix}$		L <sub>2</sub> $\begin{matrix} +.25\text{mm} \\ -.00\text{mm} \end{matrix}$					
.0820	#45	2.082 mm	.394	<b>10.00 mm</b>	(3x)	4 mm	50 mm	DHE0820-C3	45.80
.0820	#45	2.082 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BVT0820-C3	50.30
.0820	#45	2.082 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	ADS0820-C3	52.90
.0820	#45	2.082 mm	.945	<b>24.00 mm</b>	(10x)	4 mm	63 mm	EXP0820-C3	54.50
.0820	#45	2.082 mm	1.142	<b>29.00 mm</b>	(12x)	4 mm	75 mm	CHT0820-C3	56.00
.0860	#44	2.184 mm	.413	<b>10.50 mm</b>	(3x)	4 mm	50 mm	DHE0860-C3	45.80
.0860	#44	2.184 mm	.571	<b>14.50 mm</b>	(5x)	4 mm	50 mm	BVT0860-C3	50.30
.0860	#44	2.184 mm	.827	<b>21.00 mm</b>	(8x)	4 mm	63 mm	ADS0860-C3	52.90
.0860	#44	2.184 mm	1.024	<b>26.00 mm</b>	(10x)	4 mm	63 mm	EXP0860-C3	54.50
.0860	#44	2.184 mm	1.181	<b>30.00 mm</b>	(12x)	4 mm	75 mm	CHT0860-C3	56.00
.0890	#43	2.260 mm	.413	<b>10.50 mm</b>	(3x)	4 mm	50 mm	DHE0890-C3	45.80
.0890	#43	2.260 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BVT0890-C3	50.30
.0890	#43	2.260 mm	.866	<b>22.00 mm</b>	(8x)	4 mm	63 mm	ADS0890-C3	52.90
.0890	#43	2.260 mm	1.063	<b>27.00 mm</b>	(10x)	4 mm	63 mm	EXP0890-C3	54.50
.0890	#43	2.260 mm	1.220	<b>31.00 mm</b>	(12x)	4 mm	75 mm	CHT0890-C3	56.00
.0900		2.286 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BVT0900-C3	50.30
.0900		2.286 mm	1.220	<b>31.00 mm</b>	(12x)	4 mm	75 mm	CHT0900-C3	56.00
.0935	#42	2.374 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	DHE0935-C3	45.80
.0935	#42	2.374 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BVT0935-C3	50.30
.0935	#42	2.374 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	ADS0935-C3	52.90
.0935	#42	2.374 mm	1.102	<b>28.00 mm</b>	(10x)	4 mm	63 mm	EXP0935-C3	54.50
.0935	#42	2.374 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	CHT0935-C3	56.00
.0937 (3/32)		2.381 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	DHE0937-C3	49.00
.0937 (3/32)		2.381 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BVT0937-C3	50.30
.0937 (3/32)		2.381 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	ADS0937-C3	52.90
.0937 (3/32)		2.381 mm	1.102	<b>28.00 mm</b>	(10x)	4 mm	63 mm	EXP0937-C3	54.50
.0937 (3/32)		2.381 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	CHT0937-C3	55.80
.0960	#41	2.438 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	DHE0960-C3	49.00
.0960	#41	2.438 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BVT0960-C3	50.30
.0960	#41	2.438 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	ADS0960-C3	52.90
.0960	#41	2.438 mm	1.142	<b>29.00 mm</b>	(10x)	4 mm	75 mm	EXP0960-C3	54.50
.0960	#41	2.438 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	CHT0960-C3	55.80
.0980	#40	2.489 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	DHE0980-C3	49.00
.0980	#40	2.489 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BVT0980-C3	50.30
.0980	#40	2.489 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	ADS0980-C3	52.90
.0980	#40	2.489 mm	1.142	<b>29.00 mm</b>	(10x)	4 mm	75 mm	EXP0980-C3	54.50
.0980	#40	2.489 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	CHT0980-C3	55.80
.0984		2.500 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	DHE0984-C3	51.80
.0984		2.500 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BVT0984-C3	53.50
.0984		2.500 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	ADS0984-C3	56.10
.0984		2.500 mm	1.142	<b>29.00 mm</b>	(10x)	4 mm	75 mm	EXP0984-C3	57.40
.0984		2.500 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	CHT0984-C3	58.80
.0995	#39	2.527 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	DHE0995-C3	51.80
.0995	#39	2.527 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BVT0995-C3	53.50
.0995	#39	2.527 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	ADS0995-C3	56.10
.0995	#39	2.527 mm	1.181	<b>30.00 mm</b>	(10x)	4 mm	75 mm	EXP0995-C3	57.40
.0995	#39	2.527 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	CHT0995-C3	58.80

PREHARDENED STEELS

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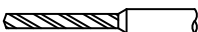
# MINIATURE HIGH PERFORMANCE DRILLS

## 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
		$D_1 \begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		$L_2 \begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$		$D_2$ (h6)	$L_1$		
.1000		2.540 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	DHE1000-C3	51.80
.1000		2.540 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BVT1000-C3	53.50
.1000		2.540 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	ADS1000-C3	56.10
.1000		2.540 mm	1.181	<b>30.00 mm</b>	(10x)	4 mm	75 mm	EXP1000-C3	57.40
.1000		2.540 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	CHT1000-C3	58.80
.1015	#38	2.578 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	DHE1015-C3	51.80
.1015	#38	2.578 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BVT1015-C3	53.50
.1015	#38	2.578 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	ADS1015-C3	56.10
.1015	#38	2.578 mm	1.181	<b>30.00 mm</b>	(10x)	4 mm	75 mm	EXP1015-C3	57.40
.1015	#38	2.578 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	CHT1015-C3	58.80
.1040	#37	2.641 mm	.492	<b>12.50 mm</b>	(3x)	4 mm	50 mm	DHE1040-C3	51.80
.1040	#37	2.641 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BVT1040-C3	53.50
.1040	#37	2.641 mm	1.024	<b>26.00 mm</b>	(8x)	4 mm	63 mm	ADS1040-C3	56.10
.1040	#37	2.641 mm	1.220	<b>31.00 mm</b>	(10x)	4 mm	75 mm	EXP1040-C3	57.40
.1040	#37	2.641 mm	1.417	<b>36.00 mm</b>	(12x)	4 mm	75 mm	CHT1040-C3	58.80
.1065	#36	2.705 mm	.512	<b>13.00 mm</b>	(3x)	4 mm	50 mm	DHE1065-C3	51.80
.1065	#36	2.705 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BVT1065-C3	53.50
.1065	#36	2.705 mm	1.024	<b>26.00 mm</b>	(8x)	4 mm	63 mm	ADS1065-C3	56.10
.1065	#36	2.705 mm	1.260	<b>32.00 mm</b>	(10x)	4 mm	75 mm	EXP1065-C3	57.40
.1065	#36	2.705 mm	1.417	<b>36.00 mm</b>	(12x)	4 mm	75 mm	CHT1065-C3	58.80
.1093 (7/64)		2.778 mm	.512	<b>13.00 mm</b>	(3x)	4 mm	50 mm	DHE1093-C3	51.80
.1093 (7/64)		2.778 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BVT1093-C3	53.50
.1093 (7/64)		2.778 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	ADS1093-C3	56.10
.1093 (7/64)		2.778 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	EXP1093-C3	57.40
.1093 (7/64)		2.778 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	CHT1093-C3	58.80
.1100	#35	2.794 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	DHE1100-C3	51.80
.1100	#35	2.794 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BVT1100-C3	53.50
.1100	#35	2.794 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	ADS1100-C3	56.10
.1100	#35	2.794 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	EXP1100-C3	57.40
.1100	#35	2.794 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	CHT1100-C3	58.80
.1110	#34	2.819 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	DHE1110-C3	51.80
.1110	#34	2.819 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BVT1110-C3	53.50
.1110	#34	2.819 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	ADS1110-C3	56.10
.1110	#34	2.819 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	EXP1110-C3	57.40
.1110	#34	2.819 mm	1.535	<b>39.00 mm</b>	(12x)	4 mm	75 mm	CHT1110-C3	58.80
.1130	#33	2.870 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	DHE1130-C3	51.80
.1130	#33	2.870 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BVT1130-C3	53.50
.1130	#33	2.870 mm	1.102	<b>28.00 mm</b>	(8x)	4 mm	63 mm	ADS1130-C3	56.10
.1130	#33	2.870 mm	1.339	<b>34.00 mm</b>	(10x)	4 mm	75 mm	EXP1130-C3	57.40
.1130	#33	2.870 mm	1.535	<b>39.00 mm</b>	(12x)	4 mm	75 mm	CHT1130-C3	58.80
.1160	#32	2.946 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BVT1160-C3	53.50
.1160	#32	2.946 mm	1.575	<b>40.00 mm</b>	(12x)	4 mm	75 mm	CHT1160-C3	58.80
.1181		3.000 mm	.571	<b>14.50 mm</b>	(3x)	4 mm	50 mm	DHE1181-C3	51.80
.1181		3.000 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BVT1181-C3	53.50
.1181		3.000 mm	1.142	<b>29.00 mm</b>	(8x)	4 mm	63 mm	ADS1181-C3	56.10
.1181		3.000 mm	1.378	<b>35.00 mm</b>	(10x)	4 mm	100 mm	EXP1181-C3	57.40
.1181		3.000 mm	1.654	<b>42.00 mm</b>	(12x)	4 mm	100 mm	CHT1181-C3	58.80

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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				
		$D_1$		$L_2$		$D_2$ (h6)	$L_1$	2 FL	PRICE
.1200	#31	3.048 mm	.571	<b>14.50 mm</b>	(3x)	6 mm	63 mm	DHE1200-C3	58.10
.1200	#31	3.048 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BVT1200-C3	59.80
.1200	#31	3.048 mm	1.181	<b>30.00 mm</b>	(8x)	6 mm	75 mm	ADS1200-C3	62.50
.1200	#31	3.048 mm	1.417	<b>36.00 mm</b>	(10x)	6 mm	100 mm	EXP1200-C3	63.70
.1200	#31	3.048 mm	1.654	<b>42.00 mm</b>	(12x)	6 mm	100 mm	CHT1200-C3	65.00
.1240		3.149 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BVT1240-C3	59.80
.1240		3.149 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	CHT1240-C3	65.00
.1250 (1/8)		3.175 mm	.591	<b>15.00 mm</b>	(3x)	6 mm	63 mm	DHE1250-C3	58.10
.1250 (1/8)		3.175 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BVT1250-C3	59.80
.1250 (1/8)		3.175 mm	1.220	<b>31.00 mm</b>	(8x)	6 mm	75 mm	ADS1250-C3	62.50
.1250 (1/8)		3.175 mm	1.457	<b>37.00 mm</b>	(10x)	6 mm	100 mm	EXP1250-C3	63.70
.1250 (1/8)		3.175 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	CHT1250-C3	65.00
.1260		3.200 mm	.866	<b>22.00 mm</b>	(5x)	6 mm	63 mm	BVT1260-C3	59.80
.1260		3.200 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	CHT1260-C3	65.00
.1285	#30	3.263 mm	.866	<b>22.00 mm</b>	(5x)	6 mm	63 mm	BVT1285-C3	59.80
.1285	#30	3.263 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	CHT1285-C3	65.00
.1360	#29	3.454 mm	.630	<b>16.00 mm</b>	(3x)	6 mm	63 mm	DHE1360-C3	58.10
.1360	#29	3.454 mm	.906	<b>23.00 mm</b>	(5x)	6 mm	63 mm	BVT1360-C3	59.80
.1360	#29	3.454 mm	1.339	<b>34.00 mm</b>	(8x)	6 mm	75 mm	ADS1360-C3	62.50
.1360	#29	3.454 mm	1.575	<b>40.00 mm</b>	(10x)	6 mm	100 mm	EXP1360-C3	63.70
.1360	#29	3.454 mm	1.890	<b>48.00 mm</b>	(12x)	6 mm	100 mm	CHT1360-C3	65.00
.1405	#28	3.568 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BVT1405-C3	59.80
.1405	#28	3.568 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	CHT1405-C3	65.00
.1406 (9/64)		3.571 mm	.669	<b>17.00 mm</b>	(3x)	6 mm	63 mm	DHE1406-C3	58.10
.1406 (9/64)		3.571 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BVT1406-C3	59.80
.1406 (9/64)		3.571 mm	1.378	<b>35.00 mm</b>	(8x)	6 mm	75 mm	ADS1406-C3	62.50
.1406 (9/64)		3.571 mm	1.654	<b>42.00 mm</b>	(10x)	6 mm	100 mm	EXP1406-C3	63.70
.1406 (9/64)		3.571 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	CHT1406-C3	65.00
.1417		3.600 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BVT1417-C3	59.80
.1417		3.600 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	CHT1417-C3	65.00
.1440	#27	3.657 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BVT1440-C3	59.80
.1440	#27	3.657 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	CHT1440-C3	65.00
.1470	#26	3.733 mm	.709	<b>18.00 mm</b>	(3x)	6 mm	63 mm	DHE1470-C3	58.10
.1470	#26	3.733 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BVT1470-C3	59.80
.1470	#26	3.733 mm	1.417	<b>36.00 mm</b>	(8x)	6 mm	100 mm	ADS1470-C3	62.50
.1470	#26	3.733 mm	1.732	<b>44.00 mm</b>	(10x)	6 mm	100 mm	EXP1470-C3	63.70
.1470	#26	3.733 mm	2.047	<b>52.00 mm</b>	(12x)	6 mm	100 mm	CHT1470-C3	65.00
.1495	#25	3.797 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BVT1495-C3	59.80
.1495	#25	3.797 mm	2.047	<b>52.00 mm</b>	(12x)	6 mm	100 mm	CHT1495-C3	65.00
.1520	#24	3.860 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BVT1520-C3	59.80
.1520	#24	3.860 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	CHT1520-C3	65.00
.1540	#23	3.911 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BVT1540-C3	59.80
.1540	#23	3.911 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	CHT1540-C3	65.00
.1562 (5/32)		3.968 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	DHE1562-C3	58.10
.1562 (5/32)		3.968 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BVT1562-C3	59.80
.1562 (5/32)		3.968 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ADS1562-C3	62.50
.1562 (5/32)		3.968 mm	1.811	<b>46.00 mm</b>	(10x)	6 mm	100 mm	EXP1562-C3	63.70
.1562 (5/32)		3.968 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	CHT1562-C3	65.00

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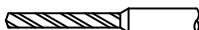
# MINIATURE HIGH PERFORMANCE DRILLS

## Prehardened Steels (cont.)

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DRILL DIAMETER	FLUTE LENGTH		SHANK DIAMETER	OVERALL LENGTH	AITIN COATED				
	inch	metric			inch	metric	hole depth	2 FL	PRICE
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>		
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.75mm</sup> / <sub>-.00mm</sub>					
.1570	#22	3.987 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BVT1570-C3	59.80
.1570	#22	3.987 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	CHT1570-C3	65.00
.1574		4.000 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	DHE1574-C3	58.10
.1574		4.000 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BVT1574-C3	59.80
.1574		4.000 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ADS1574-C3	62.50
.1574		4.000 mm	1.890	<b>48.00 mm</b>	(10x)	6 mm	100 mm	EXP1574-C3	63.70
.1574		4.000 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	CHT1574-C3	65.00
.1590	#21	4.038 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	DHE1590-C3	58.10
.1590	#21	4.038 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BVT1590-C3	59.80
.1590	#21	4.038 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	ADS1590-C3	62.50
.1590	#21	4.038 mm	1.890	<b>48.00 mm</b>	(10x)	6 mm	100 mm	EXP1590-C3	63.70
.1590	#21	4.038 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	CHT1590-C3	65.00
.1610	#20	4.089 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BVT1610-C3	59.80
.1610	#20	4.089 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	CHT1610-C3	65.00
.1660	#19	4.216 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BVT1660-C3	59.80
.1660	#19	4.216 mm	2.283	<b>58.00 mm</b>	(12x)	6 mm	100 mm	CHT1660-C3	65.00
.1695	#18	4.305 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BVT1695-C3	59.80
.1695	#18	4.305 mm	2.362	<b>60.00 mm</b>	(12x)	6 mm	100 mm	CHT1695-C3	65.00
.1718 (11/64)		4.365 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	DHE1718-C3	58.10
.1718 (11/64)		4.365 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BVT1718-C3	59.80
.1718 (11/64)		4.365 mm	1.654	<b>42.00 mm</b>	(8x)	6 mm	100 mm	ADS1718-C3	62.50
.1718 (11/64)		4.365 mm	2.047	<b>52.00 mm</b>	(10x)	6 mm	100 mm	EXP1718-C3	63.70
.1718 (11/64)		4.365 mm	2.362	<b>60.00 mm</b>	(12x)	6 mm	100 mm	CHT1718-C3	65.00
.1730	#17	4.394 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BVT1730-C3	59.80
.1730	#17	4.394 mm	2.362	<b>60.00 mm</b>	(12x)	6 mm	100 mm	CHT1730-C3	65.00
.1770	#16	4.495 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	DHE1770-C3	58.10
.1770	#16	4.495 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BVT1770-C3	59.80
.1770	#16	4.495 mm	1.732	<b>44.00 mm</b>	(8x)	6 mm	100 mm	ADS1770-C3	62.50
.1770	#16	4.495 mm	2.047	<b>52.00 mm</b>	(10x)	6 mm	100 mm	EXP1770-C3	63.70
.1770	#16	4.495 mm	2.441	<b>62.00 mm</b>	(12x)	6 mm	125 mm	CHT1770-C3	65.00
.1800	#15	4.572 mm	.866	<b>22.00 mm</b>	(3x)	6 mm	63 mm	DHE1800-C3	58.10
.1800	#15	4.572 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BVT1800-C3	59.80
.1800	#15	4.572 mm	1.732	<b>44.00 mm</b>	(8x)	6 mm	100 mm	ADS1800-C3	62.50
.1800	#15	4.572 mm	2.126	<b>54.00 mm</b>	(10x)	6 mm	100 mm	EXP1800-C3	63.70
.1800	#15	4.572 mm	2.441	<b>62.00 mm</b>	(12x)	6 mm	125 mm	CHT1800-C3	65.00
.1820	#14	4.622 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BVT1820-C3	59.80
.1820	#14	4.622 mm	2.520	<b>64.00 mm</b>	(12x)	6 mm	125 mm	CHT1820-C3	65.00
.1850	#13	4.700 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BVT1850-C3	59.80
.1850	#13	4.700 mm	2.520	<b>64.00 mm</b>	(12x)	6 mm	125 mm	CHT1850-C3	65.00
.1875 (3/16)		4.762 mm	.906	<b>23.00 mm</b>	(3x)	6 mm	63 mm	DHE1875-C3	58.10
.1875 (3/16)		4.762 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BVT1875-C3	59.80
.1875 (3/16)		4.762 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	ADS1875-C3	62.50
.1875 (3/16)		4.762 mm	2.205	<b>56.00 mm</b>	(10x)	6 mm	100 mm	EXP1875-C3	63.70
.1875 (3/16)		4.762 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	CHT1875-C3	65.00
.1890	#12	4.800 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BVT1890-C3	59.80
.1890	#12	4.800 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	CHT1890-C3	65.00
.1910	#11	4.851 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BVT1910-C3	59.80
.1910	#11	4.851 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	CHT1910-C3	65.00

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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				
		$D_1 \begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		$L_2 \begin{smallmatrix} +.75\text{mm} \\ -.00\text{mm} \end{smallmatrix}$		$D_2 \text{ (h6)}$	$L_1$	2 FL	PRICE
.1935	#10	4.914 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT1935-C3	59.80
.1935	#10	4.914 mm	2.677	<b>68.00 mm</b>	(12x)	6 mm	125 mm	CHT1935-C3	65.00
.1960	#9	4.978 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT1960-C3	59.80
.1960	#9	4.978 mm	2.677	<b>68.00 mm</b>	(12x)	6 mm	125 mm	CHT1960-C3	65.00
.1968		5.000 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	DHE1968-C3	58.10
.1968		5.000 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT1968-C3	59.80
.1968		5.000 mm	1.890	<b>48.00 mm</b>	(8x)	6 mm	100 mm	ADS1968-C3	62.50
.1968		5.000 mm	2.283	<b>58.00 mm</b>	(10x)	6 mm	100 mm	EXP1968-C3	63.70
.1968		5.000 mm	2.677	<b>68.00 mm</b>	(12x)	6 mm	125 mm	CHT1968-C3	65.00
.1990	#8	5.054 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT1990-C3	59.80
.1990	#8	5.054 mm	2.756	<b>70.00 mm</b>	(12x)	6 mm	125 mm	CHT1990-C3	65.00
.2009	#7	5.105 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	DHE2009-C3	58.10
.2009	#7	5.105 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT2009-C3	59.80
.2009	#7	5.105 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ADS2009-C3	62.50
.2009	#7	5.105 mm	2.362	<b>60.00 mm</b>	(10x)	6 mm	100 mm	EXP2009-C3	63.70
.2009	#7	5.105 mm	2.756	<b>70.00 mm</b>	(12x)	6 mm	125 mm	CHT2009-C3	65.00
.2031 (13/64)		5.159 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	DHE2031-C3	58.10
.2031 (13/64)		5.159 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT2031-C3	59.80
.2031 (13/64)		5.159 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	ADS2031-C3	62.50
.2031 (13/64)		5.159 mm	2.362	<b>60.00 mm</b>	(10x)	6 mm	100 mm	EXP2031-C3	63.70
.2031 (13/64)		5.159 mm	2.756	<b>70.00 mm</b>	(12x)	6 mm	125 mm	CHT2031-C3	65.00
.2040	#6	5.181 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BVT2040-C3	59.80
.2040	#6	5.181 mm	2.835	<b>72.00 mm</b>	(12x)	6 mm	125 mm	CHT2040-C3	65.00
.2055	#5	5.219 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BVT2055-C3	59.80
.2055	#5	5.219 mm	2.835	<b>72.00 mm</b>	(12x)	6 mm	125 mm	CHT2055-C3	65.00
.2090		5.308 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BVT2090-C3	59.80
.2090		5.308 mm	2.835	<b>72.00 mm</b>	(12x)	6 mm	125 mm	CHT2090-C3	65.00
.2129	#3	5.410 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	DHE2129-C3	58.10
.2129	#3	5.410 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BVT2129-C3	59.80
.2129	#3	5.410 mm	2.047	<b>52.00 mm</b>	(8x)	6 mm	100 mm	ADS2129-C3	62.50
.2129	#3	5.410 mm	2.520	<b>64.00 mm</b>	(10x)	6 mm	125 mm	EXP2129-C3	63.70
.2129	#3	5.410 mm	2.913	<b>74.00 mm</b>	(12x)	6 mm	125 mm	CHT2129-C3	65.00
.2165		5.500 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BVT2165-C3	59.80
.2165		5.500 mm	2.992	<b>76.00 mm</b>	(12x)	6 mm	125 mm	CHT2165-C3	65.00
.2187 (7/32)		5.556 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	DHE2187-C3	58.10
.2187 (7/32)		5.556 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BVT2187-C3	59.80
.2187 (7/32)		5.556 mm	2.126	<b>54.00 mm</b>	(8x)	6 mm	100 mm	ADS2187-C3	62.50
.2187 (7/32)		5.556 mm	2.598	<b>66.00 mm</b>	(10x)	6 mm	125 mm	EXP2187-C3	63.70
.2187 (7/32)		5.556 mm	2.992	<b>76.00 mm</b>	(12x)	6 mm	125 mm	CHT2187-C3	65.00
.2205		5.600 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BVT2205-C3	59.80
.2205		5.600 mm	3.071	<b>78.00 mm</b>	(12x)	6 mm	125 mm	CHT2205-C3	65.00
.2210	#2	5.613 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BVT2210-C3	59.80
.2210	#2	5.613 mm	3.071	<b>78.00 mm</b>	(12x)	6 mm	125 mm	CHT2210-C3	65.00
.2280	#1	5.791 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BVT2280-C3	59.80
.2280	#1	5.791 mm	3.150	<b>80.00 mm</b>	(12x)	6 mm	125 mm	CHT2280-C3	65.00
.2340	A	5.943 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BVT2340-C3	59.80
.2340	A	5.943 mm	3.228	<b>82.00 mm</b>	(12x)	6 mm	125 mm	CHT2340-C3	65.00

PREHARDENED STEELS

continued on next page

# MINIATURE HIGH PERFORMANCE DRILLS

## Prehardened Steels (cont.)

PREHARDENED STEELS

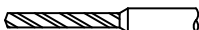
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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	A TiN COATED	
inch	wire	metric	inch	metric	hole depth				
		D <sub>1</sub> <sup>+ .000mm</sup> <sub>-.013mm</sub>		L <sub>2</sub> <sup>+ .75mm</sup> <sub>-.00mm</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.2343 (15/64)		5.953 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	DHE2343-C3	58.10
.2343 (15/64)		5.953 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BVT2343-C3	59.80
.2343 (15/64)		5.953 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	ADS2343-C3	62.50
.2343 (15/64)		5.953 mm	2.756	<b>70.00 mm</b>	(10x)	6 mm	125 mm	EXP2343-C3	63.70
.2343 (15/64)		5.953 mm	3.228	<b>82.00 mm</b>	(12x)	6 mm	125 mm	CHT2343-C3	65.00
.2362		6.000 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	DHE2362-C3	58.10
.2362		6.000 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BVT2362-C3	59.80
.2362		6.000 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	ADS2362-C3	62.50
.2362		6.000 mm	2.756	<b>70.00 mm</b>	(10x)	6 mm	125 mm	EXP2362-C3	63.70
.2362		6.000 mm	3.228	<b>82.00 mm</b>	(12x)	6 mm	125 mm	CHT2362-C3	65.00
.2380	B	6.045 mm	1.575	<b>40.00 mm</b>	(5x)	8 mm	100 mm	BVT2380-C3	61.90
.2380	B	6.045 mm	3.307	<b>84.00 mm</b>	(12x)	8 mm	125 mm	CHT2380-C3	67.10
.2420	C	6.146 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BVT2420-C3	61.90
.2420	C	6.146 mm	3.307	<b>84.00 mm</b>	(12x)	8 mm	125 mm	CHT2420-C3	67.10
.2460	D	6.248 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BVT2460-C3	61.90
.2460	D	6.248 mm	3.386	<b>86.00 mm</b>	(12x)	8 mm	150 mm	CHT2460-C3	67.10
.2500 (1/4)	E	6.350 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	75 mm	DHE2500-C3	58.10
.2500 (1/4)	E	6.350 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BVT2500-C3	59.80
.2500 (1/4)	E	6.350 mm	2.441	<b>62.00 mm</b>	(8x)	8 mm	125 mm	ADS2500-C3	62.50
.2500 (1/4)	E	6.350 mm	2.913	<b>74.00 mm</b>	(10x)	8 mm	125 mm	EXP2500-C3	63.70
.2500 (1/4)	E	6.350 mm	3.465	<b>88.00 mm</b>	(12x)	8 mm	150 mm	CHT2500-C3	65.00

### SPEEDS & FEEDS (Miniature High Performance Drills – Prehardened Steels)

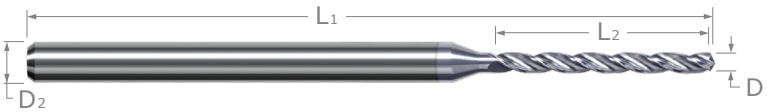
**Important Note:** Values in table are in inches and are based on 3x and 5x drill lengths and a material hardness of 29-37 Rc. For longer lengths, table values of IPR must be reduced (for 8x and 10x, reduce to 75%; for 12x, reduce to 65%). For ferrous materials at 38-45 Rc, reduce IPR (for 3x and 5x, 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
<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, Discoloy, Incoloy	70	.00036	.00074	.00113	.00149	.00187	.00223	.00300	.00449	.00600



# 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	43.10
.0150		.381 mm	.102	<b>2.60 mm</b>	(5x)	3 mm	50 mm	BAF0150-C8	44.10
.0150		.381 mm	.205	<b>5.20 mm</b>	(12x)	3 mm	50 mm	DQW0150-C8	49.70
.0156 (1/64)		.396 mm	.075	<b>1.90 mm</b>	(3x)	3 mm	50 mm	AVA0156-C8	43.10
.0156 (1/64)		.396 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BAF0156-C8	44.10
.0156 (1/64)		.396 mm	.154	<b>3.90 mm</b>	(8x)	3 mm	50 mm	CBG0156-C8	47.10
.0156 (1/64)		.396 mm	.185	<b>4.70 mm</b>	(10x)	3 mm	50 mm	ERY0156-C8	48.40
.0156 (1/64)		.396 mm	.213	<b>5.40 mm</b>	(12x)	3 mm	50 mm	DQW0156-C8	49.70
.0160	#78	.406 mm	.079	<b>2.00 mm</b>	(3x)	3 mm	50 mm	AVA0160-C8	43.10
.0160	#78	.406 mm	.106	<b>2.70 mm</b>	(5x)	3 mm	50 mm	BAF0160-C8	44.10
.0160	#78	.406 mm	.157	<b>4.00 mm</b>	(8x)	3 mm	50 mm	CBG0160-C8	47.10
.0160	#78	.406 mm	.189	<b>4.80 mm</b>	(10x)	3 mm	50 mm	ERY0160-C8	48.40
.0160	#78	.406 mm	.220	<b>5.60 mm</b>	(12x)	3 mm	50 mm	DQW0160-C8	49.70
.0170		.431 mm	.114	<b>2.90 mm</b>	(5x)	3 mm	50 mm	BAF0170-C8	44.10
.0170		.431 mm	.236	<b>6.00 mm</b>	(12x)	3 mm	50 mm	DQW0170-C8	49.70
.0180	#77	.457 mm	.087	<b>2.20 mm</b>	(3x)	3 mm	50 mm	AVA0180-C8	43.10
.0180	#77	.457 mm	.122	<b>3.10 mm</b>	(5x)	3 mm	50 mm	BAF0180-C8	44.10
.0180	#77	.457 mm	.177	<b>4.50 mm</b>	(8x)	3 mm	50 mm	CBG0180-C8	47.10
.0180	#77	.457 mm	.213	<b>5.40 mm</b>	(10x)	3 mm	50 mm	ERY0180-C8	48.40
.0180	#77	.457 mm	.244	<b>6.20 mm</b>	(12x)	3 mm	50 mm	DQW0180-C8	49.70
.0190		.482 mm	.130	<b>3.30 mm</b>	(5x)	3 mm	50 mm	BAF0190-C8	44.10
.0190		.482 mm	.260	<b>6.60 mm</b>	(12x)	3 mm	50 mm	DQW0190-C8	49.70
.0196		.500 mm	.094	<b>2.40 mm</b>	(3x)	3 mm	50 mm	AVA0196-C8	42.60
.0196		.500 mm	.134	<b>3.40 mm</b>	(5x)	3 mm	50 mm	BAF0196-C8	43.60
.0196		.500 mm	.193	<b>4.90 mm</b>	(8x)	3 mm	50 mm	CBG0196-C8	46.60
.0196		.500 mm	.228	<b>5.80 mm</b>	(10x)	3 mm	50 mm	ERY0196-C8	47.70
.0196		.500 mm	.268	<b>6.80 mm</b>	(12x)	3 mm	50 mm	DQW0196-C8	49.00
.0200	#76	.508 mm	.094	<b>2.40 mm</b>	(3x)	3 mm	50 mm	AVA0200-C8	42.60
.0200	#76	.508 mm	.134	<b>3.40 mm</b>	(5x)	3 mm	50 mm	BAF0200-C8	43.60
.0200	#76	.508 mm	.197	<b>5.00 mm</b>	(8x)	3 mm	50 mm	CBG0200-C8	46.60
.0200	#76	.508 mm	.236	<b>6.00 mm</b>	(10x)	3 mm	50 mm	ERY0200-C8	47.70
.0200	#76	.508 mm	.276	<b>7.00 mm</b>	(12x)	3 mm	50 mm	DQW0200-C8	49.00
.0210	#75	.533 mm	.098	<b>2.50 mm</b>	(3x)	3 mm	50 mm	AVA0210-C8	42.60
.0210	#75	.533 mm	.142	<b>3.60 mm</b>	(5x)	3 mm	50 mm	BAF0210-C8	43.60
.0210	#75	.533 mm	.205	<b>5.20 mm</b>	(8x)	3 mm	50 mm	CBG0210-C8	46.60
.0210	#75	.533 mm	.244	<b>6.20 mm</b>	(10x)	3 mm	50 mm	ERY0210-C8	47.70
.0210	#75	.533 mm	.291	<b>7.40 mm</b>	(12x)	3 mm	50 mm	DQW0210-C8	49.00

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# MINIATURE HIGH PERFORMANCE DRILLS

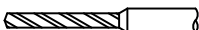
## Aluminum Alloys (cont.)

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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> $\begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		L <sub>2</sub> $\begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE
.0220		.558 mm	.150	<b>3.80 mm</b>	(5x)	3 mm	50 mm	BAF0220-C8	43.60
.0220		.558 mm	.299	<b>7.60 mm</b>	(12x)	3 mm	50 mm	DQW0220-C8	49.00
.0225	#74	.571 mm	.106	<b>2.70 mm</b>	(3x)	3 mm	50 mm	AVA0225-C8	42.60
.0225	#74	.571 mm	.154	<b>3.90 mm</b>	(5x)	3 mm	50 mm	BAF0225-C8	43.60
.0225	#74	.571 mm	.220	<b>5.60 mm</b>	(8x)	3 mm	50 mm	CBG0225-C8	46.60
.0225	#74	.571 mm	.268	<b>6.80 mm</b>	(10x)	3 mm	50 mm	ERY0225-C8	47.70
.0225	#74	.571 mm	.307	<b>7.80 mm</b>	(12x)	3 mm	50 mm	DQW0225-C8	49.00
.0230		.584 mm	.154	<b>3.90 mm</b>	(5x)	3 mm	50 mm	BAF0230-C8	43.60
.0230		.584 mm	.315	<b>8.00 mm</b>	(12x)	3 mm	50 mm	DQW0230-C8	49.00
.0236		.600 mm	.157	<b>4.00 mm</b>	(5x)	3 mm	50 mm	BAF0236-C8	43.60
.0236		.600 mm	.323	<b>8.20 mm</b>	(12x)	3 mm	50 mm	DQW0236-C8	49.00
.0240	#73	.609 mm	.114	<b>2.90 mm</b>	(3x)	3 mm	50 mm	AVA0240-C8	42.60
.0240	#73	.609 mm	.165	<b>4.20 mm</b>	(5x)	3 mm	50 mm	BAF0240-C8	43.60
.0240	#73	.609 mm	.236	<b>6.00 mm</b>	(8x)	3 mm	50 mm	CBG0240-C8	46.60
.0240	#73	.609 mm	.283	<b>7.20 mm</b>	(10x)	3 mm	50 mm	ERY0240-C8	47.70
.0240	#73	.609 mm	.331	<b>8.40 mm</b>	(12x)	3 mm	50 mm	DQW0240-C8	49.00
.0250	#72	.635 mm	.118	<b>3.00 mm</b>	(3x)	3 mm	50 mm	AVA0250-C8	42.60
.0250	#72	.635 mm	.165	<b>4.20 mm</b>	(5x)	3 mm	50 mm	BAF0250-C8	43.60
.0250	#72	.635 mm	.244	<b>6.20 mm</b>	(8x)	3 mm	50 mm	CBG0250-C8	46.60
.0250	#72	.635 mm	.291	<b>7.40 mm</b>	(10x)	3 mm	50 mm	ERY0250-C8	47.70
.0250	#72	.635 mm	.346	<b>8.80 mm</b>	(12x)	3 mm	50 mm	DQW0250-C8	49.00
.0260	#71	.660 mm	.122	<b>3.10 mm</b>	(3x)	3 mm	50 mm	AVA0260-C8	42.60
.0260	#71	.660 mm	.173	<b>4.40 mm</b>	(5x)	3 mm	50 mm	BAF0260-C8	43.60
.0260	#71	.660 mm	.252	<b>6.40 mm</b>	(8x)	3 mm	50 mm	CBG0260-C8	46.60
.0260	#71	.660 mm	.307	<b>7.80 mm</b>	(10x)	3 mm	50 mm	ERY0260-C8	47.70
.0260	#71	.660 mm	.354	<b>9.00 mm</b>	(12x)	3 mm	50 mm	DQW0260-C8	49.00
.0270		.685 mm	.181	<b>4.60 mm</b>	(5x)	3 mm	50 mm	BAF0270-C8	43.60
.0270		.685 mm	.370	<b>9.40 mm</b>	(12x)	3 mm	50 mm	DQW0270-C8	49.00
.0275		.700 mm	.189	<b>4.80 mm</b>	(5x)	3 mm	50 mm	BAF0275-C8	43.60
.0275		.700 mm	.378	<b>9.60 mm</b>	(12x)	3 mm	50 mm	DQW0275-C8	49.00
.0280	#70	.711 mm	.134	<b>3.40 mm</b>	(3x)	3 mm	50 mm	AVA0280-C8	42.60
.0280	#70	.711 mm	.189	<b>4.80 mm</b>	(5x)	3 mm	50 mm	BAF0280-C8	43.60
.0280	#70	.711 mm	.276	<b>7.00 mm</b>	(8x)	3 mm	50 mm	CBG0280-C8	46.60
.0280	#70	.711 mm	.331	<b>8.40 mm</b>	(10x)	3 mm	50 mm	ERY0280-C8	47.70
.0280	#70	.711 mm	.386	<b>9.80 mm</b>	(12x)	3 mm	50 mm	DQW0280-C8	49.00
.0292	#69	.741 mm	.138	<b>3.50 mm</b>	(3x)	3 mm	50 mm	AVA0292-C8	42.60
.0292	#69	.741 mm	.197	<b>5.00 mm</b>	(5x)	3 mm	50 mm	BAF0292-C8	43.60
.0292	#69	.741 mm	.283	<b>7.20 mm</b>	(8x)	3 mm	50 mm	CBG0292-C8	46.60
.0292	#69	.741 mm	.346	<b>8.80 mm</b>	(10x)	3 mm	50 mm	ERY0292-C8	47.70
.0292	#69	.741 mm	.394	<b>10.00 mm</b>	(12x)	3 mm	50 mm	DQW0292-C8	49.00
.0300		.762 mm	.205	<b>5.20 mm</b>	(5x)	3 mm	50 mm	BAF0300-C8	43.60
.0300		.762 mm	.413	<b>10.50 mm</b>	(12x)	3 mm	50 mm	DQW0300-C8	49.00
.0310	#68	.787 mm	.146	<b>3.70 mm</b>	(3x)	3 mm	50 mm	AVA0310-C8	42.60
.0310	#68	.787 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BAF0310-C8	43.60
.0310	#68	.787 mm	.299	<b>7.60 mm</b>	(8x)	3 mm	50 mm	CBG0310-C8	46.60
.0310	#68	.787 mm	.362	<b>9.20 mm</b>	(10x)	3 mm	50 mm	ERY0310-C8	48.20
.0310	#68	.787 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	DQW0310-C8	49.70
.0312 (1/32)		.793 mm	.150	<b>3.80 mm</b>	(3x)	3 mm	50 mm	AVA0312-C8	42.60
.0312 (1/32)		.793 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BAF0312-C8	43.60

ALUMINUM ALLOYS

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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>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>					
.0312 (1/32)		.793 mm	.307	<b>7.80 mm</b>	(8x)	3 mm	50 mm	CBG0312-C8	46.60
.0312 (1/32)		.793 mm	.370	<b>9.40 mm</b>	(10x)	3 mm	50 mm	ERY0312-C8	48.20
.0312 (1/32)		.793 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	DQW0312-C8	49.70
.0315		.800 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BAF0315-C8	43.60
.0315		.800 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	DQW0315-C8	49.70
.0320	#67	.812 mm	.154	<b>3.90 mm</b>	(3x)	3 mm	50 mm	AVA0320-C8	42.60
.0320	#67	.812 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BAF0320-C8	43.60
.0320	#67	.812 mm	.315	<b>8.00 mm</b>	(8x)	3 mm	50 mm	CBG0320-C8	46.60
.0320	#67	.812 mm	.378	<b>9.60 mm</b>	(10x)	3 mm	50 mm	ERY0320-C8	48.20
.0320	#67	.812 mm	.433	<b>11.00 mm</b>	(12x)	3 mm	50 mm	DQW0320-C8	49.70
.0330	#66	.838 mm	.157	<b>4.00 mm</b>	(3x)	3 mm	50 mm	AVA0330-C8	42.60
.0330	#66	.838 mm	.220	<b>5.60 mm</b>	(5x)	3 mm	50 mm	BAF0330-C8	43.60
.0330	#66	.838 mm	.323	<b>8.20 mm</b>	(8x)	3 mm	50 mm	CBG0330-C8	46.60
.0330	#66	.838 mm	.386	<b>9.80 mm</b>	(10x)	3 mm	50 mm	ERY0330-C8	48.20
.0330	#66	.838 mm	.453	<b>11.50 mm</b>	(12x)	3 mm	50 mm	DQW0330-C8	49.70
.0350	#65	.889 mm	.165	<b>4.20 mm</b>	(3x)	3 mm	50 mm	AVA0350-C8	42.60
.0350	#65	.889 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	BAF0350-C8	43.60
.0350	#65	.889 mm	.339	<b>8.60 mm</b>	(8x)	3 mm	50 mm	CBG0350-C8	46.60
.0350	#65	.889 mm	.413	<b>10.50 mm</b>	(10x)	3 mm	50 mm	ERY0350-C8	48.20
.0350	#65	.889 mm	.472	<b>12.00 mm</b>	(12x)	3 mm	50 mm	DQW0350-C8	49.70
.0354		.900 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	BAF0354-C8	43.60
.0354		.900 mm	.492	<b>12.50 mm</b>	(12x)	3 mm	50 mm	DQW0354-C8	49.70
.0360	#64	.914 mm	.173	<b>4.40 mm</b>	(3x)	3 mm	50 mm	AVA0360-C8	42.60
.0360	#64	.914 mm	.244	<b>6.20 mm</b>	(5x)	3 mm	50 mm	BAF0360-C8	43.60
.0360	#64	.914 mm	.354	<b>9.00 mm</b>	(8x)	3 mm	50 mm	CBG0360-C8	46.60
.0360	#64	.914 mm	.413	<b>10.50 mm</b>	(10x)	3 mm	50 mm	ERY0360-C8	48.20
.0360	#64	.914 mm	.492	<b>12.50 mm</b>	(12x)	3 mm	50 mm	DQW0360-C8	49.70
.0370	#63	.939 mm	.173	<b>4.40 mm</b>	(3x)	3 mm	50 mm	AVA0370-C8	42.60
.0370	#63	.939 mm	.252	<b>6.40 mm</b>	(5x)	3 mm	50 mm	BAF0370-C8	43.60
.0370	#63	.939 mm	.362	<b>9.20 mm</b>	(8x)	3 mm	50 mm	CBG0370-C8	46.60
.0370	#63	.939 mm	.433	<b>11.00 mm</b>	(10x)	3 mm	50 mm	ERY0370-C8	48.20
.0370	#63	.939 mm	.512	<b>13.00 mm</b>	(12x)	3 mm	50 mm	DQW0370-C8	49.70
.0380	#62	.965 mm	.181	<b>4.60 mm</b>	(3x)	3 mm	50 mm	AVA0380-C8	42.60
.0380	#62	.965 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	BAF0380-C8	43.60
.0380	#62	.965 mm	.370	<b>9.40 mm</b>	(8x)	3 mm	50 mm	CBG0380-C8	46.60
.0380	#62	.965 mm	.453	<b>11.50 mm</b>	(10x)	3 mm	50 mm	ERY0380-C8	48.20
.0380	#62	.965 mm	.531	<b>13.50 mm</b>	(12x)	3 mm	50 mm	DQW0380-C8	49.70
.0390	#61	.990 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	AVA0390-C8	42.60
.0390	#61	.990 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	BAF0390-C8	43.60
.0390	#61	.990 mm	.378	<b>9.60 mm</b>	(8x)	3 mm	50 mm	CBG0390-C8	46.60
.0390	#61	.990 mm	.453	<b>11.50 mm</b>	(10x)	3 mm	50 mm	ERY0390-C8	48.20
.0390	#61	.990 mm	.531	<b>13.50 mm</b>	(12x)	3 mm	50 mm	DQW0390-C8	49.70
.0393		1.000 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	AVA0393-C8	44.40
.0393		1.000 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	BAF0393-C8	45.50
.0393		1.000 mm	.386	<b>9.80 mm</b>	(8x)	3 mm	50 mm	CBG0393-C8	47.80
.0393		1.000 mm	.472	<b>12.00 mm</b>	(10x)	3 mm	50 mm	ERY0393-C8	49.30
.0393		1.000 mm	.551	<b>14.00 mm</b>	(12x)	3 mm	50 mm	DQW0393-C8	50.70

ALUMINUM ALLOYS

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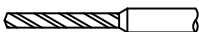
# MINIATURE HIGH PERFORMANCE DRILLS

## 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> -0.013mm		L <sub>2</sub> <sup>+0.25mm</sup> -0.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	3 FL	PRICE
.0400	#60	1.016 mm	.189	<b>4.80 mm</b>	(3x)	3 mm	50 mm	AVA0400-C8	44.40
.0400	#60	1.016 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	BAF0400-C8	45.50
.0400	#60	1.016 mm	.394	<b>10.00 mm</b>	(8x)	3 mm	50 mm	CBG0400-C8	47.80
.0400	#60	1.016 mm	.472	<b>12.00 mm</b>	(10x)	3 mm	50 mm	ERY0400-C8	49.30
.0400	#60	1.016 mm	.551	<b>14.00 mm</b>	(12x)	3 mm	50 mm	DQW0400-C8	50.70
.0410	#59	1.041 mm	.197	<b>5.00 mm</b>	(3x)	3 mm	50 mm	AVA0410-C8	44.40
.0410	#59	1.041 mm	.276	<b>7.00 mm</b>	(5x)	3 mm	50 mm	BAF0410-C8	45.50
.0410	#59	1.041 mm	.394	<b>10.00 mm</b>	(8x)	3 mm	50 mm	CBG0410-C8	47.80
.0410	#59	1.041 mm	.472	<b>12.00 mm</b>	(10x)	3 mm	50 mm	ERY0410-C8	49.30
.0410	#59	1.041 mm	.571	<b>14.50 mm</b>	(12x)	3 mm	50 mm	DQW0410-C8	50.70
.0420	#58	1.066 mm	.197	<b>5.00 mm</b>	(3x)	3 mm	50 mm	AVA0420-C8	44.40
.0420	#58	1.066 mm	.283	<b>7.20 mm</b>	(5x)	3 mm	50 mm	BAF0420-C8	45.50
.0420	#58	1.066 mm	.413	<b>10.50 mm</b>	(8x)	3 mm	50 mm	CBG0420-C8	47.80
.0420	#58	1.066 mm	.492	<b>12.50 mm</b>	(10x)	3 mm	50 mm	ERY0420-C8	49.30
.0420	#58	1.066 mm	.571	<b>14.50 mm</b>	(12x)	3 mm	50 mm	DQW0420-C8	50.70
.0430	#57	1.092 mm	.205	<b>5.20 mm</b>	(3x)	3 mm	50 mm	AVA0430-C8	44.40
.0430	#57	1.092 mm	.291	<b>7.40 mm</b>	(5x)	3 mm	50 mm	BAF0430-C8	45.50
.0430	#57	1.092 mm	.413	<b>10.50 mm</b>	(8x)	3 mm	50 mm	CBG0430-C8	47.80
.0430	#57	1.092 mm	.512	<b>13.00 mm</b>	(10x)	3 mm	50 mm	ERY0430-C8	49.30
.0430	#57	1.092 mm	.591	<b>15.00 mm</b>	(12x)	3 mm	50 mm	DQW0430-C8	50.70
.0450		1.143 mm	.307	<b>7.80 mm</b>	(5x)	3 mm	50 mm	BAF0450-C8	45.50
.0450		1.143 mm	.610	<b>15.50 mm</b>	(12x)	3 mm	50 mm	DQW0450-C8	50.70
.0465	#56	1.181 mm	.220	<b>5.60 mm</b>	(3x)	3 mm	50 mm	AVA0465-C8	44.40
.0465	#56	1.181 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BAF0465-C8	45.50
.0465	#56	1.181 mm	.453	<b>11.50 mm</b>	(8x)	3 mm	50 mm	CBG0465-C8	47.80
.0465	#56	1.181 mm	.551	<b>14.00 mm</b>	(10x)	3 mm	50 mm	ERY0465-C8	49.30
.0465	#56	1.181 mm	.630	<b>16.00 mm</b>	(12x)	3 mm	63 mm	DQW0465-C8	50.70
.0468 (3/64)		1.190 mm	.220	<b>5.60 mm</b>	(3x)	3 mm	50 mm	AVA0468-C8	44.40
.0468 (3/64)		1.190 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	BAF0468-C8	45.50
.0468 (3/64)		1.190 mm	.453	<b>11.50 mm</b>	(8x)	3 mm	50 mm	CBG0468-C8	47.80
.0468 (3/64)		1.190 mm	.551	<b>14.00 mm</b>	(10x)	3 mm	50 mm	ERY0468-C8	49.30
.0468 (3/64)		1.190 mm	.650	<b>16.50 mm</b>	(12x)	3 mm	63 mm	DQW0468-C8	50.70
.0492		1.250 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	BAF0492-C8	45.50
.0492		1.250 mm	.669	<b>17.00 mm</b>	(12x)	3 mm	63 mm	DQW0492-C8	50.70
.0500		1.270 mm	.236	<b>6.00 mm</b>	(3x)	3 mm	50 mm	AVA0500-C8	44.40
.0500		1.270 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	BAF0500-C8	45.50
.0500		1.270 mm	.492	<b>12.50 mm</b>	(8x)	3 mm	50 mm	CBG0500-C8	47.80
.0500		1.270 mm	.591	<b>15.00 mm</b>	(10x)	3 mm	50 mm	ERY0500-C8	49.30
.0500		1.270 mm	.689	<b>17.50 mm</b>	(12x)	3 mm	63 mm	DQW0500-C8	50.70
.0520	#55	1.320 mm	.244	<b>6.20 mm</b>	(3x)	3 mm	50 mm	AVA0520-C8	44.40
.0520	#55	1.320 mm	.354	<b>9.00 mm</b>	(5x)	3 mm	50 mm	BAF0520-C8	45.50
.0520	#55	1.320 mm	.512	<b>13.00 mm</b>	(8x)	3 mm	50 mm	CBG0520-C8	47.80
.0520	#55	1.320 mm	.610	<b>15.50 mm</b>	(10x)	3 mm	50 mm	ERY0520-C8	49.30
.0520	#55	1.320 mm	.709	<b>18.00 mm</b>	(12x)	3 mm	63 mm	DQW0520-C8	50.70
.0550	#54	1.397 mm	.260	<b>6.60 mm</b>	(3x)	3 mm	50 mm	AVA0550-C8	44.40
.0550	#54	1.397 mm	.374	<b>9.50 mm</b>	(5x)	3 mm	50 mm	BAF0550-C8	45.50
.0550	#54	1.397 mm	.531	<b>13.50 mm</b>	(8x)	3 mm	50 mm	CBG0550-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>
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>					
.0550	#54	1.397 mm	.650	<b>16.50 mm</b>	(10x)	3 mm	63 mm	ERY0550-C8	49.30
.0550	#54	1.397 mm	.748	<b>19.00 mm</b>	(12x)	3 mm	63 mm	DQW0550-C8	50.70
.0590		1.500 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	AVA0590-C8	44.90
.0590		1.500 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BAF0590-C8	45.90
.0590		1.500 mm	.571	<b>14.50 mm</b>	(8x)	3 mm	50 mm	CBG0590-C8	47.80
.0590		1.500 mm	.689	<b>17.50 mm</b>	(10x)	3 mm	63 mm	ERY0590-C8	49.80
.0590		1.500 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	DQW0590-C8	51.60
.0595	#53	1.511 mm	.283	<b>7.20 mm</b>	(3x)	3 mm	50 mm	AVA0595-C8	44.90
.0595	#53	1.511 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	BAF0595-C8	45.90
.0595	#53	1.511 mm	.571	<b>14.50 mm</b>	(8x)	3 mm	50 mm	CBG0595-C8	47.80
.0595	#53	1.511 mm	.709	<b>18.00 mm</b>	(10x)	3 mm	63 mm	ERY0595-C8	49.80
.0595	#53	1.511 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	DQW0595-C8	51.60
.0600		1.524 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	BAF0600-C8	45.90
.0600		1.524 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	DQW0600-C8	51.60
.0625 (1/16)		1.587 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	AVA0625-C8	44.90
.0625 (1/16)		1.587 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	BAF0625-C8	45.90
.0625 (1/16)		1.587 mm	.610	<b>15.50 mm</b>	(8x)	3 mm	50 mm	CBG0625-C8	48.70
.0625 (1/16)		1.587 mm	.728	<b>18.50 mm</b>	(10x)	3 mm	63 mm	ERY0625-C8	50.10
.0625 (1/16)		1.587 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	DQW0625-C8	51.60
.0635	#52	1.612 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	AVA0635-C8	44.90
.0635	#52	1.612 mm	.433	<b>11.00 mm</b>	(5x)	3 mm	50 mm	BAF0635-C8	45.90
.0635	#52	1.612 mm	.610	<b>15.50 mm</b>	(8x)	3 mm	50 mm	CBG0635-C8	48.70
.0635	#52	1.612 mm	.748	<b>19.00 mm</b>	(10x)	3 mm	63 mm	ERY0635-C8	50.10
.0635	#52	1.612 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	DQW0635-C8	51.60
.0670	#51	1.701 mm	.315	<b>8.00 mm</b>	(3x)	3 mm	50 mm	AVA0670-C8	44.90
.0670	#51	1.701 mm	.453	<b>11.50 mm</b>	(5x)	3 mm	50 mm	BAF0670-C8	45.90
.0670	#51	1.701 mm	.650	<b>16.50 mm</b>	(8x)	3 mm	63 mm	CBG0670-C8	48.70
.0670	#51	1.701 mm	.787	<b>20.00 mm</b>	(10x)	3 mm	63 mm	ERY0670-C8	50.10
.0670	#51	1.701 mm	.906	<b>23.00 mm</b>	(12x)	3 mm	63 mm	DQW0670-C8	51.60
.0700	#50	1.778 mm	.335	<b>8.50 mm</b>	(3x)	3 mm	50 mm	AVA0700-C8	44.90
.0700	#50	1.778 mm	.472	<b>12.00 mm</b>	(5x)	3 mm	50 mm	BAF0700-C8	45.90
.0700	#50	1.778 mm	.689	<b>17.50 mm</b>	(8x)	3 mm	63 mm	CBG0700-C8	48.70
.0700	#50	1.778 mm	.827	<b>21.00 mm</b>	(10x)	3 mm	63 mm	ERY0700-C8	50.10
.0700	#50	1.778 mm	.945	<b>24.00 mm</b>	(12x)	3 mm	63 mm	DQW0700-C8	51.60
.0730	#49	1.854 mm	.354	<b>9.00 mm</b>	(3x)	3 mm	50 mm	AVA0730-C8	44.90
.0730	#49	1.854 mm	.492	<b>12.50 mm</b>	(5x)	3 mm	50 mm	BAF0730-C8	45.90
.0730	#49	1.854 mm	.709	<b>18.00 mm</b>	(8x)	3 mm	63 mm	CBG0730-C8	48.70
.0730	#49	1.854 mm	.866	<b>22.00 mm</b>	(10x)	3 mm	63 mm	ERY0730-C8	50.10
.0730	#49	1.854 mm	.984	<b>25.00 mm</b>	(12x)	3 mm	63 mm	DQW0730-C8	51.60
.0760	#48	1.930 mm	.354	<b>9.00 mm</b>	(3x)	3 mm	50 mm	AVA0760-C8	44.90
.0760	#48	1.930 mm	.512	<b>13.00 mm</b>	(5x)	3 mm	50 mm	BAF0760-C8	45.90
.0760	#48	1.930 mm	.748	<b>19.00 mm</b>	(8x)	3 mm	63 mm	CBG0760-C8	48.70
.0760	#48	1.930 mm	.906	<b>23.00 mm</b>	(10x)	3 mm	63 mm	ERY0760-C8	50.10
.0760	#48	1.930 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	DQW0760-C8	51.60
.0781 (5/64)		1.984 mm	.374	<b>9.50 mm</b>	(3x)	3 mm	50 mm	AVA0781-C8	44.90
.0781 (5/64)		1.984 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BAF0781-C8	45.90
.0781 (5/64)		1.984 mm	.768	<b>19.50 mm</b>	(8x)	3 mm	63 mm	CBG0781-C8	48.70

continued on next page

ALUMINUM ALLOYS

# MINIATURE HIGH PERFORMANCE DRILLS

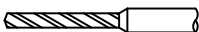
## Aluminum Alloys (cont.)

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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> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>		
.0781 (5/64)		1.984 mm	.906	<b>23.00 mm</b>	(10x)	3 mm	63 mm	ERY0781-C8	50.10
.0781 (5/64)		1.984 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	DQW0781-C8	51.60
.0785	#47	1.993 mm	.374	<b>9.50 mm</b>	(3x)	3 mm	50 mm	AVA0785-C8	44.90
.0785	#47	1.993 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	BAF0785-C8	45.90
.0785	#47	1.993 mm	.768	<b>19.50 mm</b>	(8x)	3 mm	63 mm	CBG0785-C8	48.70
.0785	#47	1.993 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	DQW0785-C8	51.60
.0787		2.000 mm	.374	<b>9.50 mm</b>	(3x)	4 mm	50 mm	AVA0787-C8	46.10
.0787		2.000 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	BAF0787-C8	47.10
.0787		2.000 mm	.768	<b>19.50 mm</b>	(8x)	4 mm	63 mm	CBG0787-C8	49.80
.0787		2.000 mm	.945	<b>24.00 mm</b>	(10x)	4 mm	63 mm	ERY0787-C8	51.20
.0787		2.000 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	DQW0787-C8	52.60
.0800		2.032 mm	.374	<b>9.50 mm</b>	(3x)	4 mm	50 mm	AVA0800-C8	46.10
.0800		2.032 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	BAF0800-C8	47.10
.0800		2.032 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	CBG0800-C8	49.80
.0800		2.032 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	DQW0800-C8	52.60
.0810	#46	2.057 mm	.394	<b>10.00 mm</b>	(3x)	4 mm	50 mm	AVA0810-C8	46.10
.0810	#46	2.057 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BAF0810-C8	47.10
.0810	#46	2.057 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	CBG0810-C8	49.80
.0810	#46	2.057 mm	.945	<b>24.00 mm</b>	(10x)	4 mm	63 mm	ERY0810-C8	51.20
.0810	#46	2.057 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	DQW0810-C8	52.60
.0820	#45	2.082 mm	.394	<b>10.00 mm</b>	(3x)	4 mm	50 mm	AVA0820-C8	46.10
.0820	#45	2.082 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BAF0820-C8	47.10
.0820	#45	2.082 mm	.787	<b>20.00 mm</b>	(8x)	4 mm	63 mm	CBG0820-C8	49.80
.0820	#45	2.082 mm	1.142	<b>29.00 mm</b>	(12x)	4 mm	75 mm	DQW0820-C8	52.60
.0860	#44	2.184 mm	.413	<b>10.50 mm</b>	(3x)	4 mm	50 mm	AVA0860-C8	46.10
.0860	#44	2.184 mm	.571	<b>14.50 mm</b>	(5x)	4 mm	50 mm	BAF0860-C8	47.10
.0860	#44	2.184 mm	.827	<b>21.00 mm</b>	(8x)	4 mm	63 mm	CBG0860-C8	49.80
.0860	#44	2.184 mm	1.024	<b>26.00 mm</b>	(10x)	4 mm	63 mm	ERY0860-C8	51.20
.0860	#44	2.184 mm	1.181	<b>30.00 mm</b>	(12x)	4 mm	75 mm	DQW0860-C8	52.60
.0890	#43	2.260 mm	.413	<b>10.50 mm</b>	(3x)	4 mm	50 mm	AVA0890-C8	46.10
.0890	#43	2.260 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BAF0890-C8	47.10
.0890	#43	2.260 mm	.866	<b>22.00 mm</b>	(8x)	4 mm	63 mm	CBG0890-C8	49.80
.0890	#43	2.260 mm	1.063	<b>27.00 mm</b>	(10x)	4 mm	63 mm	ERY0890-C8	51.20
.0890	#43	2.260 mm	1.220	<b>31.00 mm</b>	(12x)	4 mm	75 mm	DQW0890-C8	52.60
.0900		2.286 mm	.433	<b>11.00 mm</b>	(3x)	4 mm	50 mm	AVA0900-C8	46.10
.0900		2.286 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BAF0900-C8	47.10
.0900		2.286 mm	.866	<b>22.00 mm</b>	(8x)	4 mm	63 mm	CBG0900-C8	49.80
.0900		2.286 mm	1.220	<b>31.00 mm</b>	(12x)	4 mm	75 mm	DQW0900-C8	52.60
.0935	#42	2.374 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	AVA0935-C8	46.10
.0935	#42	2.374 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BAF0935-C8	47.10
.0935	#42	2.374 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	CBG0935-C8	49.80
.0935	#42	2.374 mm	1.102	<b>28.00 mm</b>	(10x)	4 mm	63 mm	ERY0935-C8	51.20
.0935	#42	2.374 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	DQW0935-C8	52.60
.0937 (3/32)		2.381 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	AVA0937-C8	46.10
.0937 (3/32)		2.381 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BAF0937-C8	47.10
.0937 (3/32)		2.381 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	CBG0937-C8	49.80
.0937 (3/32)		2.381 mm	1.102	<b>28.00 mm</b>	(10x)	4 mm	63 mm	ERY0937-C8	51.20
.0937 (3/32)		2.381 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	DQW0937-C8	52.60

ALUMINUM ALLOYS

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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> $\begin{matrix} +.000\text{mm} \\ -.013\text{mm} \end{matrix}$		L <sub>2</sub> $\begin{matrix} +.25\text{mm} \\ -.00\text{mm} \end{matrix}$		D <sub>2</sub> (h6)	L <sub>1</sub>		
.0960	#41	2.438 mm	.453	<b>11.50 mm</b>	(3x)	4 mm	50 mm	AVA0960-C8	46.10
.0960	#41	2.438 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BAF0960-C8	47.10
.0960	#41	2.438 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	CBG0960-C8	49.80
.0960	#41	2.438 mm	1.142	<b>29.00 mm</b>	(10x)	4 mm	75 mm	ERY0960-C8	51.20
.0960	#41	2.438 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	DQW0960-C8	52.60
.0980	#40	2.489 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	AVA0980-C8	46.10
.0980	#40	2.489 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BAF0980-C8	47.10
.0980	#40	2.489 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	CBG0980-C8	49.80
.0980	#40	2.489 mm	1.142	<b>29.00 mm</b>	(10x)	4 mm	75 mm	ERY0980-C8	51.20
.0980	#40	2.489 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	DQW0980-C8	52.60
.0984		2.500 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	AVA0984-C8	46.50
.0984		2.500 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BAF0984-C8	47.50
.0984		2.500 mm	.945	<b>24.00 mm</b>	(8x)	4 mm	63 mm	CBG0984-C8	50.20
.0984		2.500 mm	1.142	<b>29.00 mm</b>	(10x)	4 mm	75 mm	ERY0984-C8	51.60
.0984		2.500 mm	1.339	<b>34.00 mm</b>	(12x)	4 mm	75 mm	DQW0984-C8	52.90
.0995	#39	2.527 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	AVA0995-C8	46.50
.0995	#39	2.527 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BAF0995-C8	47.50
.0995	#39	2.527 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	CBG0995-C8	50.20
.0995	#39	2.527 mm	1.181	<b>30.00 mm</b>	(10x)	4 mm	75 mm	ERY0995-C8	51.60
.0995	#39	2.527 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	DQW0995-C8	52.90
.1000		2.540 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	AVA1000-C8	46.50
.1000		2.540 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BAF1000-C8	47.50
.1000		2.540 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	CBG1000-C8	50.20
.1000		2.540 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	DQW1000-C8	52.90
.1015	#38	2.578 mm	.472	<b>12.00 mm</b>	(3x)	4 mm	50 mm	AVA1015-C8	46.50
.1015	#38	2.578 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BAF1015-C8	47.50
.1015	#38	2.578 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	CBG1015-C8	50.20
.1015	#38	2.578 mm	1.181	<b>30.00 mm</b>	(10x)	4 mm	75 mm	ERY1015-C8	51.60
.1015	#38	2.578 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	DQW1015-C8	52.90
.1040	#37	2.641 mm	.492	<b>12.50 mm</b>	(3x)	4 mm	50 mm	AVA1040-C8	46.50
.1040	#37	2.641 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BAF1040-C8	47.50
.1040	#37	2.641 mm	1.024	<b>26.00 mm</b>	(8x)	4 mm	63 mm	CBG1040-C8	50.20
.1040	#37	2.641 mm	1.220	<b>31.00 mm</b>	(10x)	4 mm	75 mm	ERY1040-C8	51.60
.1040	#37	2.641 mm	1.417	<b>36.00 mm</b>	(12x)	4 mm	75 mm	DQW1040-C8	52.90
.1065	#36	2.705 mm	.512	<b>13.00 mm</b>	(3x)	4 mm	50 mm	AVA1065-C8	46.50
.1065	#36	2.705 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BAF1065-C8	47.50
.1065	#36	2.705 mm	1.024	<b>26.00 mm</b>	(8x)	4 mm	63 mm	CBG1065-C8	50.20
.1065	#36	2.705 mm	1.260	<b>32.00 mm</b>	(10x)	4 mm	75 mm	ERY1065-C8	51.60
.1065	#36	2.705 mm	1.457	<b>37.00 mm</b>	(12x)	4 mm	75 mm	DQW1065-C8	52.90
.1093 (7/64)		2.778 mm	.512	<b>13.00 mm</b>	(3x)	4 mm	50 mm	AVA1093-C8	46.50
.1093 (7/64)		2.778 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BAF1093-C8	47.50
.1093 (7/64)		2.778 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	CBG1093-C8	50.20
.1093 (7/64)		2.778 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	ERY1093-C8	51.60
.1093 (7/64)		2.778 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	DQW1093-C8	52.90
.1100	#35	2.794 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	AVA1100-C8	46.50
.1100	#35	2.794 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BAF1100-C8	47.50
.1100	#35	2.794 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	CBG1100-C8	50.20
.1100	#35	2.794 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	ERY1100-C8	51.60

ALUMINUM ALLOYS

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# MINIATURE HIGH PERFORMANCE DRILLS

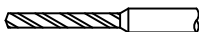
## Aluminum Alloys (cont.)

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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> / <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
.1100	#35	2.794 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	DQW1100-C8	52.90
.1110	#34	2.819 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	AVA1110-C8	46.50
.1110	#34	2.819 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BAF1110-C8	47.50
.1110	#34	2.819 mm	1.063	<b>27.00 mm</b>	(8x)	4 mm	63 mm	CBG1110-C8	50.20
.1110	#34	2.819 mm	1.299	<b>33.00 mm</b>	(10x)	4 mm	75 mm	ERY1110-C8	51.60
.1110	#34	2.819 mm	1.535	<b>39.00 mm</b>	(12x)	4 mm	75 mm	DQW1110-C8	52.90
.1130	#33	2.870 mm	.531	<b>13.50 mm</b>	(3x)	4 mm	50 mm	AVA1130-C8	46.50
.1130	#33	2.870 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BAF1130-C8	47.50
.1130	#33	2.870 mm	1.102	<b>28.00 mm</b>	(8x)	4 mm	63 mm	CBG1130-C8	50.20
.1130	#33	2.870 mm	1.339	<b>34.00 mm</b>	(10x)	4 mm	75 mm	ERY1130-C8	51.60
.1130	#33	2.870 mm	1.535	<b>39.00 mm</b>	(12x)	4 mm	75 mm	DQW1130-C8	52.90
.1160	#32	2.946 mm	.551	<b>14.00 mm</b>	(3x)	4 mm	50 mm	AVA1160-C8	46.50
.1160	#32	2.946 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BAF1160-C8	47.50
.1160	#32	2.946 mm	1.142	<b>29.00 mm</b>	(8x)	4 mm	63 mm	CBG1160-C8	50.20
.1160	#32	2.946 mm	1.575	<b>40.00 mm</b>	(12x)	4 mm	75 mm	DQW1160-C8	52.90
.1181		3.000 mm	.571	<b>14.50 mm</b>	(3x)	4 mm	50 mm	AVA1181-C8	47.50
.1181		3.000 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BAF1181-C8	48.70
.1181		3.000 mm	1.142	<b>29.00 mm</b>	(8x)	4 mm	63 mm	CBG1181-C8	51.20
.1181		3.000 mm	1.378	<b>35.00 mm</b>	(10x)	4 mm	75 mm	ERY1181-C8	52.60
.1181		3.000 mm	1.654	<b>42.00 mm</b>	(12x)	4 mm	100 mm	DQW1181-C8	54.00

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>	3 FL	PRICE
.1200	#31	3.048 mm	.571	<b>14.50 mm</b>	(3x)	6 mm	63 mm	AVA1200-C8	58.80
.1200	#31	3.048 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BAF1200-C8	60.00
.1200	#31	3.048 mm	1.181	<b>30.00 mm</b>	(8x)	6 mm	75 mm	CBG1200-C8	61.30
.1200	#31	3.048 mm	1.654	<b>42.00 mm</b>	(12x)	6 mm	100 mm	DQW1200-C8	63.80
.1250 (1/8)		3.175 mm	.591	<b>15.00 mm</b>	(3x)	6 mm	63 mm	AVA1250-C8	58.80
.1250 (1/8)		3.175 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BAF1250-C8	60.00
.1250 (1/8)		3.175 mm	1.220	<b>31.00 mm</b>	(8x)	6 mm	75 mm	CBG1250-C8	61.30
.1250 (1/8)		3.175 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	DQW1250-C8	63.80
.1285	#30	3.263 mm	.866	<b>22.00 mm</b>	(5x)	6 mm	63 mm	BAF1285-C8	60.00
.1285	#30	3.263 mm	1.732	<b>44.00 mm</b>	(12x)	6 mm	100 mm	DQW1285-C8	63.80
.1360	#29	3.454 mm	.630	<b>16.00 mm</b>	(3x)	6 mm	63 mm	AVA1360-C8	58.80
.1360	#29	3.454 mm	.906	<b>23.00 mm</b>	(5x)	6 mm	63 mm	BAF1360-C8	60.00
.1360	#29	3.454 mm	1.339	<b>34.00 mm</b>	(8x)	6 mm	75 mm	CBG1360-C8	61.30
.1360	#29	3.454 mm	1.575	<b>40.00 mm</b>	(10x)	6 mm	100 mm	ERY1360-C8	62.60
.1360	#29	3.454 mm	1.890	<b>48.00 mm</b>	(12x)	6 mm	100 mm	DQW1360-C8	63.80
.1405	#28	3.568 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BAF1405-C8	60.00
.1405	#28	3.568 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	DQW1405-C8	63.80
.1406 (9/64)		3.571 mm	.669	<b>17.00 mm</b>	(3x)	6 mm	63 mm	AVA1406-C8	58.80
.1406 (9/64)		3.571 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BAF1406-C8	60.00
.1406 (9/64)		3.571 mm	1.378	<b>35.00 mm</b>	(8x)	6 mm	75 mm	CBG1406-C8	61.30
.1406 (9/64)		3.571 mm	1.654	<b>42.00 mm</b>	(10x)	6 mm	100 mm	ERY1406-C8	62.60
.1406 (9/64)		3.571 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	DQW1406-C8	63.80
.1440	#27	3.657 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BAF1440-C8	60.00
.1440	#27	3.657 mm	1.969	<b>50.00 mm</b>	(12x)	6 mm	100 mm	DQW1440-C8	63.80
.1470	#26	3.733 mm	.709	<b>18.00 mm</b>	(3x)	6 mm	63 mm	AVA1470-C8	58.80
.1470	#26	3.733 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BAF1470-C8	60.00
.1470	#26	3.733 mm	1.417	<b>36.00 mm</b>	(8x)	6 mm	100 mm	CBG1470-C8	61.30

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## MINIATURE HIGH PERFORMANCE DRILLS

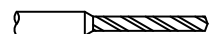
Aluminum Alloys (cont.)

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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>+ .000mm</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
.1470	#26	3.733 mm	1.732	<b>44.00 mm</b>	(10x)	6 mm	100 mm	ERY1470-C8	62.60
.1470	#26	3.733 mm	2.047	<b>52.00 mm</b>	(12x)	6 mm	100 mm	DQW1470-C8	63.80
.1495	#25	3.797 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BAF1495-C8	60.00
.1495	#25	3.797 mm	2.047	<b>52.00 mm</b>	(12x)	6 mm	100 mm	DQW1495-C8	63.80
.1520	#24	3.860 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BAF1520-C8	60.00
.1520	#24	3.860 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	DQW1520-C8	63.80
.1540	#23	3.911 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BAF1540-C8	60.00
.1540	#23	3.911 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	DQW1540-C8	63.80
.1562 (5/32)		3.968 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	AVA1562-C8	58.80
.1562 (5/32)		3.968 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BAF1562-C8	60.00
.1562 (5/32)		3.968 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	CBG1562-C8	61.30
.1562 (5/32)		3.968 mm	1.811	<b>46.00 mm</b>	(10x)	6 mm	100 mm	ERY1562-C8	62.60
.1562 (5/32)		3.968 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	DQW1562-C8	63.80
.1570	#22	3.987 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BAF1570-C8	60.00
.1570	#22	3.987 mm	2.126	<b>54.00 mm</b>	(12x)	6 mm	100 mm	DQW1570-C8	63.80
.1574		4.000 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	AVA1574-C8	58.80
.1574		4.000 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BAF1574-C8	60.00
.1574		4.000 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	CBG1574-C8	61.30
.1574		4.000 mm	1.890	<b>48.00 mm</b>	(10x)	6 mm	100 mm	ERY1574-C8	62.60
.1574		4.000 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	DQW1574-C8	63.80
.1590	#21	4.038 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	63 mm	AVA1590-C8	58.80
.1590	#21	4.038 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BAF1590-C8	60.00
.1590	#21	4.038 mm	1.535	<b>39.00 mm</b>	(8x)	6 mm	100 mm	CBG1590-C8	61.30
.1590	#21	4.038 mm	1.890	<b>48.00 mm</b>	(10x)	6 mm	100 mm	ERY1590-C8	62.60
.1590	#21	4.038 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	DQW1590-C8	63.80
.1610	#20	4.089 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BAF1610-C8	60.00
.1610	#20	4.089 mm	2.205	<b>56.00 mm</b>	(12x)	6 mm	100 mm	DQW1610-C8	63.80
.1660	#19	4.216 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BAF1660-C8	60.00
.1660	#19	4.216 mm	2.283	<b>58.00 mm</b>	(12x)	6 mm	100 mm	DQW1660-C8	63.80
.1695	#18	4.305 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BAF1695-C8	60.00
.1695	#18	4.305 mm	2.362	<b>60.00 mm</b>	(12x)	6 mm	100 mm	DQW1695-C8	63.80
.1718 (11/64)		4.365 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	AVA1718-C8	58.80
.1718 (11/64)		4.365 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BAF1718-C8	60.00
.1718 (11/64)		4.365 mm	1.654	<b>42.00 mm</b>	(8x)	6 mm	100 mm	CBG1718-C8	61.30
.1718 (11/64)		4.365 mm	2.047	<b>52.00 mm</b>	(10x)	6 mm	100 mm	ERY1718-C8	62.60
.1718 (11/64)		4.365 mm	2.362	<b>60.00 mm</b>	(12x)	6 mm	100 mm	DQW1718-C8	63.80
.1730	#17	4.394 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BAF1730-C8	60.00
.1730	#17	4.394 mm	2.362	<b>60.00 mm</b>	(12x)	6 mm	100 mm	DQW1730-C8	63.80
.1770	#16	4.495 mm	.827	<b>21.00 mm</b>	(3x)	6 mm	63 mm	AVA1770-C8	58.80
.1770	#16	4.495 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BAF1770-C8	60.00
.1770	#16	4.495 mm	1.732	<b>44.00 mm</b>	(8x)	6 mm	100 mm	CBG1770-C8	61.30
.1770	#16	4.495 mm	2.047	<b>52.00 mm</b>	(10x)	6 mm	100 mm	ERY1770-C8	62.60
.1770	#16	4.495 mm	2.441	<b>62.00 mm</b>	(12x)	6 mm	125 mm	DQW1770-C8	63.80
.1800	#15	4.572 mm	.866	<b>22.00 mm</b>	(3x)	6 mm	63 mm	AVA1800-C8	58.80
.1800	#15	4.572 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BAF1800-C8	60.00
.1800	#15	4.572 mm	1.732	<b>44.00 mm</b>	(8x)	6 mm	100 mm	CBG1800-C8	61.30
.1800	#15	4.572 mm	2.126	<b>54.00 mm</b>	(10x)	6 mm	100 mm	ERY1800-C8	62.60
.1800	#15	4.572 mm	2.441	<b>62.00 mm</b>	(12x)	6 mm	125 mm	DQW1800-C8	63.80

ALUMINUM ALLOYS

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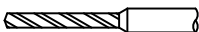
# MINIATURE HIGH PERFORMANCE DRILLS

## 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>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>±.75mm</sup> / <sub>-.00mm</sub>					
.1820	#14	4.622 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BAF1820-C8	60.00
.1820	#14	4.622 mm	2.520	<b>64.00 mm</b>	(12x)	6 mm	125 mm	DQW1820-C8	63.80
.1850	#13	4.700 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BAF1850-C8	60.00
.1850	#13	4.700 mm	2.520	<b>64.00 mm</b>	(12x)	6 mm	125 mm	DQW1850-C8	63.80
.1875 (3/16)		4.762 mm	.906	<b>23.00 mm</b>	(3x)	6 mm	63 mm	AVA1875-C8	58.80
.1875 (3/16)		4.762 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BAF1875-C8	60.00
.1875 (3/16)		4.762 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	CBG1875-C8	61.30
.1875 (3/16)		4.762 mm	2.205	<b>56.00 mm</b>	(10x)	6 mm	100 mm	ERY1875-C8	62.60
.1875 (3/16)		4.762 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	DQW1875-C8	63.80
.1890	#12	4.800 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BAF1890-C8	60.00
.1890	#12	4.800 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	DQW1890-C8	63.80
.1910	#11	4.851 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BAF1910-C8	60.00
.1910	#11	4.851 mm	2.598	<b>66.00 mm</b>	(12x)	6 mm	125 mm	DQW1910-C8	63.80
.1935	#10	4.914 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF1935-C8	60.00
.1935	#10	4.914 mm	2.677	<b>68.00 mm</b>	(12x)	6 mm	125 mm	DQW1935-C8	63.80
.1960	#9	4.978 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF1960-C8	60.00
.1960	#9	4.978 mm	2.677	<b>68.00 mm</b>	(12x)	6 mm	125 mm	DQW1960-C8	63.80
.1968		5.000 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	AVA1968-C8	58.80
.1968		5.000 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF1968-C8	60.00
.1968		5.000 mm	1.890	<b>48.00 mm</b>	(8x)	6 mm	100 mm	CBG1968-C8	61.30
.1968		5.000 mm	2.283	<b>58.00 mm</b>	(10x)	6 mm	100 mm	ERY1968-C8	62.60
.1968		5.000 mm	2.677	<b>68.00 mm</b>	(12x)	6 mm	125 mm	DQW1968-C8	63.80
.1990	#8	5.054 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF1990-C8	60.00
.1990	#8	5.054 mm	2.756	<b>70.00 mm</b>	(12x)	6 mm	125 mm	DQW1990-C8	63.80
.2009	#7	5.105 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	AVA2009-C8	58.80
.2009	#7	5.105 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF2009-C8	60.00
.2009	#7	5.105 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	CBG2009-C8	61.30
.2009	#7	5.105 mm	2.362	<b>60.00 mm</b>	(10x)	6 mm	100 mm	ERY2009-C8	62.60
.2009	#7	5.105 mm	2.756	<b>70.00 mm</b>	(12x)	6 mm	125 mm	DQW2009-C8	63.80
.2031 (13/64)		5.159 mm	.945	<b>24.00 mm</b>	(3x)	6 mm	63 mm	AVA2031-C8	58.80
.2031 (13/64)		5.159 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF2031-C8	60.00
.2031 (13/64)		5.159 mm	1.969	<b>50.00 mm</b>	(8x)	6 mm	100 mm	CBG2031-C8	61.30
.2031 (13/64)		5.159 mm	2.362	<b>60.00 mm</b>	(10x)	6 mm	100 mm	ERY2031-C8	62.60
.2031 (13/64)		5.159 mm	2.756	<b>70.00 mm</b>	(12x)	6 mm	125 mm	DQW2031-C8	63.80
.2040	#6	5.181 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BAF2040-C8	60.00
.2040	#6	5.181 mm	2.835	<b>72.00 mm</b>	(12x)	6 mm	125 mm	DQW2040-C8	63.80
.2055	#5	5.219 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BAF2055-C8	60.00
.2055	#5	5.219 mm	2.835	<b>72.00 mm</b>	(12x)	6 mm	125 mm	DQW2055-C8	63.80
.2090	#4	5.308 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BAF2090-C8	60.00
.2090	#4	5.308 mm	2.835	<b>72.00 mm</b>	(12x)	6 mm	125 mm	DQW2090-C8	63.80
.2129	#3	5.410 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	AVA2129-C8	58.80
.2129	#3	5.410 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BAF2129-C8	60.00
.2129	#3	5.410 mm	2.047	<b>52.00 mm</b>	(8x)	6 mm	100 mm	CBG2129-C8	61.30
.2129	#3	5.410 mm	2.520	<b>64.00 mm</b>	(10x)	6 mm	125 mm	ERY2129-C8	62.60
.2129	#3	5.410 mm	2.913	<b>74.00 mm</b>	(12x)	6 mm	125 mm	DQW2129-C8	63.80
.2187 (7/32)		5.556 mm	1.024	<b>26.00 mm</b>	(3x)	6 mm	75 mm	AVA2187-C8	58.80
.2187 (7/32)		5.556 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BAF2187-C8	60.00
.2187 (7/32)		5.556 mm	2.126	<b>54.00 mm</b>	(8x)	6 mm	100 mm	CBG2187-C8	61.30

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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>+ .000mm</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
.2187 (7/32)		5.556 mm	2.598	<b>66.00 mm</b>	(10x)	6 mm	125 mm	ERY2187-C8	62.60
.2187 (7/32)		5.556 mm	2.992	<b>76.00 mm</b>	(12x)	6 mm	125 mm	DQW2187-C8	63.80
.2210	#2	5.613 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BAF2210-C8	60.00
.2210	#2	5.613 mm	3.071	<b>78.00 mm</b>	(12x)	6 mm	125 mm	DQW2210-C8	63.80
.2280	#1	5.791 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BAF2280-C8	60.00
.2280	#1	5.791 mm	3.150	<b>80.00 mm</b>	(12x)	6 mm	125 mm	DQW2280-C8	63.80
.2340	A	5.943 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BAF2340-C8	60.00
.2340	A	5.943 mm	3.228	<b>82.00 mm</b>	(12x)	6 mm	125 mm	DQW2340-C8	63.80
.2343 (15/64)		5.953 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	AVA2343-C8	58.80
.2343 (15/64)		5.953 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BAF2343-C8	60.00
.2343 (15/64)		5.953 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	CBG2343-C8	61.30
.2343 (15/64)		5.953 mm	2.756	<b>70.00 mm</b>	(10x)	6 mm	125 mm	ERY2343-C8	62.60
.2343 (15/64)		5.953 mm	3.228	<b>82.00 mm</b>	(12x)	6 mm	125 mm	DQW2343-C8	63.80
.2362		6.000 mm	1.102	<b>28.00 mm</b>	(3x)	6 mm	75 mm	AVA2362-C8	58.80
.2362		6.000 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BAF2362-C8	60.00
.2362		6.000 mm	2.283	<b>58.00 mm</b>	(8x)	6 mm	100 mm	CBG2362-C8	61.30
.2362		6.000 mm	2.756	<b>70.00 mm</b>	(10x)	6 mm	125 mm	ERY2362-C8	62.60
.2362		6.000 mm	3.228	<b>82.00 mm</b>	(12x)	6 mm	125 mm	DQW2362-C8	63.80
.2380	B	6.045 mm	1.575	<b>40.00 mm</b>	(5x)	8 mm	100 mm	BAF2380-C8	62.10
.2380	B	6.045 mm	3.307	<b>84.00 mm</b>	(12x)	8 mm	125 mm	DQW2380-C8	65.90
.2420	C	6.146 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BAF2420-C8	62.10
.2420	C	6.146 mm	3.307	<b>84.00 mm</b>	(12x)	8 mm	125 mm	DQW2420-C8	65.90
.2460	D	6.248 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BAF2460-C8	62.10
.2460	D	6.248 mm	3.386	<b>86.00 mm</b>	(12x)	8 mm	150 mm	DQW2460-C8	65.90
.2500 (1/4)	E	6.350 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	75 mm	AVA2500-C8	58.80
.2500 (1/4)	E	6.350 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BAF2500-C8	60.00
.2500 (1/4)	E	6.350 mm	2.441	<b>62.00 mm</b>	(8x)	8 mm	125 mm	CBG2500-C8	61.30
.2500 (1/4)	E	6.350 mm	2.913	<b>74.00 mm</b>	(10x)	8 mm	125 mm	ERY2500-C8	62.60
.2500 (1/4)	E	6.350 mm	3.465	<b>88.00 mm</b>	(12x)	8 mm	150 mm	DQW2500-C8	63.80
.2570	F	6.528 mm	1.732	<b>44.00 mm</b>	(5x)	8 mm	100 mm	BAF2570-C8	68.20
.2812 (9/32)		7.142 mm	1.890	<b>48.00 mm</b>	(5x)	8 mm	100 mm	BAF2812-C8	68.20
.3125 (5/16)		7.937 mm	2.126	<b>54.00 mm</b>	(5x)	8 mm	100 mm	BAF3125-C8	68.20
.3150		8.000 mm	2.126	<b>54.00 mm</b>	(5x)	8 mm	100 mm	BAF3150-C8	68.20
.3750 (3/8)		9.525 mm	2.520	<b>64.00 mm</b>	(5x)	10 mm	125 mm	BAF3750-C8	117.00
.3937		10.000 mm	2.677	<b>68.00 mm</b>	(5x)	10 mm	125 mm	BAF3937-C8	117.00
.4375 (7/16)		11.112 mm	2.992	<b>76.00 mm</b>	(5x)	12 mm	125 mm	BAF4375-C8	148.50
.4724		12.000 mm	3.228	<b>82.00 mm</b>	(5x)	12 mm	125 mm	BAF4724-C8	148.50
.5000 (1/2)		12.700 mm	3.386	<b>86.00 mm</b>	(5x)	16 mm	150 mm	BAF5000-C8	261.00

ALUMINUM ALLOYS

See Speeds &amp; Feeds on next page



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# MINIATURE HIGH PERFORMANCE DRILLS

## Aluminum Alloys (cont.)

ALUMINUM ALLOYS

### SPEEDS & FEEDS (Miniature High Performance Drills – Aluminum Alloys)

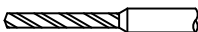
**Important Note:** Values in table are in inches and are based on 3x and 5x drill lengths. For longer lengths, table values of IPR must be reduced (for 8x and 10x, reduce to 75%; for 12x, reduce to 65%). Pecking cycles are recommended to avoid chip packing and breakage. The initial peck depth should 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).

Material (Hardness: ≤ 28 Rc)	SFM	Chip Load IPR (Inches Per Revolution) By Drill Diameter								
		.015	.031	.047	.062	.078	.093	.125	.187	.250
<b>Aluminum Alloys:</b> Casting (2xx, 5xx, 7xx, 8xx)	450									
Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	600	.00079	.00164	.00248	.00327	.00412	.00491	.00660	.00987	.01320
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	.00071	.00147	.00223	.00295	.00371	.00442	.00594	.00889	.01188
Wrought - 5%-8% Si (4xxx)	600									
Wrought - 8%-12% Si (4xxx)	480									
<b>Magnesium Alloys</b>	900									
<b>Zinc Alloys</b>	480	.00079	.00164	.00248	.00327	.00412	.00491	.00660	.00987	.01320
<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	.00063	.00131	.00199	.00262	.00329	.00393	.00528	.00790	.01056
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
Reinforced Plastics	350	.00063	.00131	.00199	.00329	.00393	.00528	.00790	.01056	.01584



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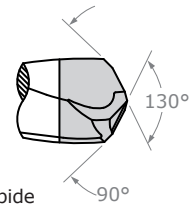
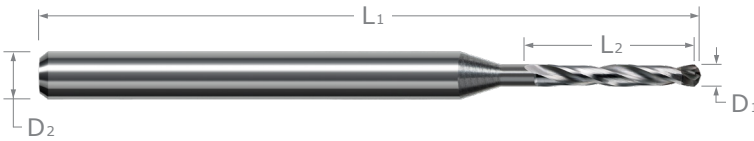
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# MINIATURE HIGH PERFORMANCE DRILLS

## 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

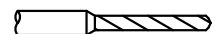
DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	PCD DIAMOND	
inch	wire	metric	inch	metric	hole depth	D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
		D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-.013mm</sub>		L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-.00mm</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.0937 (3/32)		2.381 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BCF0937	523.40
.1181		3.000 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BCF1181	523.40
		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	481.50
.1299		3.300 mm	.866	<b>22.00 mm</b>	(5x)	6 mm	63 mm	BCF1299	481.50
.1650		4.190 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BCF1650	532.20
.1875 (3/16)		4.762 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BCF1875	532.20
.1910	#11	4.851 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BCF1910	532.20
.2500 (1/4)	E	6.350 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BCF2500	612.80
.2510		6.375 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BCF2510	612.80

*For PCD End Mills, see pages 195 and 196.*

### SPEEDS & FEEDS (Miniature High Performance Drills – PCD Diamond)

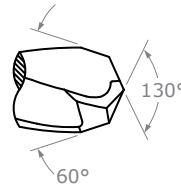
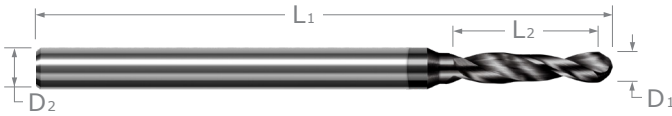
**Important Note:** Values in table are in inches and are based on 5x drill lengths. Since the melting point varies greatly from in plastics, the speed (RPM) used should be closely supervised. An additional reduction in RPM may be necessary to avoid excessive fraying, splitting and tear out of fibers. 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.harveytol.com](http://www.harveytol.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
Nycol, 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

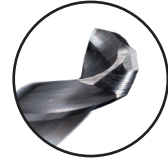


# MINIATURE HIGH PERFORMANCE DRILLS

## 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

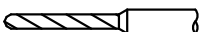


Double Angle Point Geometry Prevents Delamination

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	54.40
.0314	.800 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	DDA0315-C4	54.40
.0320	#67 .812 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	DDA0320-C4	54.40
.0330	#66 .838 mm	.220	<b>5.60 mm</b>	(5x)	3 mm	50 mm	DDA0330-C4	54.40
.0350	#65 .889 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	DDA0350-C4	54.40
.0354	.900 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	DDA0354-C4	54.40
.0360	#64 .914 mm	.244	<b>6.20 mm</b>	(5x)	3 mm	50 mm	DDA0360-C4	54.40
.0370	#63 .939 mm	.252	<b>6.40 mm</b>	(5x)	3 mm	50 mm	DDA0370-C4	54.40
.0380	#62 .965 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	DDA0380-C4	54.40
.0390	#61 .990 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	DDA0390-C4	54.40
.0393	1.000 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	DDA0393-C4	55.80
.0400	#60 1.016 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	DDA0400-C4	55.80
.0410	#59 1.041 mm	.276	<b>7.00 mm</b>	(5x)	3 mm	50 mm	DDA0410-C4	55.80
.0420	#58 1.066 mm	.283	<b>7.20 mm</b>	(5x)	3 mm	50 mm	DDA0420-C4	55.80
.0430	#57 1.092 mm	.291	<b>7.40 mm</b>	(5x)	3 mm	50 mm	DDA0430-C4	55.80
.0450	1.143 mm	.307	<b>7.80 mm</b>	(5x)	3 mm	50 mm	DDA0450-C4	55.80
.0465	#56 1.181 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	DDA0465-C4	55.80
.0468 (3/64)	1.190 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	DDA0468-C4	55.80
.0492	1.250 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	DDA0492-C4	55.80
.0500	1.270 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	DDA0500-C4	55.80
.0520	#55 1.320 mm	.354	<b>9.00 mm</b>	(5x)	3 mm	50 mm	DDA0520-C4	55.80
.0550	#54 1.397 mm	.374	<b>9.50 mm</b>	(5x)	3 mm	50 mm	DDA0550-C4	55.80
.0590	1.500 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	DDA0590-C4	56.60
.0595	#53 1.511 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	DDA0595-C4	56.60
.0600	1.524 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	DDA0600-C4	56.60
.0625 (1/16)	1.587 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	DDA0625-C4	56.60
.0635	#52 1.612 mm	.433	<b>11.00 mm</b>	(5x)	3 mm	50 mm	DDA0635-C4	56.60
.0670	#51 1.701 mm	.453	<b>11.50 mm</b>	(5x)	3 mm	50 mm	DDA0670-C4	56.60

continued on next page



# MINIATURE HIGH PERFORMANCE DRILLS

Composites – Double Angle (cont.)

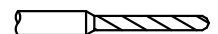
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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AMORPHOUS DIAMOND	
inch	wire	metric	inch	metric	hole depth				
		D <sub>1</sub> +.000mm -.013mm		L <sub>2</sub> +.25mm -.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>	2 FL	PRICE
.0700	#50	1.778 mm	.472	<b>12.00 mm</b>	(5x)	3 mm	50 mm	DDA0700-C4	56.60
.0730	#49	1.854 mm	.492	<b>12.50 mm</b>	(5x)	3 mm	50 mm	DDA0730-C4	56.60
.0760	#48	1.930 mm	.512	<b>13.00 mm</b>	(5x)	3 mm	50 mm	DDA0760-C4	56.60
.0781 (5/64)		1.984 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	DDA0781-C4	56.60
.0785	#47	1.993 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	DDA0785-C4	56.60
.0787		2.000 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	DDA0787-C4	57.60
.0800		2.032 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	DDA0800-C4	57.60
.0810	#46	2.057 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	DDA0810-C4	57.60
.0820	#45	2.082 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	DDA0820-C4	57.60
.0860	#44	2.184 mm	.571	<b>14.50 mm</b>	(5x)	4 mm	50 mm	DDA0860-C4	57.60
.0890	#43	2.260 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	DDA0890-C4	57.60
.0900		2.286 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	DDA0900-C4	57.60
.0935	#42	2.374 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	DDA0935-C4	57.60
.0937 (3/32)		2.381 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	DDA0937-C4	57.60
.0937 (3/32)		2.381 mm	.906	<b>23.00 mm</b>	(8x)	4 mm	63 mm	AWS0937-C4	59.20
.0960	#41	2.438 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	DDA0960-C4	57.60
.0980	#40	2.489 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	DDA0980-C4	57.60
.0984		2.500 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	DDA0984-C4	58.00
.0995	#39	2.527 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	DDA0995-C4	58.00
.1000		2.540 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	DDA1000-C4	58.00
.1000		2.540 mm	.984	<b>25.00 mm</b>	(8x)	4 mm	63 mm	AWS1000-C4	59.20
.1015	#38	2.578 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	DDA1015-C4	58.00
.1040	#37	2.641 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	DDA1040-C4	58.00
.1065	#36	2.705 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	DDA1065-C4	58.00
.1093 (7/64)		2.778 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	DDA1093-C4	58.00
.1100	#35	2.794 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	DDA1100-C4	58.00
.1110	#34	2.819 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	DDA1110-C4	58.00
.1130	#33	2.870 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	DDA1130-C4	58.00
.1160	#32	2.946 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	DDA1160-C4	58.00
.1181		3.000 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	DDA1181-C4	59.40
.1181		3.000 mm	1.142	<b>29.00 mm</b>	(8x)	4 mm	63 mm	AWS1181-C4	60.90
		D <sub>1</sub> +.000mm -.013mm		L <sub>2</sub> +.75mm -.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	70.20
.1250 (1/8)		3.175 mm	.590	<b>15.00 mm</b>	(3x)	6 mm	63 mm	BAA1250-C4	69.00
.1250 (1/8)		3.175 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	DDA1250-C4	70.20
.1250 (1/8)		3.175 mm	1.220	<b>31.00 mm</b>	(8x)	6 mm	75 mm	AWS1250-C4	72.10
.1285	#30	3.263 mm	.866	<b>22.00 mm</b>	(5x)	6 mm	63 mm	DDA1285-C4	70.20
.1360	#29	3.454 mm	.906	<b>23.00 mm</b>	(5x)	6 mm	63 mm	DDA1360-C4	70.20
.1406 (9/64)		3.571 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	DDA1406-C4	70.20
.1470	#26	3.733 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	DDA1470-C4	70.20
.1562 (5/32)		3.968 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	DDA1562-C4	70.20
.1574		4.000 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	DDA1574-C4	70.20
.1590	#21	4.038 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	DDA1590-C4	70.20

NEW

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	70.20
.1770	#16	4.495 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	DDA1770-C4	70.20
.1800	#15	4.572 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	DDA1800-C4	70.20
.1875 (3/16)		4.762 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	DDA1875-C4	70.20
.1875 (3/16)		4.762 mm	1.811	<b>46.00 mm</b>	(8x)	6 mm	100 mm	AWS1875-C4	72.10
.1968		5.000 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	DDA1968-C4	70.20
.2009	#7	5.105 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	DDA2009-C4	70.20
.2031 (13/64)		5.159 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	DDA2031-C4	70.20
.2129	#3	5.410 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	DDA2129-C4	70.20
.2187 (7/32)		5.556 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	DDA2187-C4	70.20
.2343 (15/64)		5.953 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	DDA2343-C4	70.20
.2362		6.000 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	DDA2362-C4	70.20
.2500 (1/4)	E	6.350 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	75 mm	BAA2500-C4	69.00
.2500 (1/4)	E	6.350 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	DDA2500-C4	70.20
.2500 (1/4)	E	6.350 mm	2.441	<b>62.00 mm</b>	(8x)	8 mm	125 mm	AWS2500-C4	72.10

COMPOSITES

NEW

### SPEEDS & FEEDS (Miniature High Performance Drills – Composites)

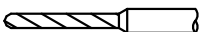
**Important Note:** Posted chiploads are for the double angle drills. For broad point drills, reduce chiploads by approx. 10%. Since the melting point varies greatly from plastic to plastic, the speed (RPM) used should be closely supervised. An additional reduction in RPM may be necessary to avoid excessive 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	
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
	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
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
	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
		Carbon/Glass Filled 5% < 20%	100 > 150 Rr	400-600	.0007	.0015	.0022	.0029	.0037	.0044	.0059	.0089	.0119
		Carbon/Glass Filled 21% < 40%	100 > 150 Rr	350-500	.0006	.0012	.0018	.0024	.0030	.0036	.0049	.0073	.0097
Fiber Reinforced	FR4, G10, G11	Carbon/Glass Fiber 5% < 20%	100 > 150 Rr	350-500	.0007	.0015	.0022	.0029	.0037	.0044	.0059	.0089	.0119
	G30	Carbon/Glass Fiber 21% < 40%	100 > 150 Rr	200-300	.0006	.0012	.0018	.0024	.0030	.0036	.0049	.0073	.0097



View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).


Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)



## MINIATURE HIGH PERFORMANCE DRILLS

Composites – Brad Point



- 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 

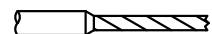


Brad Point Prevents Fraying &amp; Tear Out

DRILL DIAMETER		FLUTE LENGTH			SHANK DIAMETER	OVERALL LENGTH	AMORPHOUS DIAMOND	
inch	metric	inch	metric	hole depth			2 FL	PRICE
	$D_1 \begin{smallmatrix} +.000\text{mm} \\ -.013\text{mm} \end{smallmatrix}$		$L_2 \begin{smallmatrix} +.25\text{mm} \\ -.00\text{mm} \end{smallmatrix}$		$D_2 \text{ (h6)}$	$L_1$		
.0312 (1/32)	.793 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BSW0312-C4	46.90
.0315	.800 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	BSW0315-C4	46.90
.0320	#67	.812 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	BSW0320-C4	46.90
.0330	#66	.838 mm	.220	<b>5.60 mm</b>	(5x)	3 mm	BSW0330-C4	46.90
.0350	#65	.889 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	BSW0350-C4	46.90
.0354		.900 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	BSW0354-C4	46.90
.0360	#64	.914 mm	.244	<b>6.20 mm</b>	(5x)	3 mm	BSW0360-C4	46.90
.0370	#63	.939 mm	.252	<b>6.40 mm</b>	(5x)	3 mm	BSW0370-C4	46.90
.0380	#62	.965 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	BSW0380-C4	46.90
.0390	#61	.990 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	BSW0390-C4	46.90
.0393		1.000 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	BSW0393-C4	49.10
.0400	#60	1.016 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	BSW0400-C4	49.10
.0410	#59	1.041 mm	.276	<b>7.00 mm</b>	(5x)	3 mm	BSW0410-C4	49.10
.0420	#58	1.066 mm	.283	<b>7.20 mm</b>	(5x)	3 mm	BSW0420-C4	49.10
.0430	#57	1.092 mm	.291	<b>7.40 mm</b>	(5x)	3 mm	BSW0430-C4	49.10
.0450		1.143 mm	.307	<b>7.80 mm</b>	(5x)	3 mm	BSW0450-C4	49.10
.0465	#56	1.181 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	BSW0465-C4	49.10
.0468 (3/64)		1.190 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	BSW0468-C4	49.10
.0492		1.250 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	BSW0492-C4	49.10
.0500		1.270 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	BSW0500-C4	49.10
.0520	#55	1.320 mm	.354	<b>9.00 mm</b>	(5x)	3 mm	BSW0520-C4	49.10
.0550	#54	1.397 mm	.374	<b>9.50 mm</b>	(5x)	3 mm	BSW0550-C4	49.10
.0590		1.500 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	BSW0590-C4	49.10
.0595	#53	1.511 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	BSW0595-C4	49.10
.0600		1.524 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	BSW0600-C4	49.10
.0625 (1/16)		1.587 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	BSW0625-C4	49.10
.0635	#52	1.612 mm	.433	<b>11.00 mm</b>	(5x)	3 mm	BSW0635-C4	49.10
.0670	#51	1.701 mm	.453	<b>11.50 mm</b>	(5x)	3 mm	BSW0670-C4	49.10
.0700	#50	1.778 mm	.472	<b>12.00 mm</b>	(5x)	3 mm	BSW0700-C4	49.10
.0730	#49	1.854 mm	.492	<b>12.50 mm</b>	(5x)	3 mm	BSW0730-C4	49.10
.0760	#48	1.930 mm	.512	<b>13.00 mm</b>	(5x)	3 mm	BSW0760-C4	49.10
.0781 (5/64)		1.984 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	BSW0781-C4	49.10
.0785	#47	1.993 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	BSW0785-C4	49.10
.0787		2.000 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	BSW0787-C4	51.00

COMPOSITES

continued on next page



# MINIATURE HIGH PERFORMANCE DRILLS

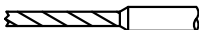
## Composites – Brad Point (cont.)

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> <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>	2 FL	PRICE
.0800		2.032 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	BSW0800-C4	51.00
.0810	#46	2.057 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BSW0810-C4	51.00
.0820	#45	2.082 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	BSW0820-C4	51.00
.0860	#44	2.184 mm	.571	<b>14.50 mm</b>	(5x)	4 mm	50 mm	BSW0860-C4	51.00
.0890	#43	2.260 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BSW0890-C4	51.00
.0900		2.286 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	BSW0900-C4	51.00
.0935	#42	2.374 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BSW0935-C4	51.70
.0937 (3/32)		2.381 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BSW0937-C4	51.70
.0960	#41	2.438 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	BSW0960-C4	51.70
.0980	#40	2.489 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BSW0980-C4	51.70
.0984		2.500 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BSW0984-C4	52.10
.0995	#39	2.527 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BSW0995-C4	52.10
.1000		2.540 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BSW1000-C4	52.10
.1015	#38	2.578 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	BSW1015-C4	52.10
.1040	#37	2.641 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BSW1040-C4	52.10
.1065	#36	2.705 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	BSW1065-C4	52.10
.1093 (7/64)		2.778 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BSW1093-C4	52.10
.1100	#35	2.794 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BSW1100-C4	52.10
.1110	#34	2.819 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BSW1110-C4	52.10
.1130	#33	2.870 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	BSW1130-C4	52.10
.1160	#32	2.946 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BSW1160-C4	52.10
.1181		3.000 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	BSW1181-C4	52.10
.1200	#31	3.048 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BSW1200-C4	60.10
.1250 (1/8)		3.175 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	BSW1250-C4	60.10
.1285	#30	3.263 mm	.866	<b>22.00 mm</b>	(5x)	6 mm	63 mm	BSW1285-C4	60.10
.1360	#29	3.454 mm	.906	<b>23.00 mm</b>	(5x)	6 mm	63 mm	BSW1360-C4	60.10
.1406 (9/64)		3.571 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	BSW1406-C4	60.10
.1470	#26	3.733 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BSW1470-C4	60.10
.1562 (5/32)		3.968 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	BSW1562-C4	60.10
.1574		4.000 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BSW1574-C4	60.10
.1590	#21	4.038 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	BSW1590-C4	60.10
.1718 (11/64)		4.365 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BSW1718-C4	60.10
.1770	#16	4.495 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BSW1770-C4	60.10
.1800	#15	4.572 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	BSW1800-C4	60.10
.1875 (3/16)		4.762 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	BSW1875-C4	60.10
.1968		5.000 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BSW1968-C4	60.10
.2009	#7	5.105 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BSW2009-C4	60.10
.2031 (13/64)		5.159 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	BSW2031-C4	60.10
.2129	#3	5.410 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	BSW2129-C4	60.10
.2187 (7/32)		5.556 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	BSW2187-C4	60.10
.2343 (15/64)		5.953 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BSW2343-C4	60.10
.2362		6.000 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	BSW2362-C4	60.10
.2500 (1/4)	E	6.350 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	BSW2500-C4	60.10

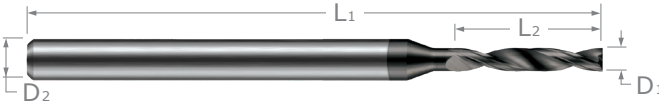
COMPOSITES

PLEASE SEE SPEEDS & FEEDS ON PAGE 396



# MINIATURE HIGH PERFORMANCE DRILLS

Flat Bottom



**Ideal for Inclined & Rounded Surfaces**



No Point Angle & No Dish  
Allows for Drilling on Irregular 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

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> <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	FBD0312-C3	43.40	FBD0312-C8	46.40
.0314		.800 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	FBD0315-C3	43.40	FBD0315-C8	46.40
.0320	#67	.812 mm	.213	<b>5.40 mm</b>	(5x)	3 mm	50 mm	FBD0320-C3	43.40	FBD0320-C8	46.40
.0330	#66	.838 mm	.220	<b>5.60 mm</b>	(5x)	3 mm	50 mm	FBD0330-C3	43.40	FBD0330-C8	46.40
.0350	#65	.889 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	FBD0350-C3	43.40	FBD0350-C8	46.40
.0354		.900 mm	.236	<b>6.00 mm</b>	(5x)	3 mm	50 mm	FBD0354-C3	43.40	FBD0354-C8	46.40
.0360	#64	.914 mm	.244	<b>6.20 mm</b>	(5x)	3 mm	50 mm	FBD0360-C3	43.40	FBD0360-C8	46.40
.0370	#63	.939 mm	.252	<b>6.40 mm</b>	(5x)	3 mm	50 mm	FBD0370-C3	43.40	FBD0370-C8	46.40
.0380	#62	.965 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	FBD0380-C3	43.40	FBD0380-C8	46.40
.0390	#61	.990 mm	.260	<b>6.60 mm</b>	(5x)	3 mm	50 mm	FBD0390-C3	43.40	FBD0390-C8	46.40
.0393		1.000 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	FBD0393-C3	47.60	FBD0393-C8	50.60
.0400	#60	1.016 mm	.268	<b>6.80 mm</b>	(5x)	3 mm	50 mm	FBD0400-C3	47.60	FBD0400-C8	50.60
.0410	#59	1.041 mm	.276	<b>7.00 mm</b>	(5x)	3 mm	50 mm	FBD0410-C3	47.60	FBD0410-C8	50.60
.0420	#58	1.066 mm	.283	<b>7.20 mm</b>	(5x)	3 mm	50 mm	FBD0420-C3	47.60	FBD0420-C8	50.60
.0430	#57	1.092 mm	.291	<b>7.40 mm</b>	(5x)	3 mm	50 mm	FBD0430-C3	47.60	FBD0430-C8	50.60
.0450		1.143 mm	.307	<b>7.80 mm</b>	(5x)	3 mm	50 mm	FBD0450-C3	47.60	FBD0450-C8	50.60
.0465	#56	1.181 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	FBD0465-C3	47.60	FBD0465-C8	50.60
.0468 (3/64)		1.190 mm	.315	<b>8.00 mm</b>	(5x)	3 mm	50 mm	FBD0468-C3	47.60	FBD0468-C8	50.60
.0492		1.250 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	FBD0492-C3	47.60	FBD0492-C8	50.60
.0500		1.270 mm	.335	<b>8.50 mm</b>	(5x)	3 mm	50 mm	FBD0500-C3	47.60	FBD0500-C8	50.60
.0520	#55	1.320 mm	.354	<b>9.00 mm</b>	(5x)	3 mm	50 mm	FBD0520-C3	47.60	FBD0520-C8	50.60
.0550	#54	1.397 mm	.374	<b>9.50 mm</b>	(5x)	3 mm	50 mm	FBD0550-C3	47.60	FBD0550-C8	50.60
.0590		1.500 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	FBD0590-C3	51.20	FBD0590-C8	54.20
.0595	#53	1.511 mm	.394	<b>10.00 mm</b>	(5x)	3 mm	50 mm	FBD0595-C3	51.20	FBD0595-C8	54.20
.0600		1.524 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	FBD0600-C3	51.20	FBD0600-C8	54.20
<b>NEW</b> .0625 (1/16)		1.587 mm	.299	<b>7.60 mm</b>	(3x)	3 mm	50 mm	<b>FBF0625-C3</b>	50.00	<b>FBF0625-C8</b>	53.00
.0625 (1/16)		1.587 mm	.413	<b>10.50 mm</b>	(5x)	3 mm	50 mm	FBD0625-C3	51.20	FBD0625-C8	54.20
.0635	#52	1.612 mm	.433	<b>11.00 mm</b>	(5x)	3 mm	50 mm	FBD0635-C3	51.20	FBD0635-C8	54.20
.0670	#51	1.701 mm	.453	<b>11.50 mm</b>	(5x)	3 mm	50 mm	FBD0670-C3	51.20	FBD0670-C8	54.20
<b>NEW</b> .0700	#50	1.778 mm	.334	<b>8.50 mm</b>	(3x)	3 mm	50 mm	<b>FBF0700-C3</b>	50.00	<b>FBF0700-C8</b>	53.00
.0700	#50	1.778 mm	.472	<b>12.00 mm</b>	(5x)	3 mm	50 mm	FBD0700-C3	51.20	FBD0700-C8	54.20

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	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
D <sub>1</sub> <sup>+0.00mm</sup> / <sub>-0.13mm</sub>			L <sub>2</sub> <sup>+0.25mm</sup> / <sub>-0.00mm</sub>								
.0730	#49	1.854 mm	.492	<b>12.50 mm</b>	(5x)	3 mm	50 mm	FBD0730-C3	51.20	FBD0730-C8	54.20
.0760	#48	1.930 mm	.512	<b>13.00 mm</b>	(5x)	3 mm	50 mm	FBD0760-C3	51.20	FBD0760-C8	54.20
.0781 (5/64)		1.984 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	FBD0781-C3	51.20	FBD0781-C8	54.20
.0785	#47	1.993 mm	.531	<b>13.50 mm</b>	(5x)	3 mm	50 mm	FBD0785-C3	51.20	FBD0785-C8	54.20
.0787		2.000 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	FBD0787-C3	55.20	FBD0787-C8	58.20
.0800		2.032 mm	.531	<b>13.50 mm</b>	(5x)	4 mm	50 mm	FBD0800-C3	55.20	FBD0800-C8	58.20
.0810	#46	2.057 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	FBD0810-C3	55.20	FBD0810-C8	58.20
.0820	#45	2.082 mm	.551	<b>14.00 mm</b>	(5x)	4 mm	50 mm	FBD0820-C3	55.20	FBD0820-C8	58.20
.0860	#44	2.184 mm	.571	<b>14.50 mm</b>	(5x)	4 mm	50 mm	FBD0860-C3	55.20	FBD0860-C8	58.20
.0890	#43	2.260 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	FBD0890-C3	55.20	FBD0890-C8	58.20
.0900		2.286 mm	.591	<b>15.00 mm</b>	(5x)	4 mm	50 mm	FBD0900-C3	55.20	FBD0900-C8	58.20
.0935	#42	2.374 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	FBD0935-C3	55.20	FBD0935-C8	58.20
.0937 (3/32)		2.381 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	FBD0937-C3	55.20	FBD0937-C8	58.20
.0960	#41	2.438 mm	.630	<b>16.00 mm</b>	(5x)	4 mm	63 mm	FBD0960-C3	55.20	FBD0960-C8	58.20
.0980	#40	2.489 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	FBD0980-C3	55.20	FBD0980-C8	58.20
.0984		2.500 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	FBD0984-C3	58.50	FBD0984-C8	61.60
.0995	#39	2.527 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	FBD0995-C3	58.50	FBD0995-C8	61.60
.1000		2.540 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	FBD1000-C3	58.50	FBD1000-C8	61.60
.1015	#38	2.578 mm	.669	<b>17.00 mm</b>	(5x)	4 mm	63 mm	FBD1015-C3	58.50	FBD1015-C8	61.60
.1040	#37	2.641 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	FBD1040-C3	58.50	FBD1040-C8	61.60
.1065	#36	2.705 mm	.709	<b>18.00 mm</b>	(5x)	4 mm	63 mm	FBD1065-C3	58.50	FBD1065-C8	61.60
.1093 (7/64)		2.778 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	FBD1093-C3	58.50	FBD1093-C8	61.60
.1100	#35	2.794 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	FBD1100-C3	58.50	FBD1100-C8	61.60
.1110	#34	2.819 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	FBD1110-C3	58.50	FBD1110-C8	61.60
.1130	#33	2.870 mm	.748	<b>19.00 mm</b>	(5x)	4 mm	63 mm	FBD1130-C3	58.50	FBD1130-C8	61.60
.1160	#32	2.946 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	FBD1160-C3	58.50	FBD1160-C8	61.60
.1181		3.000 mm	.787	<b>20.00 mm</b>	(5x)	4 mm	63 mm	FBD1181-C3	58.50	FBD1181-C8	61.60

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	2 FL	PRICE
.1200	#31	3.048 mm	.570	<b>14.50 mm</b>	(3x)			6 mm	63 mm	<b>FBF1200-C3</b>	64.40
.1200	#31	3.048 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	FBD1200-C3	65.60	FBD1200-C8	68.50
.1250 (1/8)		3.175 mm	.590	<b>15.00 mm</b>	(3x)	6 mm	63 mm	<b>FBF1250-C3</b>	64.40	<b>FBF1250-C8</b>	67.30
.1250 (1/8)		3.175 mm	.827	<b>21.00 mm</b>	(5x)	6 mm	63 mm	FBD1250-C3	65.60	FBD1250-C8	68.50
.1360	#29	3.454 mm	.629	<b>16.00 mm</b>	(3x)	6 mm	63 mm	<b>FBF1360-C3</b>	64.40	<b>FBF1360-C8</b>	67.30
.1360	#29	3.454 mm	.906	<b>23.00 mm</b>	(5x)	6 mm	63 mm	FBD1360-C3	65.60	FBD1360-C8	68.50
.1406 (9/64)		3.571 mm	.945	<b>24.00 mm</b>	(5x)	6 mm	75 mm	FBD1406-C3	65.60	FBD1406-C8	68.50
.1470	#26	3.733 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	FBD1470-C3	65.60	FBD1470-C8	68.50
.1562 (5/32)		3.968 mm	1.024	<b>26.00 mm</b>	(5x)	6 mm	75 mm	FBD1562-C3	65.60	FBD1562-C8	68.50
.1574		4.000 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	FBD1574-C3	65.60	FBD1574-C8	68.50
.1590	#21	4.038 mm	.748	<b>19.00 mm</b>	(3x)	6 mm	75 mm	<b>FBF1590-C3</b>	64.40	<b>FBF1590-C8</b>	67.30
.1590	#21	4.038 mm	1.102	<b>28.00 mm</b>	(5x)	6 mm	75 mm	FBD1590-C3	65.60	FBD1590-C8	68.50
.1718 (11/64)		4.365 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	FBD1718-C3	65.60	FBD1718-C8	68.50
.1770	#16	4.495 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	FBD1770-C3	65.60	FBD1770-C8	68.50
.1800	#15	4.572 mm	1.181	<b>30.00 mm</b>	(5x)	6 mm	75 mm	FBD1800-C3	65.60	FBD1800-C8	68.50
.1875 (3/16)		4.762 mm	1.260	<b>32.00 mm</b>	(5x)	6 mm	75 mm	FBD1875-C3	65.60	FBD1875-C8	68.50
.1968		5.000 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	FBD1968-C3	65.60	FBD1968-C8	68.50
.2009	#7	5.105 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	FBD2009-C3	65.60	FBD2009-C8	68.50

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			2 FL	PRICE	2 FL	PRICE
		D <sub>1</sub> +.000mm -.013mm		L <sub>2</sub> +.75mm -.00mm		D <sub>2</sub> (h6)	L <sub>1</sub>				
.2031 (13/64)		5.159 mm	1.339	<b>34.00 mm</b>	(5x)	6 mm	75 mm	FBD2031-C3	65.60	FBD2031-C8	68.50
.2129	#3	5.410 mm	1.417	<b>36.00 mm</b>	(5x)	6 mm	75 mm	FBD2129-C3	65.60	FBD2129-C8	68.50
.2187 (7/32)		5.556 mm	1.496	<b>38.00 mm</b>	(5x)	6 mm	100 mm	FBD2187-C3	65.60	FBD2187-C8	68.50
.2343 (15/64)		5.953 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	FBD2343-C3	65.60	FBD2343-C8	68.50
.2362		6.000 mm	1.575	<b>40.00 mm</b>	(5x)	6 mm	100 mm	FBD2362-C3	65.60	FBD2362-C8	68.50
.2500 (1/4)	E	6.350 mm	1.181	<b>30.00 mm</b>	(3x)	8 mm	100 mm	<b>FBF2500-C3</b>	64.40	<b>FBF2500-C8</b>	67.30
.2500 (1/4)	E	6.350 mm	1.654	<b>42.00 mm</b>	(5x)	8 mm	100 mm	FBD2500-C3	65.60	FBD2500-C8	68.50

NEW

## 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
AITIN 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, Discoloy, 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, C2xxx, C3xxx, C4xxx, C66400-C69800)		375									
Phosphor Bronzes (Copper Tin alloys, C5xxx)		170									
Aluminum Bronzes (Copper Aluminum alloys, C60600-C64200)		375									
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>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

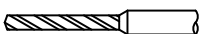


Coolant Through Design for Improved Chip Removal

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	160.90
.0550	#54	1.397 mm	.748	<b>19.00 mm</b>	(12x)	3 mm	63 mm	ACD0550-C3	160.90
.0590		1.500 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	ACD0590-C3	160.90
.0590		1.500 mm	1.280	<b>32.50 mm</b>	(20x)	3 mm	75 mm	CXZ0590-C3	191.10
.0595	#53	1.511 mm	.827	<b>21.00 mm</b>	(12x)	3 mm	63 mm	ACD0595-C3	160.90
.0625 (1/16)		1.587 mm	.866	<b>22.00 mm</b>	(12x)	3 mm	63 mm	ACD0625-C3	160.90
.0625 (1/16)		1.587 mm	1.358	<b>34.50 mm</b>	(20x)	3 mm	75 mm	CXZ0625-C3	191.10
.0700	#50	1.778 mm	.945	<b>24.00 mm</b>	(12x)	3 mm	63 mm	ACD0700-C3	160.90
.0781 (5/64)		1.984 mm	1.063	<b>27.00 mm</b>	(12x)	3 mm	63 mm	ACD0781-C3	160.90
.0781 (5/64)		1.984 mm	1.693	<b>43.00 mm</b>	(20x)	3 mm	100 mm	CXZ0781-C3	191.10
.0787		2.000 mm	1.102	<b>28.00 mm</b>	(12x)	4 mm	63 mm	ACD0787-C3	166.60
.0787		2.000 mm	1.732	<b>44.00 mm</b>	(20x)	4 mm	100 mm	CXZ0787-C3	211.80
.0890	#43	2.260 mm	1.220	<b>31.00 mm</b>	(12x)	4 mm	75 mm	ACD0890-C3	166.60
.0937 (3/32)		2.381 mm	1.299	<b>33.00 mm</b>	(12x)	4 mm	75 mm	ACD0937-C3	166.60
.0937 (3/32)		2.381 mm	2.047	<b>52.00 mm</b>	(20x)	4 mm	100 mm	CXZ0937-C3	211.80
.1015	#38	2.578 mm	1.378	<b>35.00 mm</b>	(12x)	4 mm	75 mm	ACD1015-C3	166.60
.1065	#36	2.705 mm	1.457	<b>37.00 mm</b>	(12x)	4 mm	75 mm	ACD1065-C3	166.60
.1093 (7/64)		2.778 mm	1.496	<b>38.00 mm</b>	(12x)	4 mm	75 mm	ACD1093-C3	166.60
.1093 (7/64)		2.778 mm	2.362	<b>60.00 mm</b>	(20x)	4 mm	100 mm	CXZ1093-C3	211.80
.1181		3.000 mm	1.654	<b>42.00 mm</b>	(12x)	4 mm	100 mm	ACD1181-C3	166.60
.1181		3.000 mm	2.559	<b>65.00 mm</b>	(20x)	4 mm	100 mm	CXZ1181-C3	211.80

See Speeds & Feeds on next page



# MINIATURE HIGH PERFORMANCE DRILLS

## Deep Hole – Coolant-Through (cont.)

### SPEEDS & FEEDS (Miniature High Performance Drills – Deep Hole)

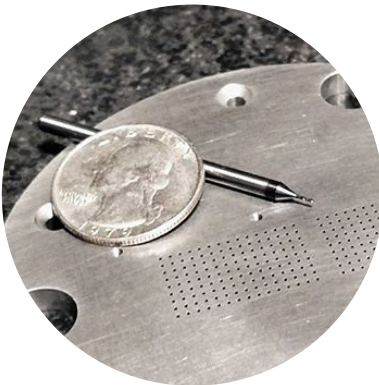
**Important Note:** Values in table are in inches and are based on 12x length drills and a material hardness of 29-37 Rc. For longer lengths and higher hardness materials, table values of IPR must be reduced (for 20x, reduce to 75%). For ferrous materials at 38-45 Rc, reduce IPR to 80%. For complete 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 <small>20020</small>	.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, Discology, 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.



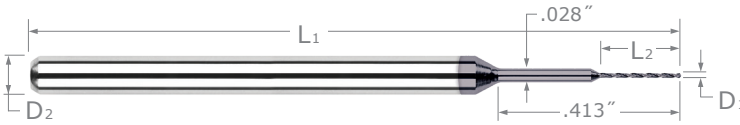
### Selecting the Right Harvey Tool Miniature Drill

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"**

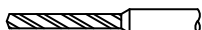
- ↻ For tools .020" and smaller, there is an intermediate neck diameter as pictured above
- ↻ 130° drill point
- ↻ Carbide
- ↻ CNC ground in Germany

MINIATURE DRILLS

DRILL DIAMETER			FLUTE LENGTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
inch	wire	metric				2 FL	PRICE	2 FL	PRICE
D <sub>1</sub> <sup>+0.0003"</sup> *			L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
.0020		.050 mm	.023	1/8	1-1/2	810020**	36.60		
.0020		.050 mm	.028	1/8	1-1/2	20020	36.60		
.0039	#102	.100 mm	.026	1/8	1-1/2	810039**	26.00		
.0039	#102	.100 mm	.039	1/8	1-1/2	20039	26.00		
.0051	#99	.130 mm	.034	1/8	1-1/2	810051**	25.40		
.0051	#99	.130 mm	.056	1/8	1-1/2	20051	25.40		
.0059	#97	.150 mm	.040	1/8	1-1/2	810059**	23.60		
.0059	#97	.150 mm	.066	1/8	1-1/2	20059	23.60		
.0063	#96		.042	1/8	1-1/2	810063**	23.60		
.0063	#96		.066	1/8	1-1/2	20063	23.60		
.0067	#95		.066	1/8	1-1/2	20067	23.60		
.0069		.175 mm	.066	1/8	1-1/2	20069	23.60		
.0071	#94		.106	1/8	1-1/2	20071	21.50		
.0075	#93		.106	1/8	1-1/2	20075	21.50		
.0079	#92	.200 mm	.054	1/8	1-1/2	810079**	18.00	810079-C3**	22.60
.0079	#92	.200 mm	.160	1/8	1-1/2	20079	18.00	20079-C3	22.60
.0083	#91		.160	1/8	1-1/2	20083	18.00	20083-C3	22.60
.0087	#90		.126	1/8	1-1/2	20087	18.00	20087-C3	22.60
.0089		.225 mm	.160	1/8	1-1/2	20089	18.00	20089-C3	22.60
.0091	#89		.160	1/8	1-1/2	20091	17.60	20091-C3	22.20
.0095	#88		.064	1/8	1-1/2	810095**	17.60	810095-C3**	22.20
.0095	#88		.160	1/8	1-1/2	20095	17.60	20095-C3	22.20
.0098		.250 mm	.066	1/8	1-1/2	810098**	17.60	810098-C3**	22.20
.0098		.250 mm	.160	1/8	1-1/2	20098	17.60	20098-C3	22.20
.0100	#87		.068	1/8	1-1/2	810100**	17.60	810100-C3**	22.20
.0100	#87		.160	1/8	1-1/2	20100	17.60	20100-C3	22.20
.0105	#86		.160	1/8	1-1/2	20105	17.60	20105-C3	22.20
.0108		.275 mm	.160	1/8	1-1/2	20108	17.60	20108-C3	22.20
.0110	#85		.160	1/8	1-1/2	20110	17.60	20110-C3	22.20
.0115	#84		.180	1/8	1-1/2	20115	17.60	20115-C3	22.20
.0118		.300 mm	.180	1/8	1-1/2	20118	17.60	20118-C3	22.20

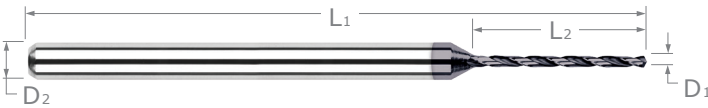
\* Tolerance for all AITIN coating is +.0002"/-.0003". \*\* Total overhang from shank transition is .250"

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## MINIATURE DRILLS

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DRILL DIAMETER			FLUTE LENGTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TIN COATED	
inch	wire	metric				2 FL	PRICE	2 FL	PRICE
D <sub>1</sub> <sup>+0.0002"</sup> / <sub>-0.0003"</sub> *			L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
.0120	#83		.080	1/8	1-1/2	810120	15.90	810120-C3	20.50
.0120	#83		.230	1/8	1-1/2	20120	15.90	20120-C3	20.50
.0125	#82		.230	1/8	1-1/2	20125	15.90	20125-C3	20.50
.0130	#81		.230	1/8	1-1/2	20130	15.90	20130-C3	20.50
.0135	#80		.270	1/8	1-1/2	20135	15.50	20135-C3	20.10
.0138		.350 mm	.270	1/8	1-1/2	20138	15.50	20138-C3	20.10
.0145	#79		.100	1/8	1-1/2	810145	15.50	810145-C3	20.10
.0145	#79		.270	1/8	1-1/2	20145	15.50	20145-C3	20.10
.0157		.400 mm	.105	1/8	1-1/2	810157	15.50	810157-C3	20.10
.0157		.400 mm	.270	1/8	1-1/2	20157	15.50	20157-C3	20.10
.0160	#78		.270	1/8	1-1/2	20160	15.50	20160-C3	20.10
.0168			.270	1/8	1-1/2	20168	15.50	20168-C3	20.10
.0177		.450 mm	.270	1/8	1-1/2	20177	15.50	20177-C3	20.10
.0180	#77		.120	1/8	1-1/2	810180	14.40	810180-C3	19.00
.0180	#77		.270	1/8	1-1/2	20180	14.40	20180-C3	19.00
.0197		.500 mm	.275	1/8	1-1/2	20197	14.40	20197-C3	19.00
.0200	#76		.135	1/8	1-1/2	810200	14.40	810200-C3	19.00
.0200	#76		.275	1/8	1-1/2	20200	14.40	20200-C3	19.00
.0210	#75		.275	1/8	1-1/2	20205	14.40	20205-C3	19.00
.0225	#74		.150	1/8	1-1/2	810210	14.40	810210-C3	19.00
.0225	#74		.275	1/8	1-1/2	20210	14.40	20210-C3	19.00
.0236		.600 mm	.275	1/8	1-1/2	20214	14.40	20214-C3	19.00
.0240	#73		.275	1/8	1-1/2	20215	14.40	20215-C3	19.00
.0250	#72		.170	1/8	1-1/2	810220	14.40	810220-C3	19.00
.0250	#72		.275	1/8	1-1/2	20220	14.40	20220-C3	19.00
.0260	#71		.275	1/8	1-1/2	20225	14.40	20225-C3	19.00
.0276		.700 mm	.335	1/8	1-1/2	20229	14.40	20229-C3	19.00
.0280	#70		.335	1/8	1-1/2	20230	14.40	20230-C3	19.00
.0292	#69		.335	1/8	1-1/2	20235	14.40	20235-C3	19.00
.0302			.395	1/8	1-1/2	20240	14.40	20240-C3	19.00
.0310	#68		.210	1/8	1-1/2	810245	13.50	810245-C3	18.10
.0310	#68		.395	1/8	1-1/2	20245	13.50	20245-C3	18.10
.0312 (1/32)			.210	1/8	1-1/2	810250	13.50	810250-C3	18.10
.0312 (1/32)			.395	1/8	1-1/2	20250	13.50	20250-C3	18.10
.0315		.800 mm	.395	1/8	1-1/2	20253	13.50	20253-C3	18.10
.0320	#67		.395	1/8	1-1/2	20255	13.50	20255-C3	18.10

\* Tolerance for all A1TIN coating is +.0002"/-.0003".

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# MINIATURE DRILLS

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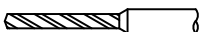
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MINIATURE DRILLS

DRILL DIAMETER			FLUTE LENGTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED	
inch	wire	metric				2 FL	PRICE	2 FL	PRICE
$D_1 \begin{smallmatrix} +.0000'' \\ -.0003'' \end{smallmatrix} *$			L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
.0330	#66		.395	1/8	1-1/2	20260	13.50	20260-C3	18.10
.0350	#65		.395	1/8	1-1/2	20265	13.50	20265-C3	18.10
.0354		.900 mm	.395	1/8	1-1/2	20267	13.50	20267-C3	18.10
.0360	#64		.395	1/8	1-1/2	20270	13.50	20270-C3	18.10
.0370	#63		.395	1/8	1-1/2	20275	13.50	20275-C3	18.10
.0380	#62		.395	1/8	1-1/2	20280	13.50	20280-C3	18.10
.0390	#61		.395	1/8	1-1/2	20285	13.50	20285-C3	18.10
.0394		1.000 mm	.395	1/8	1-1/2	20290	13.50	20290-C3	18.10
.0400	#60		.395	1/8	1-1/2	20295	13.50	20295-C3	18.10
.0410	#59		.395	1/8	1-1/2	20300	13.50	20300-C3	18.10
.0420	#58		.395	1/8	1-1/2	20305	13.50	20305-C3	18.10
.0430	#57		.395	1/8	1-1/2	20310	13.50	20310-C3	18.10
.0433		1.100 mm	.395	1/8	1-1/2	20311	13.50	20311-C3	18.10
.0440			.395	1/8	1-1/2	20315	13.50	20315-C3	18.10
.0465	#56		.395	1/8	1-1/2	20320	13.50	20320-C3	18.10
.0469 (3/64)			.395	1/8	1-1/2	20325	13.50	20325-C3	18.10
.0472		1.200 mm	.395	1/8	1-1/2	20327	13.50	20327-C3	18.10
.0492		1.250 mm	.395	1/8	1-1/2	20330	13.50	20330-C3	18.10
.0500		1.270 mm	.395	1/8	1-1/2	20332	13.50	20332-C3	18.10
.0512		1.300 mm	.413	1/8	1-1/2	20335	13.50	20335-C3	18.10
.0520	#55		.413	1/8	1-1/2	20340	13.50	20340-C3	18.10
.0520	#55		.500	1/8	1-1/2	815340	13.50	815340-C3	18.10
.0531		1.350 mm	.413	1/8	1-1/2	20345	13.50	20345-C3	18.10
.0550	#54		.413	1/8	1-1/2	20350	13.50	20350-C3	18.10
.0550	#54		.525	1/8	1-1/2	815350	13.50	815350-C3	18.10
.0571		1.450 mm	.413	1/8	1-1/2	20355	13.50	20355-C3	18.10
.0591		1.500 mm	.413	1/8	1-1/2	20360	13.50	20360-C3	18.10
.0595	#53		.413	1/8	1-1/2	20365	13.50	20365-C3	18.10
.0595	#53		.575	1/8	2	815365	14.20	815365-C3	18.80
.0610		1.550 mm	.413	1/8	1-1/2	20370	13.50	20370-C3	18.10
.0625 (1/16)			.413	1/8	1-1/2	20375	13.50	20375-C3	18.10
.0625 (1/16)			.600	1/8	2	815375	14.20	815375-C3	18.80
$D_1 \begin{smallmatrix} +.0000'' \\ -.0005'' \end{smallmatrix} **$			L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
.0630		1.600 mm	.413	1/8	1-1/2	20376	13.50	20376-C3	18.10
.0635	#52		.413	1/8	1-1/2	20377	13.50	20377-C3	18.10
.0635	#52		.600	1/8	2	815377	14.20	815377-C3	18.80
.0670	#51		.413	1/8	1-1/2	20384	13.50	20384-C3	18.10
.0670	#51		.650	1/8	2	815384	14.20	815384-C3	18.80

\* Tolerance for all AITIN coating is +.0002"/-.0003". \*\* Tolerance for AITIN coating is +.0002"/-.0005".

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## MINIATURE DRILLS

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DRILL DIAMETER inch wire metric	FLUTE LENGTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TIN COATED	
				2 FL	PRICE	2 FL	PRICE
D <sub>1</sub> <sup>+0.000"</sup> <sub>-.0005"</sub> **	L <sub>2</sub>	D <sub>2</sub>	L <sub>1</sub>	2 FL	PRICE	2 FL	PRICE
.0700 #50	.413	1/8	1-1/2	20390	13.50	20390-C3	18.10
.0700 #50	.700	1/8	2	815390	14.20	815390-C3	18.80
.0730 #49	.413	1/8	1-1/2	20396	13.50	20396-C3	18.10
.0760 #48	.413	1/8	1-1/2	20402	13.50	20402-C3	18.10
.0760 #48	.750	1/8	2	815402	14.20	815402-C3	18.80
.0781 (5/64)	.413	1/8	1-1/2	20407	13.50	20407-C3	18.10
.0781 (5/64)	.750	1/8	2	815407	14.20	815407-C3	18.80
.0785 #47	.413	1/8	1-1/2	20408	13.50	20408-C3	18.10
.0787 2.000 mm	.413	1/8	1-1/2	20409	13.50	20409-C3	18.10
.0810 #46	.413	1/8	1-1/2	20414	13.50	20414-C3	18.10
.0810 #46	.800	1/8	2	815414	14.20	815414-C3	18.80
.0820 #45	.413	1/8	1-1/2	20416	13.50	20416-C3	18.10
.0860 #44	.413	1/8	1-1/2	20424	13.50	20424-C3	18.10
.0890 #43	.413	1/8	1-1/2	20430	13.50	20430-C3	18.10
.0890 #43	.850	1/8	2	815430	14.20	815430-C3	18.80
.0935 #42	.413	1/8	1-1/2	20439	13.50	20439-C3	18.10
.0938 (3/32)	.413	1/8	1-1/2	20440	13.50	20440-C3	18.10
.0938 (3/32)	.900	1/8	2	815440	14.20	815440-C3	18.80
.0960 #41	.413	1/8	1-1/2	20445	13.50	20445-C3	18.10
.0980 #40	.413	1/8	1-1/2	20449	13.50	20449-C3	18.10
.0984 2.500 mm	.413	1/8	1-1/2	20450	13.50	20450-C3	18.10
.0995 #39	.413	1/8	1-1/2	20453	13.50	20453-C3	18.10
.1015 #38	.413	1/8	1-1/2	20457	13.50	20457-C3	18.10
.1040 #37	.413	1/8	1-1/2	20462	13.50	20462-C3	18.10
.1065 #36	.413	1/8	1-1/2	20467	13.50	20467-C3	18.10
.1094 (7/64)	.413	1/8	1-1/2	20473	13.50	20473-C3	18.10
.1094 (7/64)	1.100	1/8	2-1/2	815473	14.20	815473-C3	18.80
.1100 #35	.413	1/8	1-1/2	20475	13.50	20475-C3	18.10
.1110 #34	.413	1/8	1-1/2	20477	13.50	20477-C3	18.10
.1130 #33	.413	1/8	1-1/2	20481	13.50	20481-C3	18.10
.1160 #32	.413	1/8	1-1/2	20487	13.50	20487-C3	18.10
.1181 3.000 mm	.413	1/8	1-1/2	20491	13.50	20491-C3	18.10
.1200 #31	.413	1/8	1-1/2	20493	13.50	20493-C3	18.10
.1250 (1/8)	.413	1/8	1-1/2	20498	13.50	20498-C3	18.10
.1250 (1/8)	1.200	1/8	2-1/2	815498	14.20	815498-C3	18.80

\*\* Tolerance for A1TIN coating is +.0002"/-.0005".



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# MINIATURE DRILLS

## Spotting Drills



◀ **Stocked in 9 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		AISI IN COATED	
							2 FL	PRICE	2 FL	PRICE
$A_{-1^{\circ}}^{+1^{\circ}}$	D <sub>1</sub>	L <sub>2</sub>			D <sub>2</sub>	L <sub>1</sub>				
<b>60°</b>	.020	.060 (3x)	.0020	I	1/8	1-1/2	932720	29.20	932720-C3	33.80
	.030	.090 (3x)	.0030	I	1/8	1-1/2	932730	28.60	932730-C3	33.20
	.031 (1/32)	.093 (3x)	.0030	I	1/8	1-1/2	932731	28.60	932731-C3	33.20
	.045	.135 (3x)	.0030	I	1/8	1-1/2	932745	24.80	932745-C3	29.40
	.060	.180 (3x)	.0050	I	1/8	1-1/2	932760	28.60	932760-C3	33.20
	.062 (1/16)	.186 (3x)	.0050	I	1/8	1-1/2	932762	28.60	932762-C3	33.20
	.090	.270 (3x)	.0050	I	1/8	1-1/2	932790	28.60	932790-C3	33.20
	.093 (3/32)	.279 (3x)	.0060	I	1/8	1-1/2	932793	28.60	932793-C3	33.20
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	932808	28.60	932808-C3	33.20
	.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	932811	28.60	932811-C3	33.20
.187 (3/16)	.625 (3x)	.0130	II	3/16	2	932812	25.70	932812-C3	30.70	
.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	932816	31.00	932816-C3	37.80	
<b>82°</b>	.010	.030 (3x)	.0015	I	1/8	1-1/2	983110	34.20	983110-C3	38.80
	.020	.060 (3x)	.0020	I	1/8	1-1/2	983120	29.20	983120-C3	33.80
	.030	.090 (3x)	.0030	I	1/8	1-1/2	983130	27.60	983130-C3	32.20
	.045	.135 (3x)	.0030	I	1/8	1-1/2	983145	24.80	983145-C3	29.40
	.060	.180 (3x)	.0050	I	1/8	1-1/2	983160	24.50	983160-C3	29.10
	.090	.270 (3x)	.0050	I	1/8	1-1/2	983190	23.40	983190-C3	28.00
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	983208	22.20	983208-C3	26.80
	.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	965208	22.20	965208-C3	26.80
	.187 (3/16)	.625 (3x)	.0130	II	3/16	2	965212	25.70	965212-C3	30.70
.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	965216	31.90	965216-C3	38.70	
<b>90°</b>	.008	.024 (3x)	.0015	I	1/8	1-1/2	11408	41.60	11408-C3	46.20
	.010	.030 (3x)	.0015	I	1/8	1-1/2	11410	33.10	11410-C3	37.70
	.010	.030 (3x)	.0015	I	1/8	3	<b>LONG!</b> 987910	39.70	987910-C3	44.30
	.012	.036 (3x)	.0015	I	1/8	1-1/2	11412	41.60	11412-C3	46.20
	.015 (1/64)	.045 (3x)	.0015	I	1/8	1-1/2	11415	33.10	11415-C3	37.70
	.020	.060 (3x)	.0020	I	1/8	1-1/2	11420	28.60	11420-C3	33.20
	.020	.060 (3x)	.0020	I	1/8	3	<b>LONG!</b> 987920	35.20	987920-C3	39.80
	.025	.075 (3x)	.0020	I	1/8	1-1/2	11425	28.60	11425-C3	33.20
	.030	.045 (1.5x)	.0030	I	1/8	1-1/2	816030	26.40	816030-C3	33.20
	.030	.090 (3x)	.0030	I	1/8	1-1/2	11430	26.40	11430-C3	31.00
	.030	.090 (3x)	.0030	I	1/8	3	<b>LONG!</b> 987930	33.40	987930-C3	38.00
	.031 (1/32)	.093 (3x)	.0030	I	1/8	1-1/2	11431	26.40	11431-C3	31.00
	.035	.105 (3x)	.0030	I	1/8	1-1/2	11435	26.40	11435-C3	31.00
.039 (1 mm)	.117 (3x)	.0030	I	1/8	1-1/2	11439	26.40	11439-C3	31.00	

continued on next page



End View

### TYPE I

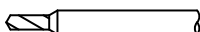
On center design reduces walking and minimizes flat at bottom of spot. Ideally suited for starting smaller diameter drills and shallow spots.



End View

### TYPE II

Ahead of center design improves tip strength. Ideally suited for larger diameter drills and tougher materials.





# MINIATURE DRILLS

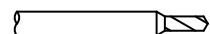
## Spotting Drills (cont.)

continued from previous page

INCLUDED ANGLE	DRILL DIAMETER	FLUTE LENGTH	WEB THICKNESS	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
							2 FL	PRICE	2 FL	PRICE
90°	D <sub>1</sub>	L <sub>2</sub>			D <sub>2</sub>	L <sub>1</sub>				
	A <sup>+1°</sup> / <sub>-1°</sub>									
	.040	.120 (3x)	.0030	I	1/8	1-1/2	11440	24.20	11440-C3	28.80
	.045	.135 (3x)	.0030	I	1/8	1-1/2	11445	24.20	11445-C3	28.80
	.045	.135 (3x)	.0030	I	1/8	3 <b>LONG!</b>	987945	31.00	987945-C3	35.60
	.047 (3/64)	.141 (3x)	.0040	I	1/8	1-1/2	11447	24.20	11447-C3	28.80
	.050	.150 (3x)	.0040	I	1/8	1-1/2	11450	24.20	11450-C3	28.80
	.055	.165 (3x)	.0040	I	1/8	1-1/2	11455	24.20	11455-C3	28.80
	.060	.090 (1.5x)	.0050	I	1/8	1-1/2	816060	23.90	816060-C3	28.90
	.060	.180 (3x)	.0050	I	1/8	1-1/2	11460	23.90	11460-C3	28.50
	.060	.180 (3x)	.0050	I	1/8	3 <b>LONG!</b>	987960	30.60	987960-C3	35.20
	.062 (1/16)	.186 (3x)	.0050	I	1/8	1-1/2	11462	23.90	11462-C3	28.50
	.070	.210 (3x)	.0050	I	1/8	1-1/2	11470	23.90	11470-C3	28.50
	.075	.225 (3x)	.0050	I	1/8	1-1/2	11475	23.90	11475-C3	28.50
	.078 (5/64)	.234 (3x)	.0050	I	1/8	1-1/2	11478	23.90	11478-C3	28.50
	.080	.240 (3x)	.0050	I	1/8	1-1/2	11480	23.90	11480-C3	28.50
	.090	.135 (1.5x)	.0050	I	1/8	1-1/2	816090	22.50	816090-C3	27.50
	.090	.270 (3x)	.0050	I	1/8	1-1/2	11490	22.50	11490-C3	27.10
	.090	.270 (3x)	.0050	I	1/8	3 <b>LONG!</b>	987990	29.40	987990-C3	34.00
	.093 (3/32)	.279 (3x)	.0060	I	1/8	1-1/2	11493	22.50	11493-C3	27.10
	.100	.300 (3x)	.0060	I	1/8	1-1/2	11500	22.50	11500-C3	27.10
	.109 (7/64)	.327 (3x)	.0080	I	1/8	1-1/2	11509	22.50	11509-C3	27.10
	.118 (3 mm)	.354 (3x)	.0080	I	1/8	1-1/2	1153M	22.50	1153M-C3	27.10
	.125 (1/8)	.188 (1.5x)	.0100	I	1/8	1-1/2	816108	21.00	816108-C3	26.00
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	11525	21.00	11525-C3	25.60
	.125 (1/8)	.375 (3x)	.0100	I	1/8	3 <b>LONG!</b>	988008	28.60	988008-C3	33.20
	.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	37508	21.00	37508-C3	25.60
	.125 (1/8)	.375 (3x)	.0100	II	1/8	4 <b>LONG!</b>	55808	30.40	55808-C3	35.40
	.140 (9/64)	.375 (2.5x)	.0100	II	3/16	2	37509	30.00	37509-C3	35.00
	.156 (5/32)	.375 (2.5x)	.0110	II	3/16	2	37510	25.00	37510-C3	30.00
	.187 (3/16)	.625 (3.5x)	.0130	I	3/16	2	803912	24.20	803912-C3	29.20
	.187 (3/16)	.625 (3.5x)	.0130	II	3/16	2	37512	24.20	37512-C3	29.20
	.187 (3/16)	.625 (3.5x)	.0130	II	3/16	4 <b>LONG!</b>	55812	37.30	55812-C3	44.10
.218 (7/32)	.750 (3.5x)	.0150	II	1/4	2-1/2	37514	38.40	37514-C3	45.20	
.236 (6 mm)	.750 (3x)	.0160	II	1/4	2-1/2	37515	38.40	37515-C3	45.20	
.250 (1/4)	.750 (3x)	.0180	I	1/4	2-1/2	803916	30.10	803916-C3	36.90	
.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	37516	30.10	37516-C3	36.90	
.250 (1/4)	.750 (3x)	.0180	II	1/4	6 <b>LONG!</b>	55816	50.50	55816-C3	59.50	
.312 (5/16)	.750 (2.5x)	.0220	II	5/16	2-1/2	37520	51.60	37520-C3	59.50	
.375 (3/8)	1.000 (2.5x)	.0270	II	3/8	2-1/2	37524	54.70	37524-C3	63.70	
.500 (1/2)	1.000 (2x)	.0350	II	1/2	3	37532	94.50	37532-C3	107.90	
100°	.030	.090 (3x)	.0030	I	1/8	1-1/2	975830	27.60	975830-C3	32.20
	.060	.180 (3x)	.0050	I	1/8	1-1/2	975860	24.50	975860-C3	29.10
	.090	.270 (3x)	.0050	I	1/8	1-1/2	975890	24.80	975890-C3	29.40
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	975908	22.20	975908-C3	26.80
	.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	955908	22.20	955908-C3	26.80
	.187 (3/16)	.625 (3x)	.0130	II	3/16	2	955912	25.70	955912-C3	30.70
	.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	955916	31.90	955916-C3	38.70

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SPOTTING DRILLS



# MINIATURE DRILLS

## Spotting Drills (cont.)

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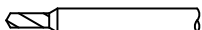
INCLUDED ANGLE	DRILL DIAMETER	FLUTE LENGTH	WEB THICKNESS	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
							2 FL	PRICE	2 FL	PRICE
<b>120°</b>	A $+1^\circ$ -1°	D <sub>1</sub>	L <sub>2</sub>		D <sub>2</sub>	L <sub>1</sub>				
	.010	.030 (3x)	.0015	I	1/8	1-1/2	11610	33.10	11610-C3	37.70
	.015 (1/64)	.045 (3x)	.0015	I	1/8	1-1/2	11615	33.10	11615-C3	37.70
	.020	.060 (3x)	.0020	I	1/8	1-1/2	11620	28.60	11620-C3	33.20
	.025	.075 (3x)	.0020	I	1/8	1-1/2	11625	28.60	11625-C3	33.20
	.030	.090 (3x)	.0030	I	1/8	1-1/2	11630	26.40	11630-C3	31.00
	.031 (1/32)	.093 (3x)	.0030	I	1/8	1-1/2	11631	26.40	11631-C3	31.00
	.040	.120 (3x)	.0030	I	1/8	1-1/2	11640	24.20	11640-C3	28.80
	.045	.135 (3x)	.0030	I	1/8	1-1/2	11645	24.20	11645-C3	28.80
	.047 (3/64)	.141 (3x)	.0040	I	1/8	1-1/2	11647	24.20	11647-C3	28.80
	.050	.150 (3x)	.0040	I	1/8	1-1/2	11650	24.20	11650-C3	28.80
	.055	.165 (3x)	.0040	I	1/8	1-1/2	11655	24.20	11655-C3	28.80
	.060	.180 (3x)	.0050	I	1/8	1-1/2	11660	23.90	11660-C3	28.50
	.062 (1/16)	.186 (3x)	.0050	I	1/8	1-1/2	11662	23.90	11662-C3	28.50
	.070	.210 (3x)	.0050	I	1/8	1-1/2	11670	23.90	11670-C3	28.50
	.078 (5/64)	.234 (3x)	.0050	I	1/8	1-1/2	11678	23.90	11678-C3	28.50
	.090	.270 (3x)	.0050	I	1/8	1-1/2	11690	22.50	11690-C3	27.10
	.093 (3/32)	.279 (3x)	.0060	I	1/8	1-1/2	11693	22.50	11693-C3	27.10
	.100	.300 (3x)	.0060	I	1/8	1-1/2	11700	22.50	11700-C3	27.10
	.118 (3 mm)	.354 (3x)	.0080	I	1/8	1-1/2	1173M	22.50	1173M-C3	27.10
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	11725	21.00	11725-C3	25.60
	.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	38208	21.00	38208-C3	25.60
	.156 (5/32)	.375 (2.5x)	.0110	II	3/16	2	38210	46.80	38210-C3	51.80
	.187 (3/16)	.625 (3.5x)	.0130	I	3/16	2	804012	24.20	804012-C3	29.20
	.187 (3/16)	.625 (3.5x)	.0130	II	3/16	2	38212	24.20	38212-C3	29.20
	.250 (1/4)	.750 (3x)	.0180	I	1/4	2-1/2	804016	30.10	804016-C3	36.90
	.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	38216	30.10	38216-C3	36.90
	.375 (3/8)	1.000 (2.5x)	.0270	II	3/8	2-1/2	38224	54.70	38224-C3	63.70
<b>130°</b>	.030	.090 (3x)	.0030	I	1/8	1-1/2	839530	30.40	839530-C3	34.90
	.060	.180 (3x)	.0050	I	1/8	1-1/2	839560	30.40	839560-C3	34.90
	.090	.270 (3x)	.0050	I	1/8	1-1/2	839590	30.40	839590-C3	34.90
	.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	839608	31.90	839608-C3	36.30
	.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	847016	33.30	847016-C3	40.10
<b>140°</b>	.010	.030 (3x)	.0015	I	1/8	1-1/2	39810	34.20	39810-C3	38.80
	.015 (1/64)	.045 (3x)	.0015	I	1/8	1-1/2	39815	34.20	39815-C3	38.80
	.020	.060 (3x)	.0020	I	1/8	1-1/2	39820	29.20	39820-C3	33.80
	.025	.075 (3x)	.0020	I	1/8	1-1/2	39825	29.20	39825-C3	33.80
	.030	.045 (1.5x)	.0030	I	1/8	1-1/2	815830	27.60	815830-C3	32.60
	.030	.090 (3x)	.0030	I	1/8	1-1/2	39830	27.60	39830-C3	32.20
	.031 (1/32)	.093 (3x)	.0030	I	1/8	1-1/2	39831	27.60	39831-C3	32.20
	.040	.120 (3x)	.0030	I	1/8	1-1/2	39840	24.80	39840-C3	29.40
	.045	.135 (3x)	.0030	I	1/8	1-1/2	39845	24.80	39845-C3	29.40
	.047 (3/64)	.141 (3x)	.0040	I	1/8	1-1/2	39847	24.80	39847-C3	29.40
	.050	.150 (3x)	.0040	I	1/8	1-1/2	39850	24.80	39850-C3	29.40
	.055	.165 (3x)	.0040	I	1/8	1-1/2	39855	24.80	39855-C3	29.40
	.060	.090 (1.5x)	.0050	I	1/8	1-1/2	815860	24.50	815860-C3	29.10
	.060	.180 (3x)	.0050	I	1/8	1-1/2	39860	24.50	39860-C3	29.10
	.062 (1/16)	.186 (3x)	.0050	I	1/8	1-1/2	39862	24.50	39862-C3	29.10
	.070	.210 (3x)	.0050	I	1/8	1-1/2	39870	24.50	39870-C3	29.10
	.075	.225 (3x)	.0050	I	1/8	1-1/2	39875	24.50	39875-C3	29.10
	.078 (5/64)	.234 (3x)	.0050	I	1/8	1-1/2	39878	24.50	39878-C3	29.10
	.090	.135 (1.5x)	.0050	I	1/8	1-1/2	815890	23.40	815890-C3	28.00
	.090	.270 (3x)	.0050	I	1/8	1-1/2	39890	23.40	39890-C3	28.00
	.093 (3/32)	.279 (3x)	.0060	I	1/8	1-1/2	39893	23.40	39893-C3	28.00

SPOTTING DRILLS

NEW

NEW

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# MINIATURE DRILLS

## Spotting Drills (cont.)

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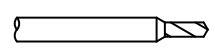
INCLUDED ANGLE	DRILL DIAMETER	FLUTE LENGTH	WEB THICKNESS	TYPE	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED		
							2 FL	PRICE	2 FL	PRICE	
A $^{+1^\circ}_{-1^\circ}$	D <sub>1</sub>	L <sub>2</sub>			D <sub>2</sub>	L <sub>1</sub>					
NEW NEW	140°	.100	.300 (3x)	.0060	I	1/8	1-1/2	39900	23.40	39900-C3	28.00
		.118 (3mm)	.354 (3x)	.0080	I	1/8	1-1/2	3993M	23.40	3993M-C3	28.00
		.125 (1/8)	.188 (1.5x)	.0100	I	1/8	1-1/2	815908	22.20	815908-C3	26.80
		.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	39925	22.20	39925-C3	26.80
		.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	41008	22.20	41008-C3	26.80
		.140 (9/64)	.375 (2.5x)	.0100	II	3/16	2	41009	25.70	41009-C3	30.70
		.156 (5/32)	.375 (2.5x)	.0110	II	3/16	2	41010	25.70	41010-C3	30.70
		.187 (3/16)	.625 (3x)	.0130	I	3/16	2	804112	25.70	804112-C3	30.70
		.187 (3/16)	.625 (3x)	.0130	II	3/16	2	41012	25.70	41012-C3	30.70
		.250 (1/4)	.750 (3x)	.0180	I	1/4	2-1/2	804116	31.90	804116-C3	38.70
.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	41016	31.90	41016-C3	38.70		
.375 (3/8)	1.000 (2.5x)	.0270	II	3/8	2-1/2	41024	56.30	41024-C3	65.30		
NEW NEW NEW NEW NEW	150°	.030	.090 (3x)	.0030	I	1/8	1-1/2	961130	27.60	961130-C3	32.20
		.040	.120 (3x)	.0030	I	1/8	1-1/2	961140	24.80	961140-C3	29.40
		.045	.135 (3x)	.0030	I	1/8	1-1/2	961145	24.80	961145-C3	29.40
		.047	.141 (3x)	.0040	I	1/8	1-1/2	961147	24.80	961147-C3	29.40
		.060	.180 (3x)	.0050	I	1/8	1-1/2	961160	24.50	961160-C3	29.10
		.062 (1/16)	.186 (3x)	.0050	I	1/8	1-1/2	961162	24.80	961162-C3	29.40
		.078 (5/64)	.234 (3x)	.0050	I	1/8	1-1/2	961178	24.80	961178-C3	29.40
		.090	.270 (3x)	.0050	I	1/8	1-1/2	961190	24.80	961190-C3	29.40
		.093 (3/32)	.279 (3x)	.0060	I	1/8	1-1/2	961193	24.80	961193-C3	29.40
		.125 (1/8)	.375 (3x)	.0100	I	1/8	1-1/2	961208	22.20	961208-C3	26.80
		.125 (1/8)	.375 (3x)	.0100	II	1/8	1-1/2	949508	22.20	949508-C3	26.80
		.187 (3/16)	.625 (3x)	.0130	II	3/16	2	949512	25.70	949512-C3	30.70
		.250 (1/4)	.750 (3x)	.0180	II	1/4	2-1/2	949516	31.90	949516-C3	38.70
		NEW	170°	.060	.180 (3x)	.0050	I	1/8	1-1/2	893660	24.80
.125 (1/8)	.375 (3x)			.0100	I	1/8	1-1/2	893708	24.80	893708-C3	29.40
.250 (1/4)	.750 (3x)			.0180	II	1/4	2-1/2	893716	31.90	893716-C3	38.70

SPOTTING DRILLS



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# MINIATURE REAMERS



D <sub>1</sub> Tolerances	
Uncoated	+ .0000" - .0002"
AITIN Coated	+ .0002" - .0000"

- ↻ Available uncoated or with AITIN 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		AITIN 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	50.30	RSB0080-C3	54.70
.0083	#91	.062	.100	.0014	4	1/8	1-1/2	RSB0083	50.30	RSB0083-C3	54.70
.0085		.062	.109	.0014	4	1/8	1-1/2	RSB0085	50.30	RSB0085-C3	54.70
.0087	#90	.062	.109	.0015	4	1/8	1-1/2	RSB0087	50.30	RSB0087-C3	54.70
.0090		.062	.118	.0015	4	1/8	1-1/2	RSB0090	50.30	RSB0090-C3	54.70
.0091	#89	.062	.118	.0015	4	1/8	1-1/2	RSB0091	50.30	RSB0091-C3	54.70
.0095	#88	.062	.118	.0016	4	1/8	1-1/2	RSB0095	50.30	RSB0095-C3	54.70
.0100	#87	.078	.125	.0017	4	1/8	1-1/2	RSB0100	50.30	RSB0100-C3	54.70
.0105	#86	.078	.125	.0018	4	1/8	1-1/2	RSB0105	50.30	RSB0105-C3	54.70
.0110	#85	.078	.141	.0018	4	1/8	1-1/2	RSB0110	50.30	RSB0110-C3	54.70
.0115	#84	.078	.141	.0019	4	1/8	1-1/2	RSB0115	50.30	RSB0115-C3	54.70
.0120	#83	.093	.156	.0020	4	1/8	1-1/2	RSB0120	50.30	RSB0120-C3	54.70
.0125	#82	.093	.172	.0021	4	1/8	1-1/2	RSB0125	50.30	RSB0125-C3	54.70
.0130	#81	.093	.172	.0022	4	1/8	1-1/2	RSB0130	50.30	RSB0130-C3	54.70
.0135	#80	.109	.187	.0023	4	1/8	1-1/2	RSB0135	50.30	RSB0135-C3	54.70
.0140		.109	.187	.0023	4	1/8	1-1/2	RSB0140	50.30	RSB0140-C3	54.70
.0145	#79	.109	.187	.0024	4	1/8	1-1/2	RSB0145	50.30	RSB0145-C3	54.70
.0150		.109	.187	.0025	4	1/8	1-1/2	RSB0150	50.30	RSB0150-C3	54.70
.0155		.109	.187	.0026	4	1/8	1-1/2	RSB0155	50.30	RSB0155-C3	54.70
.0160	#78	.125	.218	.0027	4	1/8	1-1/2	RSB0160	37.90	RSB0160-C3	42.30
.0165		.125	.218	.0019	4	1/8	1-1/2	RSB0165	37.90	RSB0165-C3	42.30
.0170		.125	.218	.0020	4	1/8	1-1/2	RSB0170	37.90	RSB0170-C3	42.30
.0175		.125	.218	.0020	4	1/8	1-1/2	RSB0175	37.90	RSB0175-C3	42.30
.0180	#77	.140	.250	.0021	4	1/8	1-1/2	RSB0180	37.90	RSB0180-C3	42.30
.0185		.140	.250	.0021	4	1/8	1-1/2	RSB0185	37.90	RSB0185-C3	42.30
.0190		.140	.250	.0022	4	1/8	1-1/2	RSB0190	37.90	RSB0190-C3	42.30
.0195		.140	.250	.0022	4	1/8	1-1/2	RSB0195	37.90	RSB0195-C3	42.30
.0200	#76	.140	.250	.0023	4	1/8	1-1/2	RSB0200	37.90	RSB0200-C3	42.30
.0205		.140	.250	.0024	4	1/8	1-1/2	RSB0205	37.90	RSB0205-C3	42.30
.0210	#75	.172	.281	.0024	4	1/8	1-1/2	RSB0210	37.90	RSB0210-C3	42.30
.0215		.172	.281	.0025	4	1/8	1-1/2	RSB0215	37.90	RSB0215-C3	42.30
.0220		.172	.281	.0025	4	1/8	1-1/2	RSB0220	37.90	RSB0220-C3	42.30
.0225	#74	.172	.281	.0026	4	1/8	1-1/2	RSB0225	37.90	RSB0225-C3	42.30
.0230		.172	.281	.0026	4	1/8	1-1/2	RSB0230	37.90	RSB0230-C3	42.30
.0235		.172	.281	.0027	4	1/8	1-1/2	RSB0235	37.90	RSB0235-C3	42.30
.0240	#73	.187	.312	.0028	4	1/8	1-1/2	RSB0240	37.90	RSB0240-C3	42.30
.0245		.187	.312	.0028	4	1/8	1-1/2	RSB0245	37.90	RSB0245-C3	42.30
.0250	#72	.187	.312	.0029	4	1/8	1-1/2	RSB0250	37.90	RSB0250-C3	42.30
.0255		.187	.312	.0029	4	1/8	1-1/2	RSB0255	37.90	RSB0255-C3	42.30
.0260	#71	.187	.312	.0030	4	1/8	1-1/2	RSB0260	37.90	RSB0260-C3	42.30
.0265		.187	.312	.0030	4	1/8	1-1/2	RSB0265	37.90	RSB0265-C3	42.30

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AITIN coating is +.0002"/-.0000".

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## MINIATURE REAMERS

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REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A TiN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> *		L <sub>2</sub> <sup>+0.020" -0.000"</sup>	L <sub>3</sub> <sup>+0.020" -0.000"</sup>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>				
.0270		.218	.375	.0031	4	1/8	2	RSB0270	37.90	RSB0270-C3	42.30
.0275		.218	.375	.0032	4	1/8	2	RSB0275	37.90	RSB0275-C3	42.30
.0280	#70	.218	.375	.0032	4	1/8	2	RSB0280	37.90	RSB0280-C3	42.30
.0285		.218	.375	.0033	4	1/8	2	RSB0285	37.90	RSB0285-C3	42.30
.0290		.218	.375	.0033	4	1/8	2	RSB0290	37.90	RSB0290-C3	42.30
.0292	#69	.218	.375	.0034	4	1/8	2	RSB0292	37.90	RSB0292-C3	42.30
.0295 (.75 mm)		.218	.375	.0034	4	1/8	2	RSB0295	37.90	RSB0295-C3	42.30
.0300		.218	.375	.0035	4	1/8	2	RSB0300	37.90	RSB0300-C3	42.30
.0305		.218	.375	.0035	4	1/8	2	RSB0305	37.90	RSB0305-C3	42.30
.0310	#68	.218	.375	.0036	4	1/8	2	RSB0310	37.90	RSB0310-C3	42.30
.0315 (.80 mm)		.218	.375	.0036	4	1/8	2	RSB0315	37.90	RSB0315-C3	42.30
.0320	#67	.250	.437	.0037	4	1/8	2	RSB0320	37.90	RSB0320-C3	42.30
.0325		.250	.437	.0037	4	1/8	2	RSB0325	37.90	RSB0325-C3	42.30
.0330	#66	.250	.437	.0038	4	1/8	2	RSB0330	37.90	RSB0330-C3	42.30
.0335 (.85 mm)		.250	.437	.0039	4	1/8	2	RSB0335	37.90	RSB0335-C3	42.30
.0340		.250	.437	.0039	4	1/8	2	RSB0340	37.90	RSB0340-C3	42.30
.0345		.250	.437	.0040	4	1/8	2	RSB0345	37.90	RSB0345-C3	42.30
.0350	#65	.250	.437	.0040	4	1/8	2	RSB0350	37.90	RSB0350-C3	42.30
.0355		.250	.437	.0041	4	1/8	2	RSB0355	37.90	RSB0355-C3	42.30
.0360	#64	.281	.500	.0041	4	1/8	2	RSB0360	37.90	RSB0360-C3	42.30
.0365		.281	.500	.0042	4	1/8	2	RSB0365	37.90	RSB0365-C3	42.30
.0370	#63	.281	.500	.0043	4	1/8	2	RSB0370	37.90	RSB0370-C3	42.30
.0375		.281	.500	.0043	4	1/8	2	RSB0375	37.90	RSB0375-C3	42.30
.0380	#62	.281	.500	.0044	4	1/8	2	RSB0380	37.90	RSB0380-C3	42.30
.0385		.281	.500	.0044	4	1/8	2	RSB0385	37.90	RSB0385-C3	42.30
.0390	#61	.281	.500	.0045	4	1/8	2	RSB0390	37.90	RSB0390-C3	42.30
.0395		.281	.500	.0045	4	1/8	2	RSB0395	37.90	RSB0395-C3	42.30
.0400	#60	.281	.500	.0046	4	1/8	2	RSB0400	37.90	RSB0400-C3	42.30
.0405		.281	.500	.0047	4	1/8	2	RSB0405	37.90	RSB0405-C3	42.30
.0410	#59	.281	.500	.0047	4	1/8	2	RSB0410	37.90	RSB0410-C3	42.30
.0415		.281	.500	.0048	4	1/8	2	RSB0415	37.90	RSB0415-C3	42.30
.0420	#58	.281	.500	.0048	4	1/8	2	RSB0420	37.90	RSB0420-C3	42.30
.0425		.312	.562	.0049	4	1/8	2	RSB0425	37.90	RSB0425-C3	42.30
.0430	#57	.312	.562	.0049	4	1/8	2	RSB0430	37.90	RSB0430-C3	42.30
.0435		.312	.562	.0050	4	1/8	2	RSB0435	37.90	RSB0435-C3	42.30
.0440		.312	.562	.0044	4	1/8	2	RSB0440	37.90	RSB0440-C3	42.30
.0445		.312	.562	.0045	4	1/8	2	RSB0445	37.90	RSB0445-C3	42.30
.0450		.312	.562	.0045	4	1/8	2	RSB0450	37.90	RSB0450-C3	42.30
.0455		.312	.562	.0046	4	1/8	2	RSB0455	37.90	RSB0455-C3	42.30
.0460		.312	.562	.0046	4	1/8	2	RSB0460	37.90	RSB0460-C3	42.30
.0465	#56	.312	.562	.0047	4	1/8	2	RSB0465	37.90	RSB0465-C3	42.30
.0469 (3/64)		.312	.562	.0047	4	1/8	2	RSB0469	31.80	RSB0469-C3	36.20
.0470		.312	.562	.0047	4	1/8	2	RSB0470	31.80	RSB0470-C3	36.20
.0475		.312	.562	.0048	4	1/8	2	RSB0475	31.80	RSB0475-C3	36.20
.0480		.375	.625	.0048	4	1/8	2	RSB0480	31.80	RSB0480-C3	36.20
.0485		.375	.625	.0049	4	1/8	2	RSB0485	31.80	RSB0485-C3	36.20
.0490		.375	.625	.0049	4	1/8	2	RSB0490	31.80	RSB0490-C3	36.20
.0495		.375	.625	.0050	4	1/8	2	RSB0495	31.80	RSB0495-C3	36.20
.0500		.375	.625	.0050	4	1/8	2	RSB0500	31.80	RSB0500-C3	36.20

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for A TiN coating is +.0002"/-.0000".

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# MINIATURE REAMERS

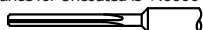
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REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIRTIN COATED	
								TOOL #	PRICE	TOOL #	PRICE
D <sub>1</sub> *		L <sub>2</sub> <sup>+0.020"</sup> -0.000"	L <sub>3</sub> <sup>+0.020"</sup> -0.000"	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>				
.0505		.375	.625	.0051	4	1/8	2	RSB0505	31.80	RSB0505-C3	36.20
.0510		.375	.625	.0051	4	1/8	2	RSB0510	31.80	RSB0510-C3	36.20
.0515		.375	.625	.0052	4	1/8	2	RSB0515	31.80	RSB0515-C3	36.20
.0520	#55	.375	.625	.0052	4	1/8	2	RSB0520	31.80	RSB0520-C3	36.20
.0525		.375	.625	.0053	4	1/8	2	RSB0525	31.80	RSB0525-C3	36.20
.0530		.437	.687	.0053	4	1/8	2	RSB0530	31.80	RSB0530-C3	36.20
.0535		.437	.687	.0054	4	1/8	2	RSB0535	31.80	RSB0535-C3	36.20
.0540		.437	.687	.0054	4	1/8	2	RSB0540	31.80	RSB0540-C3	36.20
.0545		.437	.687	.0055	4	1/8	2	RSB0545	31.80	RSB0545-C3	36.20
.0550	#54	.437	.687	.0055	4	1/8	2	RSB0550	31.80	RSB0550-C3	36.20
.0555		.437	.750	.0056	4	1/8	2	RSB0555	31.80	RSB0555-C3	36.20
.0560		.437	.750	.0056	4	1/8	2	RSB0560	31.80	RSB0560-C3	36.20
.0565		.437	.750	.0057	4	1/8	2	RSB0565	31.80	RSB0565-C3	36.20
.0570		.437	.750	.0057	4	1/8	2	RSB0570	31.80	RSB0570-C3	36.20
.0575		.437	.750	.0058	4	1/8	2	RSB0575	31.80	RSB0575-C3	36.20
.0580		.437	.750	.0058	4	1/8	2	RSB0580	31.80	RSB0580-C3	36.20
.0585		.437	.750	.0059	4	1/8	2	RSB0585	31.80	RSB0585-C3	36.20
.0590		.437	.750	.0059	4	1/8	2	RSB0590	31.80	RSB0590-C3	36.20
.0595	#53	.437	.750	.0060	4	1/8	2	RSB0595	31.80	RSB0595-C3	36.20
.0600		.437	.812	.0060	4	1/8	2	RSB0600	31.80	RSB0600-C3	36.20
.0605		.437	.812	.0061	4	1/8	2	RSB0605	31.80	RSB0605-C3	36.20
.0610 (1.55 mm)		.437	.812	.0061	4	1/8	2	RSB0610	31.80	RSB0610-C3	36.20
.0615		.437	.812	.0062	4	1/8	2	RSB0615	31.80	RSB0615-C3	36.20
.0620		.437	.812	.0062	4	1/8	2	RSB0620	31.80	RSB0620-C3	36.20
.0625 (1/16)		.437	.812	.0063	4	1/8	2	RSB0625	31.80	RSB0625-C3	36.20
.0630 (1.60 mm)		.437	.812	.0063	4	1/8	2	RSB0630	31.80	RSB0630-C3	36.20
.0635	#52	.437	.812	.0064	4	1/8	2	RSB0635	31.80	RSB0635-C3	36.20
.0640		.437	.812	.0064	4	1/8	2	RSB0640	31.80	RSB0640-C3	36.20
.0650 (1.65 mm)		.437	.812	.0065	4	1/8	2	RSB0650	31.80	RSB0650-C3	36.20
.0660		.500	.875	.0066	4	1/8	2	RSB0660	31.80	RSB0660-C3	36.20
.0670	#51	.500	.875	.0067	4	1/8	2	RSB0670	31.80	RSB0670-C3	36.20
.0680		.500	.875	.0068	4	1/8	2	RSB0680	31.80	RSB0680-C3	36.20
.0690		.500	.875	.0062	4	1/8	2	RSB0690	31.80	RSB0690-C3	36.20
.0700	#50	.562	.937	.0063	4	1/8	2	RSB0700	31.80	RSB0700-C3	36.20
.0710		.562	.937	.0064	4	1/8	2	RSB0710	31.80	RSB0710-C3	36.20
.0720		.562	.937	.0065	4	1/8	2	RSB0720	31.80	RSB0720-C3	36.20
.0730	#49	.562	.937	.0066	4	1/8	2	RSB0730	31.80	RSB0730-C3	36.20
.0740		.562	.937	.0067	4	1/8	2	RSB0740	31.80	RSB0740-C3	36.20
.0750		.562	1.000	.0068	4	1/8	2	RSB0750	31.80	RSB0750-C3	36.20
.0760	#48	.562	1.000	.0068	4	1/8	2	RSB0760	31.80	RSB0760-C3	36.20
.0765		.562	1.000	.0069	4	1/8	2	RSB0765	31.80	RSB0765-C3	36.20
.0770		.562	1.000	.0069	4	1/8	2	RSB0770	31.80	RSB0770-C3	36.20
.0775		.562	1.000	.0070	4	1/8	2	RSB0775	31.80	RSB0775-C3	36.20
.0780		.562	1.000	.0070	4	1/8	2	RSB0780	31.80	RSB0780-C3	36.20
.0781 (5/64)		.562	1.000	.0070	4	1/8	2	RSB0781	31.80	RSB0781-C3	36.20
.0785	#47	.562	1.000	.0071	4	1/8	2	RSB0785	31.80	RSB0785-C3	36.20
.0787 (2.00 mm)		.562	1.000	.0071	4	1/8	2	RSB0787	31.80	RSB0787-C3	36.20
.0790		.562	1.000	.0071	4	1/8	2	RSB0790	31.80	RSB0790-C3	36.20
.0795		.562	1.000	.0072	4	1/8	2	RSB0795	31.80	RSB0795-C3	36.20

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AIRTIN coating is +.0002"/-.0000".

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## MINIATURE REAMERS

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REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
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>	TOOL #	PRICE	TOOL #	PRICE
.0800		.562	1.000	.0072	4	1/8	2	RSB0800	31.80	RSB0800-C3	36.20
.0810	#46	.562	1.000	.0073	4	1/8	2	RSB0810	31.80	RSB0810-C3	36.20
.0820	#45	.562	1.000	.0074	4	1/8	2	RSB0820	31.80	RSB0820-C3	36.20
.0830		.562	1.000	.0075	4	1/8	2	RSB0830	31.80	RSB0830-C3	36.20
.0840		.625	1.125	.0076	4	1/8	2-1/2	RSB0840	31.80	RSB0840-C3	36.20
.0850		.625	1.125	.0077	4	1/8	2-1/2	RSB0850	31.80	RSB0850-C3	36.20
.0860	#44	.625	1.125	.0077	4	1/8	2-1/2	RSB0860	31.80	RSB0860-C3	36.20
.0870		.625	1.125	.0078	4	1/8	2-1/2	RSB0870	31.80	RSB0870-C3	36.20
.0880		.625	1.125	.0079	4	1/8	2-1/2	RSB0880	31.80	RSB0880-C3	36.20
.0890	#43	.625	1.125	.0080	4	1/8	2-1/2	RSB0890	31.80	RSB0890-C3	36.20
.0900		.625	1.125	.0081	4	1/8	2-1/2	RSB0900	31.80	RSB0900-C3	36.20
.0910		.625	1.125	.0082	4	1/8	2-1/2	RSB0910	31.80	RSB0910-C3	36.20
.0920		.625	1.125	.0083	4	1/8	2-1/2	RSB0920	31.80	RSB0920-C3	36.20
.0925 (2.35 mm)		.687	1.250	.0083	4	1/8	2-1/2	RSB0925	31.80	RSB0925-C3	36.20
.0930		.687	1.250	.0084	4	1/8	2-1/2	RSB0930	31.80	RSB0930-C3	36.20
.0935	#42	.687	1.250	.0084	4	1/8	2-1/2	RSB0935	31.80	RSB0935-C3	36.20
.0937 (3/32)		.687	1.250	.0084	4	1/8	2-1/2	RSB0937	31.80	RSB0937-C3	36.20
.0940		.687	1.250	.0085	4	1/8	2-1/2	RSB0940	31.80	RSB0940-C3	36.20
.0945 (2.40 mm)		.687	1.250	.0085	4	1/8	2-1/2	RSB0945	31.80	RSB0945-C3	36.20
.0950		.687	1.250	.0086	4	1/8	2-1/2	RSB0950	31.80	RSB0950-C3	36.20
.0960	#41	.687	1.250	.0086	4	1/8	2-1/2	RSB0960	31.80	RSB0960-C3	36.20
.0970		.687	1.250	.0087	4	1/8	2-1/2	RSB0970	31.80	RSB0970-C3	36.20
.0980	#40	.687	1.250	.0088	4	1/8	2-1/2	RSB0980	31.80	RSB0980-C3	36.20
.0990		.687	1.250	.0089	4	1/8	2-1/2	RSB0990	31.80	RSB0990-C3	36.20
.0995	#39	.687	1.250	.0090	4	1/8	2-1/2	RSB0995	31.80	RSB0995-C3	36.20
.1000		.750	1.375	.0090	4	1/8	2-1/2	RSB1000	31.80	RSB1000-C3	36.20
.1010		.750	1.375	.0091	4	1/8	2-1/2	RSB1010	31.80	RSB1010-C3	36.20
.1015	#38	.750	1.375	.0091	4	1/8	2-1/2	RSB1015	31.80	RSB1015-C3	36.20
.1020		.750	1.375	.0092	4	1/8	2-1/2	RSB1020	31.80	RSB1020-C3	36.20
.1030		.750	1.375	.0093	4	1/8	2-1/2	RSB1030	31.80	RSB1030-C3	36.20
.1040	#37	.750	1.375	.0094	4	1/8	2-1/2	RSB1040	31.80	RSB1040-C3	36.20
.1050		.750	1.375	.0095	4	1/8	2-1/2	RSB1050	31.80	RSB1050-C3	36.20
.1060		.750	1.375	.0095	4	1/8	2-1/2	RSB1060	31.80	RSB1060-C3	36.20
.1065	#36	.750	1.375	.0096	4	1/8	2-1/2	RSB1065	31.80	RSB1065-C3	36.20
.1070		.750	1.375	.0096	4	1/8	2-1/2	RSB1070	31.80	RSB1070-C3	36.20
.1080		.750	1.375	.0097	4	1/8	2-1/2	RSB1080	31.80	RSB1080-C3	36.20
.1083 (2.75 mm)		.750	1.375	.0097	4	1/8	2-1/2	RSB1083	31.80	RSB1083-C3	36.20
.1085		.750	1.375	.0098	4	1/8	2-1/2	RSB1085	31.80	RSB1085-C3	36.20
.1090		.750	1.375	.0098	4	1/8	2-1/2	RSB1090	31.80	RSB1090-C3	36.20
.1094 (7/64)		.750	1.375	.0098	4	1/8	2-1/2	RSB1094	31.80	RSB1094-C3	36.20
.1100	#35	.750	1.375	.0099	4	1/8	2-1/2	RSB1100	31.80	RSB1100-C3	36.20
.1105		.750	1.375	.0099	4	1/8	2-1/2	RSB1105	31.80	RSB1105-C3	36.20
.1110	#34	.750	1.375	.0100	4	1/8	2-1/2	RSB1110	31.80	RSB1110-C3	36.20
.1120		.750	1.375	.0101	4	1/8	2-1/2	RSB1120	31.80	RSB1120-C3	36.20
.1130	#33	.750	1.500	.0102	4	1/8	2-1/2	RSB1130	31.80	RSB1130-C3	36.20
.1140		.750	1.500	.0103	4	1/8	2-1/2	RSB1140	31.80	RSB1140-C3	36.20
.1150		.750	1.500	.0104	4	1/8	2-1/2	RSB1150	31.80	RSB1150-C3	36.20
.1160	#32	.750	1.500	.0104	4	1/8	2-1/2	RSB1160	31.80	RSB1160-C3	36.20
.1170		.750	1.500	.0105	4	1/8	2-1/2	RSB1170	31.80	RSB1170-C3	36.20

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AITIN coating is +.0002"/-.0000".

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REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIIIN COATED	
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>	TOOL #	PRICE	TOOL #	PRICE
.1180		.750	1.500	.0106	4	1/8	2-1/2	RSB1180	31.80	RSB1180-C3	36.20
.1190		.750	1.500	.0107	4	1/8	2-1/2	RSB1190	31.80	RSB1190-C3	36.20
.1200	#31	.750	1.500	.0108	4	1/8	2-1/2	RSB1200	31.80	RSB1200-C3	36.20
.1210		.750	1.500	.0109	4	1/8	2-1/2	RSB1210	31.80	RSB1210-C3	36.20
.1220 (3.10 mm)		.750	1.500	.0110	4	1/8	2-1/2	RSB1220	31.80	RSB1220-C3	36.20
.1230		.750	1.500	.0111	4	3/16	3	RSB1230	37.30	RSB1230-C3	42.10
.1235		.750	1.500	.0111	4	3/16	3	RSB1235	37.30	RSB1235-C3	42.10
.1240		.750	1.500	.0112	4	3/16	3	RSB1240	37.30	RSB1240-C3	42.10
.1245		.750	1.500	.0112	4	3/16	3	RSB1245	37.30	RSB1245-C3	42.10
.1250 (1/8)		.750	1.500	.0113	4	3/16	3	RSB1250	37.30	RSB1250-C3	42.10
.1255		.750	1.500	.0113	4	3/16	3	RSB1255	37.30	RSB1255-C3	42.10
.1260 (3.20 mm)		.750	1.500	.0113	4	3/16	3	RSB1260	37.30	RSB1260-C3	42.10
.1265		.750	1.500	.0114	4	3/16	3	RSB1265	37.30	RSB1265-C3	42.10
.1285	#30	.750	1.500	.0116	4	3/16	3	RSB1285	37.30	RSB1285-C3	42.10
.1360	#29	.750	1.625	.0122	4	3/16	3	RSB1360	37.30	RSB1360-C3	42.10
.1390		.750	1.625	.0125	4	3/16	3	RSB1390	37.30	RSB1390-C3	42.10
.1395		.750	1.625	.0126	4	3/16	3	RSB1395	37.30	RSB1395-C3	42.10
.1400		.750	1.625	.0126	4	3/16	3	RSB1400	37.30	RSB1400-C3	42.10
.1405	#28	.750	1.625	.0126	4	3/16	3	RSB1405	37.30	RSB1405-C3	42.10
.1406 (9/64)		.750	1.625	.0127	4	3/16	3	RSB1406	37.30	RSB1406-C3	42.10
.1410		.750	1.625	.0127	4	3/16	3	RSB1410	37.30	RSB1410-C3	42.10
.1415		.750	1.625	.0127	4	3/16	3	RSB1415	37.30	RSB1415-C3	42.10
.1420		.750	1.625	.0128	4	3/16	3	RSB1420	37.30	RSB1420-C3	42.10
.1440	#27	.750	1.625	.0130	4	3/16	3	RSB1440	37.30	RSB1440-C3	42.10
.1470	#26	.875	1.750	.0132	4	3/16	3	RSB1470	37.30	RSB1470-C3	42.10
.1495	#25	.875	1.750	.0135	4	3/16	3	RSB1495	37.30	RSB1495-C3	42.10
.1520	#24	.875	1.750	.0137	4	3/16	3	RSB1520	37.30	RSB1520-C3	42.10
.1540	#23	.875	1.750	.0139	4	3/16	3	RSB1540	37.30	RSB1540-C3	42.10
.1545		.875	1.750	.0139	4	3/16	3	RSB1545	37.30	RSB1545-C3	42.10
.1550		.875	1.750	.0140	4	3/16	3	RSB1550	37.30	RSB1550-C3	42.10
.1555		.875	1.750	.0140	4	3/16	3	RSB1555	37.30	RSB1555-C3	42.10
.1560		.875	1.750	.0140	4	3/16	3	RSB1560	37.30	RSB1560-C3	42.10
.1562 (5/32)		.875	1.750	.0141	4	3/16	3	RSB1562	37.30	RSB1562-C3	42.10
.1565		.875	1.750	.0141	4	3/16	3	RSB1565	37.30	RSB1565-C3	42.10
.1570	#22	.875	1.750	.0141	4	3/16	3	RSB1570	37.30	RSB1570-C3	42.10
.1575 (4.00 mm)		.875	1.750	.0142	4	3/16	3	RSB1575	37.30	RSB1575-C3	42.10
.1580		.875	1.875	.0142	4	3/16	3	RSB1580	37.30	RSB1580-C3	42.10
.1585		.875	1.875	.0143	4	3/16	3	RSB1585	37.30	RSB1585-C3	42.10
.1590	#21	.875	1.875	.0143	4	3/16	3	RSB1590	37.30	RSB1590-C3	42.10
.1610	#20	.875	1.875	.0145	4	3/16	3	RSB1610	37.30	RSB1610-C3	42.10
.1660	#19	.875	1.875	.0149	4	3/16	3	RSB1660	37.30	RSB1660-C3	42.10
.1695	#18	1.000	2.000	.0153	4	3/16	4	RSB1695	41.40	RSB1695-C3	47.80
.1705		1.000	2.000	.0153	4	3/16	4	RSB1705	41.40	RSB1705-C3	47.80
.1710		1.000	2.000	.0154	4	3/16	4	RSB1710	41.40	RSB1710-C3	47.80
.1715		1.000	2.000	.0154	4	3/16	4	RSB1715	41.40	RSB1715-C3	47.80
.1719 (11/64)		1.000	2.000	.0155	4	3/16	4	RSB1719	41.40	RSB1719-C3	47.80

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AIIIN coating is +.0002"/-.0000".

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## MINIATURE REAMERS

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REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		A1TIN 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>				
.1725		1.000	2.000	.0155	4	3/16	4	RSB1725	41.40	RSB1725-C3	47.80
.1730	#17	1.000	2.000	.0156	4	3/16	4	RSB1730	41.40	RSB1730-C3	47.80
.1735		1.000	2.000	.0156	4	3/16	4	RSB1735	41.40	RSB1735-C3	47.80
.1770	#16	1.000	2.000	.0159	4	3/16	4	RSB1770	41.40	RSB1770-C3	47.80
.1800	#15	1.000	2.125	.0162	4	3/16	4	RSB1800	41.40	RSB1800-C3	47.80
.1820	#14	1.000	2.125	.0164	4	3/16	4	RSB1820	41.40	RSB1820-C3	47.80
.1850 (4.70 mm)	#13	1.000	2.125	.0167	4	1/4	4	RSB1850	50.00	RSB1850-C3	56.80
.1860		1.000	2.125	.0167	4	1/4	4	RSB1860	50.00	RSB1860-C3	56.80
.1865		1.000	2.125	.0168	4	1/4	4	RSB1865	50.00	RSB1865-C3	56.80
.1870		1.000	2.125	.0168	4	1/4	4	RSB1870	50.00	RSB1870-C3	56.80
.1875 (3/16)		1.000	2.125	.0169	4	1/4	4	RSB1875	50.00	RSB1875-C3	56.80
.1880		1.000	2.125	.0169	4	1/4	4	RSB1880	50.00	RSB1880-C3	56.80
.1885		1.000	2.125	.0170	4	1/4	4	RSB1885	50.00	RSB1885-C3	56.80
.1890	#12	1.000	2.125	.0170	4	1/4	4	RSB1890	50.00	RSB1890-C3	56.80
.1910	#11	1.000	2.125	.0172	4	1/4	4	RSB1910	50.00	RSB1910-C3	57.60
.1935	#10	1.000	2.125	.0174	4	1/4	4	RSB1935	50.00	RSB1935-C3	57.60
.1960	#9	1.000	2.125	.0176	4	1/4	4	RSB1960	50.00	RSB1960-C3	57.60
.1969 (5.00 mm)		1.000	2.125	.0177	4	1/4	4	RSB1969	52.40	RSB1969-C3	60.00
.1990	#8	1.000	2.125	.0179	4	1/4	4	RSB1990	52.40	RSB1990-C3	60.00
.2010	#7	1.000	2.125	.0181	4	1/4	4	RSB2010	52.40	RSB2010-C3	60.00
.2015		1.000	2.125	.0181	4	1/4	4	RSB2015	52.40	RSB2015-C3	60.00
.2020		1.000	2.125	.0182	4	1/4	4	RSB2020	52.40	RSB2020-C3	60.00
.2025		1.000	2.125	.0182	4	1/4	4	RSB2025	52.40	RSB2025-C3	60.00
.2031 (13/64)		1.000	2.250	.0183	4	1/4	4	RSB2031	53.20	RSB2031-C3	60.70
.2035		1.000	2.250	.0183	4	1/4	4	RSB2035	53.20	RSB2035-C3	60.70
.2040	#6	1.000	2.250	.0184	4	1/4	4	RSB2040	53.20	RSB2040-C3	60.70
.2045		1.000	2.250	.0184	4	1/4	4	RSB2045	53.20	RSB2045-C3	60.70
.2055	#5	1.000	2.250	.0185	4	1/4	4	RSB2055	53.20	RSB2055-C3	60.70
.2090	#4	1.000	2.250	.0188	4	1/4	4	RSB2090	53.20	RSB2090-C3	60.70
.2130	#3	1.000	2.250	.0192	4	1/4	4	RSB2130	53.20	RSB2130-C3	60.70
.2170		1.000	2.375	.0195	4	1/4	4	RSB2170	53.20	RSB2170-C3	60.70
.2175		1.000	2.375	.0196	4	1/4	4	RSB2175	53.20	RSB2175-C3	60.70
.2180		1.000	2.375	.0196	4	1/4	4	RSB2180	53.20	RSB2180-C3	60.70
.2185		1.000	2.375	.0197	4	1/4	4	RSB2185	53.20	RSB2185-C3	60.70
.2187 (7/32)		1.000	2.375	.0197	4	1/4	4	RSB2187	53.20	RSB2187-C3	60.70
.2190		1.000	2.375	.0197	4	1/4	4	RSB2190	53.20	RSB2190-C3	60.70
.2195		1.000	2.375	.0198	4	1/4	4	RSB2195	53.20	RSB2195-C3	60.70
.2200		1.000	2.375	.0198	4	1/4	4	RSB2200	53.20	RSB2200-C3	60.70
.2205 (5.60 mm)		1.000	2.375	.0198	4	1/4	4	RSB2205	53.20	RSB2205-C3	60.70
.2210	#2	1.000	2.375	.0199	4	1/4	4	RSB2210	53.20	RSB2210-C3	60.70
.2280	#1	1.125	2.500	.0182	6	1/4	4	RSB2280	57.70	RSB2280-C3	65.30
.2330		1.125	2.500	.0186	6	1/4	4	RSB2330	57.70	RSB2330-C3	65.30
.2335		1.125	2.500	.0187	6	1/4	4	RSB2335	57.70	RSB2335-C3	65.30
.2340	A	1.125	2.500	.0187	6	1/4	4	RSB2340	57.70	RSB2340-C3	65.30
.2344 (15/64)		1.125	2.500	.0188	6	1/4	4	RSB2344	57.70	RSB2344-C3	65.30
.2350		1.125	2.500	.0188	6	1/4	4	RSB2350	57.70	RSB2350-C3	65.30
.2355		1.125	2.500	.0188	6	1/4	4	RSB2355	57.70	RSB2355-C3	65.30
.2360		1.125	2.500	.0189	6	1/4	4	RSB2360	57.70	RSB2360-C3	65.30

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for A1TIN coating is +.0002"/-.0000".

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# MINIATURE REAMERS

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REAMER DIAMETER	WIRE	MARGIN LENGTH	OVERALL REACH	CHAMFER LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AIIIN COATED	
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>	TOOL #	PRICE	TOOL #	PRICE
.2362 (6.00 mm)		1.125	2.500	.0189	6	1/4	4	RSB2362	57.70	RSB2362-C3	65.30
.2380	B	1.125	2.500	.0190	6	1/4	4	RSB2380	57.70	RSB2380-C3	65.30
.2420	C	1.125	2.500	.0194	6	1/4	4	RSB2420	57.70	RSB2420-C3	65.30
.2460	D	1.125	2.500	.0197	6	1/4	4	RSB2460	57.70	RSB2460-C3	65.30
.2485		1.125	2.750	.0199	6	5/16	4	RSB2485	60.50	RSB2485-C3	69.80
.2490		1.125	2.750	.0199	6	5/16	4	RSB2490	60.50	RSB2490-C3	69.80
.2495		1.125	2.750	.0200	6	5/16	4	RSB2495	60.50	RSB2495-C3	69.80
.2500 (1/4)	E	1.125	2.750	.0200	6	5/16	4	RSB2500	60.50	RSB2500-C3	69.80
.2505		1.125	2.750	.0200	6	5/16	4	RSB2505	60.50	RSB2505-C3	69.80
.2510		1.125	2.750	.0201	6	5/16	4	RSB2510	60.50	RSB2510-C3	69.80
.2515		1.125	2.750	.0201	6	5/16	4	RSB2515	60.50	RSB2515-C3	69.80
.2570	F	1.125	2.750	.0206	6	5/16	4	RSB2570	60.50	RSB2570-C3	69.80

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AIIIN coating is +.0002"/-.0000".

## 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.

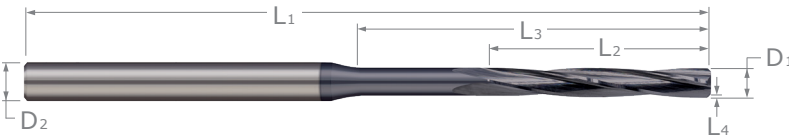
Material	SFM	Chip Load IPR (Inches Per Revolution) By Reamer Diameter									
		.015	.031	.047	.062	.078	.093	.125	.187	.250	
<b>Aluminum Alloys</b> Casting (2xx, 5xx, 7xx, 8xx)	450										
Wrought (1xxx, 2xxx, 3xxx, 5xxx, 6xxx, 7xxx, 8xxx)	600	.00041	.00084	.00127	.00167	.00211	.00251	.00338	.00505	.00675	
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	.00036	.00075	.00114	.00151	.00190	.00226	.00304	.00454	.00608	
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	.00041	.00084	.00127	.00167	.00211	.00251	.00338	.00505	.00675	
<b>Zinc Alloys</b>	480										
<b>Copper Alloys</b> High Coppers - 90%+ (C1xxxx)	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	.00032	.00067	.00102	.00134	.00168	.00201	.00270	.00404	.00540	
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>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	
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	
<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	
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	
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	
<b>Tool Steels</b> A, L, O, P, W series	125	.00032	.00067	.00102	.00134	.00168	.00201	.00270	.00404	.00540	
D, H, M, T, S series	90	.00020	.00042	.00063	.00084	.00105	.00126	.00169	.00252	.00338	
<b>Titanium Alloys</b>	100	.00020	.00042	.00063	.00084	.00105	.00126	.00169	.00252	.00338	
<b>High Temp Alloys</b> Inconel, Hastelloy, Waspalloy, Monel, Nimonic, Haynes, Discolloy, Incoloy	70	.00020	.00042	.00063	.00084	.00105	.00126	.00169	.00252	.00338	

REAMERS



## MINIATURE REAMERS

## Right Hand Spiral



D <sub>1</sub> Tolerances	
Uncoated	+0.000" -0.0002"
AlTiN Coated	+0.0002" -0.0000"

- 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	
D <sub>1</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>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>	TOOL #	PRICE	TOOL #	PRICE
.0100	#87	.078	.125	.0017	4	1/8	1-1/2	RRH0100	52.80	RRH0100-C3	57.40
.0150		.109	.187	.0025	4	1/8	1-1/2	RRH0150	52.80	RRH0150-C3	59.60
.0200	#76	.140	.250	.0023	4	1/8	1-1/2	RRH0200	39.80	RRH0200-C3	46.60
.0250	#72	.187	.312	.0029	4	1/8	1-1/2	RRH0250	39.80	RRH0250-C3	46.60
.0300		.218	.375	.0035	4	1/8	2	RRH0300	39.80	RRH0300-C3	46.60
.0305		.218	.375	.0035	4	1/8	2	RRH0305	39.80	RRH0305-C3	46.60
.0310	#68	.218	.375	.0036	4	1/8	2	RRH0310	39.80	RRH0310-C3	46.60
.0315 (.80 mm)		.218	.375	.0036	4	1/8	2	RRH0315	39.80	RRH0315-C3	44.80
.0350	#65	.250	.437	.0040	4	1/8	2	RRH0350	39.80	RRH0350-C3	44.80
.0400	#60	.281	.500	.0046	4	1/8	2	RRH0400	39.80	RRH0400-C3	44.80
.0500		.375	.625	.0050	4	1/8	2	RRH0500	33.40	RRH0500-C3	38.00
.0600		.437	.812	.0060	4	1/8	2	RRH0600	33.40	RRH0600-C3	38.00
.0620		.437	.812	.0062	4	1/8	2	RRH0620	33.40	RRH0620-C3	38.00
.0625 (1/16)		.437	.812	.0063	4	1/8	2	RRH0625	33.40	RRH0625-C3	38.00
.0630 (1.60 mm)		.437	.812	.0063	4	1/8	2	RRH0630	33.40	RRH0630-C3	38.00
.0700	#50	.562	.937	.0063	4	1/8	2	RRH0700	33.40	RRH0700-C3	38.00
.0781 (5/64)		.562	1.000	.0070	4	1/8	2	RRH0781	33.40	RRH0781-C3	38.00
.0800		.562	1.000	.0072	4	1/8	2	RRH0800	33.40	RRH0800-C3	38.00
.0900		.625	1.125	.0081	4	1/8	2-1/2	RRH0900	33.40	RRH0900-C3	38.00
.0935	#42	.687	1.250	.0084	4	1/8	2-1/2	RRH0935	33.40	RRH0935-C3	38.00
.0937 (3/32)		.687	1.250	.0084	4	1/8	2-1/2	RRH0937	33.40	RRH0937-C3	38.00
.0940		.687	1.250	.0085	4	1/8	2-1/2	RRH0940	33.40	RRH0940-C3	38.00
.0950		.687	1.250	.0086	4	1/8	2-1/2	RRH0950	33.40	RRH0950-C3	38.00
.1000		.750	1.375	.0090	4	1/8	2-1/2	RRH1000	33.40	RRH1000-C3	38.00

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AlTiN coating is +.0002"/-.0000".

continued on next page



## MINIATURE REAMERS

### Right Hand Spiral (cont.)

continued from previous page

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> / <sub>-0.000"</sub>	L <sub>3</sub> <sup>+0.030"</sup> / <sub>-0.000"</sub>	L <sub>4</sub>		D <sub>2</sub> (h6)	L <sub>1</sub>				
.1245		.750	1.500	.0112	4	3/16	3	RRH1245	39.20	RRH1245-C3	44.20
.1250 (1/8)		.750	1.500	.0113	4	3/16	3	RRH1250	39.20	RRH1250-C3	44.20
.1255		.750	1.500	.0113	4	3/16	3	RRH1255	39.20	RRH1255-C3	44.20
.1285	#30	.750	1.500	.0116	4	3/16	3	RRH1285	39.20	RRH1285-C3	44.20
.1560		.875	1.750	.0140	4	3/16	3	RRH1560	39.20	RRH1560-C3	44.20
.1575 (4.00 mm)		.875	1.750	.0142	4	3/16	3	RRH1575	39.20	RRH1575-C3	44.20
.1870		1.000	2.125	.0168	4	1/4	4	RRH1870	52.50	RRH1870-C3	60.40
.1875 (3/16)		1.000	2.125	.0169	4	1/4	4	RRH1875	52.50	RRH1875-C3	60.40
.1880		1.000	2.125	.0169	4	1/4	4	RRH1880	52.50	RRH1880-C3	60.40

\* Tolerance for Uncoated is +.0000"/-.0002". Tolerance for AITIN coating is +.0002"/-.0000".

PLEASE SEE SPEEDS & FEEDS ON PAGE 418



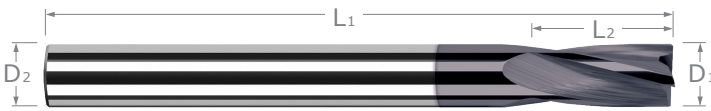
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## COUNTERBORES

Flat Bottom

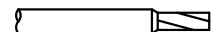


For Spot Facing or  
Counterboring on  
Irregular Surfaces

- ✦ **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 ✦ CNC ground in the USA 

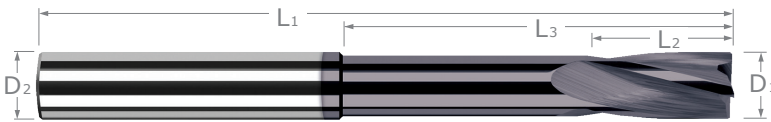
CUTTER DIAMETER	FLUTE LENGTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		AITIN NANO COATED	
				4 FL	PRICE	4 FL	PRICE	4 FL	PRICE
$D_1^{+.0000''*}$	$L_2^{+.030''}$	$D_2$	$L_1$						
	$-.0005''*$								
.0312 (1/32)	1/8	1/8	1-1/2	23331	29.60	23331-C3	34.20		
.0394 (1 mm)	5/32	1/8	1-1/2	2331M	29.60	2331M-C3	34.20		
.0469 (3/64)	3/16	1/8	1-1/2	23347	29.60	23347-C3	34.20		
.0550	1/4	1/8	1-1/2	23355	29.60	23355-C3	34.60		
.0625 (1/16)	1/4	1/8	1-1/2	23362	29.60	23362-C3	34.20	23362-C6	36.40
.0700	9/32	1/8	1-1/2	23370	29.60	23370-C3	34.60		
.0781 (5/64)	5/16	1/8	1-1/2	23378	29.60	23378-C3	34.20		
.0787 (2 mm)	5/16	1/8	1-1/2	2332M	29.60	2332M-C3	34.20		
.0900	3/8	1/8	1-1/2	23390	29.60	23390-C3	36.40		
.0937 (3/32)	3/8	1/8	1-1/2	23393	29.60	23393-C3	34.20	23393-C6	36.40
.1094 (7/64)	3/8	1/8	1-1/2	23407	29.60	23407-C3	34.20		
.1181 (3 mm)	3/8	1/8	1-1/2	2343M	29.60	2343M-C3	34.20	2343M-C6	36.40
.1250 (1/8)	1/2	1/8	1-1/2	23408	29.60	23408-C3	34.20	23408-C6	36.40
.1406 (9/64)	9/16	3/16	2	23409	28.40	23409-C3	33.40		
.1562 (5/32)	5/8	3/16	2	23410	28.40	23410-C3	33.40		
.1575 (4 mm)	5/8	3/16	2	2344M	28.40	2344M-C3	33.40		
.1719 (11/64)	5/8	3/16	2	23411	28.40	23411-C3	33.40		
.1875 (3/16)	3/4	3/16	2	23412	28.40	23412-C3	33.40	23412-C6	35.70
.1968 (5 mm)	3/4	1/4	2-1/2	2345M	38.70	2345M-C3	45.50		
.2031 (13/64)	3/4	1/4	2-1/2	23413	38.70	23413-C3	45.50		
.2187 (7/32)	3/4	1/4	2-1/2	23414	38.70	23414-C3	45.50		
.2344 (15/64)	7/8	1/4	2-1/2	23415	38.70	23415-C3	45.50		
.2362 (6 mm)	7/8	1/4	2-1/2	2346M	38.70	2346M-C3	45.50	2346M-C6	48.70
.2500 (1/4)	7/8	1/4	2-1/2	23416	38.70	23416-C3	45.50	23416-C6	48.70
.2656 (17/64)	7/8	5/16	2-1/2	23417	47.80	23417-C3	55.70		
.2812 (9/32)	7/8	5/16	2-1/2	23418	47.80	23418-C3	55.70		
.2969 (19/64)	7/8	5/16	2-1/2	23419	47.80	23419-C3	55.70		
.3125 (5/16)	1	5/16	2-1/2	23420	47.80	23420-C3	55.70		
.3150 (8 mm)	1	3/8	2-1/2	2348M	57.10	2348M-C3	66.10		
.3281 (21/64)	1	3/8	2-1/2	23421	57.10	23421-C3	66.10		
.3437 (11/32)	1	3/8	2-1/2	23422	57.10	23422-C3	66.10		
.3594 (23/64)	1	3/8	2-1/2	23423	57.10	23423-C3	66.10		
.3750 (3/8)	1	3/8	2-1/2	23424	57.10	23424-C3	66.10	23424-C6	68.30
.3937 (10 mm)	1	7/16	2-3/4	2340M	70.40	2340M-C3	81.60		
.4062 (13/32)	1	7/16	2-3/4	23426	70.40	23426-C3	81.60		
.4375 (7/16)	1	7/16	2-3/4	23428	70.40	23428-C3	81.60		
.4687 (15/32)	1	1/2	3	23430	92.50	23430-C3	105.90		
.4724 (12 mm)	1	1/2	3	23476	92.50	23476-C3	105.90		
.5000 (1/2)	1	1/2	3	23432	92.50	23432-C3	105.90		
.5625 (9/16)	1-1/2	5/8	3-1/2	23436	131.40	23436-C3	144.80		
.6250 (5/8)	1-1/2	5/8	3-1/2	23440	147.10	23440-C3	160.50		
.6875 (11/16)	1-1/2	3/4	4	23444	213.10	23444-C3	227.60		
.7500 (3/4)	1-1/2	3/4	4	23448	213.10	23448-C3	227.60		

\* Tolerance listed above refers to uncoated counterbores. Tolerance for AlTiN and AlTiN Nano coating is  $+.0002''/- .0005''$ .



# COUNTERBORES

## Flat Bottom – Long Reach



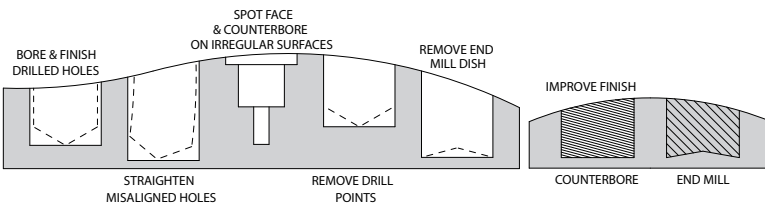
**Undersized Neck to Avoid Heeling**

- 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>+0.000"</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	34.50	25431-C3	39.10
.0394 (1 mm)	5/32	5/16	1/8	2-1/2	2541M	34.50	2541M-C3	39.10
.0469 (3/64)	3/16	3/8	1/8	2-1/2	25447	34.50	25447-C3	39.10
.0625 (1/16)	1/4	1/2	1/8	2-1/2	25462	34.50	25462-C3	39.10
.0781 (5/64)	5/16	5/8	1/8	2-1/2	25478	34.50	25478-C3	39.10
.0787 (2 mm)	5/16	5/8	1/8	2-1/2	2542M	34.50	2542M-C3	39.10
.0937 (3/32)	3/8	3/4	1/8	2-1/2	25493	34.50	25493-C3	39.10
.1094 (7/64)	3/8	7/8	1/8	2-1/2	25507	34.50	25507-C3	39.10
.1181 (3 mm)	3/8	1	1/8	2-1/2	2553M	34.50	2553M-C3	39.10
.1250 (1/8)	1/2	1	1/8	2-1/2	25508	34.50	25508-C3	39.10
.1406 (9/64)	9/16	1-1/8	3/16	3	25509	42.00	25509-C3	47.00
.1562 (5/32)	5/8	1-1/4	3/16	3	25510	42.00	25510-C3	47.00
.1575 (4 mm)	5/8	1-1/4	3/16	3	2554M	42.00	2554M-C3	47.00
.1719 (11/64)	5/8	1-3/8	3/16	3	25511	42.00	25511-C3	47.00
.1875 (3/16)	3/4	1-1/2	3/16	3	25512	42.00	25512-C3	47.00
.1968 (5 mm)	3/4	1-9/16	1/4	4	2555M	58.20	2555M-C3	66.10
.2031 (13/64)	3/4	1-5/8	1/4	4	25513	55.80	25513-C3	63.70
.2187 (7/32)	3/4	1-3/4	1/4	4	25514	55.80	25514-C3	63.70
.2344 (15/64)	7/8	1-7/8	1/4	4	25515	55.80	25515-C3	63.70
.2362 (6 mm)	7/8	1-7/8	1/4	4	2556M	58.20	2556M-C3	66.10
.2500 (1/4)	7/8	2	1/4	4	25516	55.80	25516-C3	63.70
.2656 (17/64)	7/8	2-1/8	5/16	4	25517	70.70	25517-C3	80.20
.2812 (9/32)	7/8	2-1/4	5/16	4	25518	70.70	25518-C3	80.20
.2969 (19/64)	7/8	2-3/8	5/16	4	25519	70.70	25519-C3	80.20
.3125 (5/16)	1	2-1/2	5/16	4	25520	70.70	25520-C3	80.20
.3150 (8 mm)	1	2-1/2	3/8	4	2558M	91.20	2558M-C3	103.50
.3437 (11/32)	1	2-3/4	3/8	4	25522	85.30	25522-C3	97.60
.3750 (3/8)	1	3	3/8	4	25524	85.30	25524-C3	97.60
.3937 (10 mm)	1	3	7/16	4	2550M	106.00	2550M-C3	119.40
.4375 (7/16)	1	3	7/16	4	25528	99.00	25528-C3	112.40
.5000 (1/2)	1	3	1/2	4	25532	121.40	25532-C3	134.80

\* Tolerance listed above refers to uncoated counterbores. Tolerance for A1TIN coating is +.0002"/-.0005".

### APPLICATIONS:

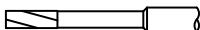


**SPOT EFFECTIVELY.** The flat bottom removes end mill dish or drill points while effectively spotting on irregular surfaces.

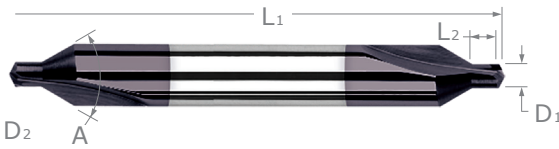
**HOLD POSITION.** The full cylindrical margin and back taper are not side cutting and won't grab or deflect.

**CONTROL FINISH.** The slow helix with a low rake avoids part engagement and helps to control finish.

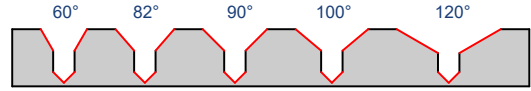
COUNTERBORES



## 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



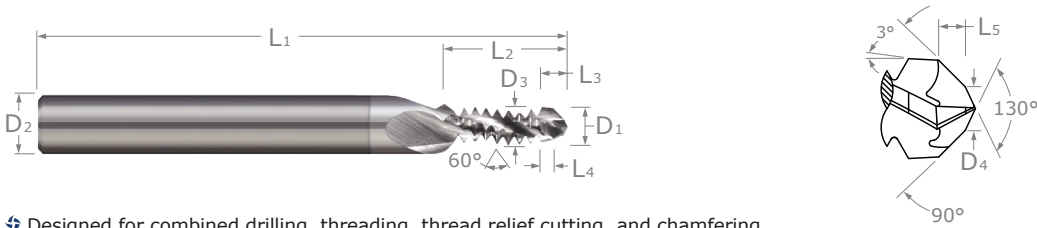
Stocked in *Five* Angles!

INCLUDED ANGLE	SIZE	DRILL DIAMETER	DRILL LENGTH	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AISI COATED	
						2 FL	PRICE	2 FL	PRICE
$A_{-1^{\circ}}^{+1^{\circ}}$		$D_1 \begin{smallmatrix} +.0015'' \\ +.0005'' \end{smallmatrix}$	$L_2 \begin{smallmatrix} +.005'' \\ -.000'' \end{smallmatrix}$	$D_2$	$L_1$				
60°	0000	1/64	1/64	1/8	1-1/2	11002	31.60	11002-C3	37.30
	000	.020	.020	1/8	1-1/2	11005	24.00	11005-C3	29.70
	00	.025	.025	1/8	1-1/2	11010	18.80	11010-C3	24.50
	0	1/32	1/32	1/8	1-1/2	11020	18.80	11020-C3	24.50
	1	3/64	3/64	1/8	1-1/2	11030	15.80	11030-C3	21.50
	2	5/64	5/64	3/16	2	11040	24.00	11040-C3	30.80
	3	7/64	7/64	1/4	2	11050	27.30	11050-C3	36.50
	4	1/8	1/8	5/16	2-1/2	11060	37.30	11060-C3	48.50
82°	5	3/16	3/16	7/16	2-3/4	11070	55.70	11070-C3	72.40
	00	.025	.025	1/8	1-1/2	25610	19.90	25610-C3	25.60
	0	1/32	1/32	1/8	1-1/2	25620	19.90	25620-C3	25.60
	1	3/64	3/64	1/8	1-1/2	25630	16.70	25630-C3	22.40
	2	5/64	5/64	3/16	2	25640	25.70	25640-C3	32.50
	3	7/64	7/64	1/4	2	25650	29.00	25650-C3	38.20
	4	1/8	1/8	5/16	2-1/2	25660	39.40	25660-C3	50.60
90°	5	3/16	3/16	7/16	2-3/4	25670	59.20	25670-C3	75.90
	0000	1/64	1/64	1/8	1-1/2	17902	32.60	17902-C3	38.30
	000	.020	.020	1/8	1-1/2	17905	24.80	17905-C3	30.50
	00	.025	.025	1/8	1-1/2	17910	19.40	17910-C3	25.10
	0	1/32	1/32	1/8	1-1/2	17920	19.40	17920-C3	25.10
	1	3/64	3/64	1/8	1-1/2	17930	16.30	17930-C3	22.00
	2	5/64	5/64	3/16	2	17940	24.80	17940-C3	31.10
	3	7/64	7/64	1/4	2	17950	28.20	17950-C3	36.80
100°	4	1/8	1/8	5/16	2-1/2	17960	38.30	17960-C3	49.50
	5	3/16	3/16	7/16	2-3/4	17970	57.40	17970-C3	73.10
	0	1/32	1/32	1/8	1-1/2	849520	22.30	849520-C3	27.40
	1	3/64	3/64	1/8	1-1/2	849530	18.70	849530-C3	24.30
	2	5/64	5/64	3/16	2	849540	28.40	849540-C3	34.00
120°	3	7/64	7/64	1/4	2	849550	32.20	849550-C3	39.70
	4	1/8	1/8	5/16	2-1/2	849560	43.70	849560-C3	52.60
	2	5/64	5/64	3/16	2	822540	28.40	822540-C3	33.00
120°	3	7/64	7/64	1/4	2	822550	32.20	822550-C3	37.20
	4	1/8	1/8	5/16	2-1/2	822560	43.70	822560-C3	48.70

COMBINED DRILL & COUNTERSINKS



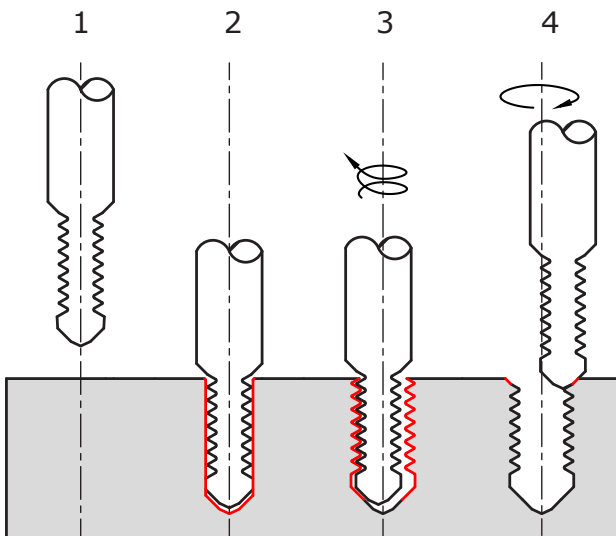
# COMBINATION DRILL / THREAD MILLS



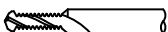
- Designed for combined drilling, threading, thread relief cutting, and chamfering
- One cutter for 4 different operations saves time on tool changes and leaves more room in the tool carousel
- Length of cut includes transition angle, allowing for optional 45° chamfer pass
- Optimized for cutting non-ferrous 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	
										3 FL	PRICE	3 FL	PRICE
	D <sub>1</sub> $\begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	L <sub>2</sub> $\begin{smallmatrix} +.030'' \\ -.000'' \end{smallmatrix}$	D <sub>3</sub> $\begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	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	107.40	820616-C8	117.40
6-32	.1076	.3323	.100	.0475	.0707	.0312	.0284	3/16	2	820622	110.80	820622-C8	120.90
8-32	.1336	.3652	.115	.0735	.0767	.0312	.0284	3/16	2	820628	118.60	820628-C8	128.90
10-24	.1494	.4966	.120	.0760	.0939	.0416	.0345	1/4	2	820634	124.50	820634-C8	135.50
10-32	.1596	.4681	.120	.0995	.0828	.0312	.0284	1/4	2	820636	124.50	820636-C8	135.00
1/4-20	.2013	.7154	.180	.1172	.1168	.0500	.0394	3/8	2-1/2	820644	148.30	820644-C8	160.00
1/4-28	.2152	.7078	.180	.1494	.1016	.0357	.0310	3/8	2-1/2	820646	148.30	820646-C8	159.50
5/16-18	.2584	.8750	.240	.1671	.1372	.0555	.0427	3/8	2-1/2	820654	162.00	820654-C8	173.60
5/16-24	.2719	.8248	.240	.1985	.1224	.0416	.0345	3/8	2-1/2	820656	182.20	820656-C8	194.40
3/8-16	.3141	1.019	.285	.2140	.1592	.0625	.0468	1/2	3	820664	216.60	820664-C8	229.80
7/16-20	.3888	1.154	.335	.3047	.1605	.0500	.0394	1/2	3-1/2	820676	234.10	820676-C8	247.90
1/2-13	.4251	1.279	.350	.3064	.2036	.0769	.0553	5/8	3-1/2	820684	241.60	820684-C8	270.90

## Combination Drill/Thread Mills Order of Operations



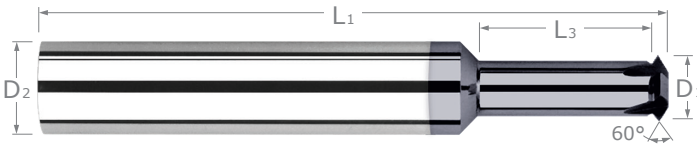
1. Approach the workpiece and center the tool along the axis of the anticipated hole.
2. Drill hole to the desired depth. For simultaneous chamfering, use the full length of cut to engage on the transition of the tool.
3. To begin thread, lift drill up by 1/2x - 1x pitch, then helically interpolate up 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.



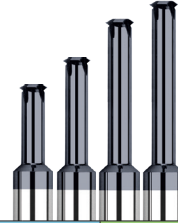


# THREAD MILLING CUTTERS

## Single Form – UN Threads



Stocked in Multiple Reach Lengths!



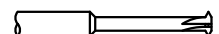
- ↪ Single thread form – can mill multiple pitches
- ↪ Cuts internal and external 60° UN threads
- ↪ Mills right hand and left hand threads
- ↪ Tip of included angle ground to a point
- ↪ Solid carbide    ↪ CNC ground in the USA

**For thread fit chart,  
search for keyword  
THREADFIT on  
[www.harveytool.com](http://www.harveytool.com)**

THREAD SIZE	CUTTER DIA. $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	NECK DIA.	MAX DEPTH OF THREAD $L_3 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$	FLUTES	SHANK DIA. $D_2$	OVERALL LENGTH $L_1$	UNCOATED		AISI IN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
00	.032	.016	<b>1/16</b>	2	1/8	1-1/2	71001	73.00	71001-C3	77.60		
00	.032	.016	<b>3/32</b>	2	1/8	1-1/2	41401	77.30	41401-C3	81.90		
0	.044	.024	<b>3/32</b>	2	1/8	1-1/2	71002	70.40	71002-C3	75.00	71002-C4	82.10
0	.044	.024	<b>1/8</b>	2	1/8	1-1/2	41402	74.80	41402-C3	79.40	41402-C4	86.50
0	.044	.024	<b>3/16</b>	2	1/8	1-1/2	54202	80.40	54202-C3	85.00	54202-C4	92.10
0	.044	.024	<b>1/4</b>	2	1/8	1-1/2	993902	84.10	993902-C3	88.70		
0	.044	.024	<b>5/16</b>	2	1/8	1-1/2	901202	87.70	901202-C3	92.30		
1	.054	.032	<b>1/8</b>	2	1/8	1-1/2	71004	70.40	71004-C3	75.00	71004-C4	82.10
1	.054	.032	<b>3/16</b>	2	1/8	1-1/2	41404	74.80	41404-C3	79.40	41404-C4	86.50
1	.054	.032	<b>1/4</b>	2	1/8	1-1/2	54204	80.40	54204-C3	85.00	54204-C4	92.10
1	.054	.032	<b>5/16</b>	2	1/8	1-1/2	993904	84.10	993904-C3	88.70		
1	.054	.032	<b>3/8</b>	2	1/8	1-1/2	901204	87.70	901204-C3	92.30		
2	.064	.038	<b>5/32</b>	2	1/8	1-1/2	71006	70.40	71006-C3	75.00	71006-C4	82.10
2	.064	.038	<b>7/32</b>	2	1/8	1-1/2	41406	74.80	41406-C3	79.40	41406-C4	86.50
2	.064	.038	<b>5/16</b>	2	1/8	1-1/2	54206	80.40	54206-C3	85.00	54206-C4	92.10
2	.064	.038	<b>7/16</b>	2	1/8	1-1/2	993906	84.10	993906-C3	88.70		
2	.064	.038	<b>9/16</b>	2	1/8	1-1/2	901206	87.70	901206-C3	92.30		
3	.072	.040	<b>5/32</b>	2	1/8	1-1/2	71008	70.40	71008-C3	75.00	71008-C4	82.10
3	.072	.040	<b>1/4</b>	2	1/8	1-1/2	41408	74.80	41408-C3	79.40	41408-C4	86.50
3	.072	.040	<b>3/8</b>	2	1/8	1-1/2	54208	80.40	54208-C3	85.00	54208-C4	92.10
3	.072	.040	<b>1/2</b>	2	1/8	1-1/2	993908	84.10	993908-C3	88.70		
4	.080	.040	<b>1/8</b>	2	3/16	2	71010	70.60	71010-C3	75.60	71010-C4	86.70
4	.080	.040	<b>1/4</b>	2	3/16	2	41410	75.00	41410-C3	80.00	41410-C4	91.10
NEW 4	.080	.040	<b>5/16</b>	2	3/16	2	821410	77.90	821410-C3	82.90		
4	.080	.040	<b>3/8</b>	2	3/16	2	54210	80.80	54210-C3	85.80	54210-C4	96.90
4	.080	.040	<b>1/2</b>	2	3/16	2	993910	84.80	993910-C3	89.80		
4	.080	.040	<b>5/8</b>	2	3/16	2	901210	89.00	901210-C3	94.00		
NEW 5	.093	.050	<b>3/16</b>	4	3/16	2	71015	70.40	71015-C3	75.40		
5	.093	.050	<b>3/8</b>	4	3/16	2	41415	74.80	41415-C3	79.80	41415-C4	90.90
5	.093	.050	<b>1/2</b>	4	3/16	2	54215	80.40	54215-C3	85.40		
5	.093	.050	<b>5/8</b>	4	3/16	2	993915	84.80	993915-C3	89.80		
6	.098	.050	<b>5/32</b>	4	3/16	2	932920	70.60	932920-C3	75.60		
6	.098	.050	<b>1/4</b>	4	3/16	2	71020	70.60	71020-C3	75.60	71020-C4	86.70
6	.098	.050	<b>5/16</b>	4	3/16	2	822720	72.60	822720-C3	79.40		
6	.098	.050	<b>3/8</b>	4	3/16	2	41420	75.00	41420-C3	80.00	41420-C4	91.10
6	.098	.050	<b>1/2</b>	4	3/16	2	54220	80.80	54220-C3	85.80	54220-C4	96.90
6	.098	.050	<b>5/8</b>	4	3/16	2	993920	84.80	993920-C3	89.80		
6	.098	.050	<b>3/4</b>	4	3/16	2	901220	89.00	901220-C3	94.00		
8	.120	.070	<b>7/32</b>	4	1/4	2-1/2	932930	71.60	932930-C3	78.40		
8	.120	.070	<b>5/16</b>	4	1/4	2-1/2	71030	72.40	71030-C3	79.20	71030-C4	90.70

THREAD MILLING CUTTERS

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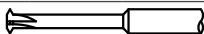
# THREAD MILLING CUTTERS

## Single Form – UN Threads (cont.)

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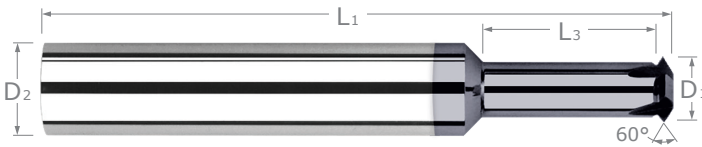
THREAD SIZE	CUTTER DIA. D <sub>1</sub> <sup>+0.000"</sup> / <sub>-.002"</sub>	NECK DIA.	MAX DEPTH OF THREAD L <sub>3</sub> <sup>+0.020"</sup> / <sub>-.000"</sub>	FLUTES	SHANK DIA. D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AITIN COATED		AMORPHOUS DIAMOND	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
8	.120	.070	<b>3/8</b>	4	1/4	2-1/2	820330	74.80	820330-C3	81.60		
8	.120	.070	<b>1/2</b>	4	1/4	2-1/2	41430	77.30	41430-C3	84.10	41430-C4	95.60
8	.120	.070	<b>9/16</b>	4	1/4	2-1/2	821430	79.90	821430-C3	84.50		
8	.120	.070	<b>5/8</b>	4	1/4	2-1/2	54230	82.60	54230-C3	89.40	54230-C4	100.90
8	.120	.070	<b>3/4</b>	4	1/4	2-1/2	993930	89.00	993930-C3	95.80		
8	.120	.070	<b>7/8</b>	4	1/4	2-1/2	901230	94.30	901230-C3	101.10		
10	.135	.070	<b>7/32</b>	4	1/4	2-1/2	932940	71.60	932940-C3	78.40		
10	.135	.070	<b>5/16</b>	4	1/4	2-1/2	71040	72.40	71040-C3	79.20	71040-C4	90.70
10	.135	.070	<b>3/8</b>	4	1/4	2-1/2	820340	74.80	820340-C3	81.60		
10	.135	.070	<b>1/2</b>	4	1/4	2-1/2	41440	77.30	41440-C3	84.10	41440-C4	95.60
10	.135	.070	<b>5/8</b>	4	1/4	2-1/2	54240	82.60	54240-C3	89.40	54240-C4	100.90
10	.135	.070	<b>7/8</b>	4	1/4	2-1/2	993940	89.00	993940-C3	95.80		
10	.135	.070	<b>1-1/8</b>	4	1/4	2-1/2	901240	94.30	901240-C3	101.10		
12	.160	.095	<b>3/8</b>	4	1/4	2-1/2	71045	72.40	71045-C3	79.20		
12	.160	.095	<b>5/8</b>	4	1/4	2-1/2	41445	77.30	41445-C3	84.10		
12	.160	.095	<b>7/8</b>	4	1/4	2-1/2	54245	82.60	54245-C3	89.40		
1/4	.180	.115	<b>5/16</b>	4	1/4	2-1/2	932950	71.60	932950-C3	78.40		
1/4	.180	.115	<b>1/2</b>	4	1/4	2-1/2	71050	72.40	71050-C3	79.20	71050-C4	90.70
1/4	.180	.115	<b>5/8</b>	4	1/4	2-1/2	822750	74.80	822750-C3	81.60		
1/4	.180	.115	<b>3/4</b>	4	1/4	2-1/2	41450	77.30	41450-C3	84.10	41450-C4	95.60
1/4	.180	.115	<b>1</b>	4	1/4	2-1/2	54250	82.60	54250-C3	89.40	54250-C4	100.90
1/4	.180	.115	<b>1-1/4</b>	4	1/4	2-1/2	993950	89.00	993950-C3	95.80		
1/4	.180	.115	<b>1-1/2</b>	4	1/4	3	901250	94.30	901250-C3	101.10		
5/16	.240	.160	<b>1/2</b>	4	1/4	2-1/2	71055	72.40	71055-C3	79.20	71055-C4	90.70
5/16	.240	.160	<b>5/8</b>	4	1/4	2-1/2	822755	74.80	822755-C3	81.60		
5/16	.240	.160	<b>3/4</b>	4	1/4	2-1/2	41455	77.30	41455-C3	84.10	41455-C4	95.60
5/16	.240	.160	<b>1</b>	4	1/4	2-1/2	54255	85.30	54255-C3	92.10	54255-C4	103.60
5/16	.240	.160	<b>1-1/4</b>	4	1/4	2-1/2	993955	89.00	993955-C3	95.80		
5/16	.240	.160	<b>1-1/2</b>	4	1/4	3	901255	94.30	901255-C3	101.10		
3/8	.300	.218	<b>3/4</b>	4	3/8	2-1/2	71060	94.30	71060-C3	102.20	71060-C4	116.40
3/8	.300	.218	<b>7/8</b>	4	3/8	2-1/2	822760	96.60	822760-C3	105.60		
3/8	.300	.218	<b>1</b>	4	3/8	2-1/2	41460	99.00	41460-C3	108.00	41460-C4	121.10
3/8	.300	.218	<b>1-1/4</b>	4	3/8	2-1/2	54260	104.30	54260-C3	113.30	54260-C4	126.40
3/8	.300	.218	<b>1-1/2</b>	4	3/8	3	993960	108.20	993960-C3	117.20		
3/8	.300	.218	<b>1-3/4</b>	4	3/8	3	901260	112.10	901260-C3	121.10		
7/16	.340	.230	<b>3/4</b>	4	3/8	2-1/2	71065	106.20	71065-C3	115.20		
7/16	.340	.230	<b>1</b>	4	3/8	2-1/2	41465	110.70	41465-C3	119.70		
1/2	.388	.250	<b>3/4</b>	4	1/2	3	71070	106.20	71070-C3	119.60		
1/2	.388	.250	<b>1</b>	4	1/2	3	822770	108.70	822770-C3	122.10		
1/2	.388	.250	<b>1-1/4</b>	4	1/2	3	41470	111.20	41470-C3	124.60	41470-C4	137.80
1/2	.388	.250	<b>1-3/4</b>	4	1/2	4	54270	118.50	54270-C3	131.90		
1/2	.388	.250	<b>2-1/4</b>	4	1/2	4	993970	123.60	993970-C3	137.00		
1/2	.388	.250	<b>2-3/4</b>	4	1/2	6	901270	128.40	901270-C3	141.80		
5/8	.450	.300	<b>1</b>	6	1/2	3	71075	111.00	71075-C3	124.40		
5/8	.450	.300	<b>1-3/8</b>	6	1/2	3	41475	116.20	41475-C3	129.60		
3/4	.495	.325	<b>1</b>	6	1/2	3	71080	111.00	71080-C3	124.40		
3/4	.495	.325	<b>1-3/8</b>	6	1/2	3	41480	116.20	41480-C3	129.60		
3/4	.495	.325	<b>1-3/4</b>	6	1/2	4	54280	122.30	54280-C3	135.70		
3/4	.495	.325	<b>2-1/4</b>	6	1/2	4	993980	127.70	993980-C3	141.10		
3/4	.495	.325	<b>2-3/4</b>	6	1/2	6	901280	132.90	901280-C3	146.30		
1	.620	.420	<b>1-5/16</b>	6	5/8	3-1/2	71090	150.90	71090-C3	164.30		
1	.620	.420	<b>1-3/4</b>	6	5/8	3-1/2	41490	159.30	41490-C3	172.70		

THREAD MILLING CUTTERS



# THREAD MILLING CUTTERS

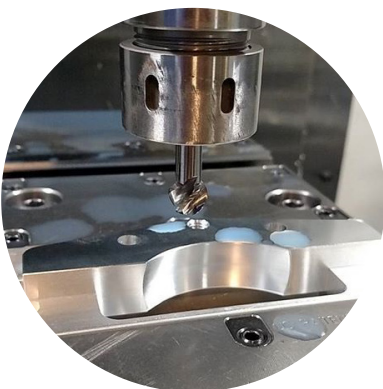
## Single Form – Metric



For thread fit chart,  
search for keyword  
**THREADFIT** on  
[www.harveytool.com](http://www.harveytool.com)

- ↪ 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

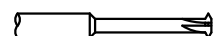
THREAD SIZE	CUTTER DIA. D <sub>1</sub> <sup>+0.00 mm</sup> / <sub>-.05 mm</sub>	NECK DIA.	MAX DEPTH OF THREAD L <sub>3</sub> <sup>+0.50 mm</sup> / <sub>-.00 mm</sub>	FLUTES	SHANK DIA. D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED		AIIIN COATED	
							TOOL #	PRICE	TOOL #	PRICE
M1.6	1.16 mm	.696 mm	<b>2.10 mm</b>	2	3 mm	38 mm	890316	74.80	890316-C3	79.40
M1.6	1.16 mm	.696 mm	<b>3.50 mm</b>	2	3 mm	38 mm	882116	74.80	882116-C3	79.40
M2	1.50 mm	.900 mm	<b>2.70 mm</b>	2	3 mm	38 mm	890319	74.80	890319-C3	79.40
M2	1.50 mm	.900 mm	<b>4.50 mm</b>	2	3 mm	38 mm	882119	74.80	882119-C3	79.40
M2	1.50 mm	.900 mm	<b>7.00 mm</b>	2	3 mm	38 mm	826519	77.00	826519-C3	81.60
M2.5	1.90 mm	1.140 mm	<b>3.50 mm</b>	2	3 mm	38 mm	890322	74.80	890322-C3	79.40
M2.5	1.90 mm	1.140 mm	<b>5.80 mm</b>	2	3 mm	38 mm	882122	74.80	882122-C3	79.40
M3	2.30 mm	1.380 mm	<b>4.00 mm</b>	4	3 mm	38 mm	890324	74.80	890324-C3	79.40
M3	2.30 mm	1.380 mm	<b>6.80 mm</b>	4	3 mm	38 mm	882124	74.80	882124-C3	79.40
M3	2.30 mm	1.380 mm	<b>11.00 mm</b>	4	3 mm	38 mm	826524	77.00	826524-C3	81.60
M4	3.00 mm	1.800 mm	<b>5.50 mm</b>	4	3 mm	38 mm	890326	75.90	890326-C3	80.50
M4	3.00 mm	1.800 mm	<b>9.00 mm</b>	4	3 mm	38 mm	882126	77.00	882126-C3	81.60
M4	3.00 mm	1.800 mm	<b>14.00 mm</b>	4	3 mm	38 mm	826526	79.30	826526-C3	83.90
M5	4.00 mm	2.400 mm	<b>7.00 mm</b>	4	4 mm	50 mm	890328	77.00	890328-C3	82.00
M5	4.00 mm	2.400 mm	<b>12.00 mm</b>	4	4 mm	50 mm	882128	79.30	882128-C3	84.30
M5	4.00 mm	2.400 mm	<b>19.00 mm</b>	4	4 mm	50 mm	826528	81.90	826528-C3	86.90
M6	4.80 mm	2.880 mm	<b>8.50 mm</b>	4	6 mm	50 mm	890330	75.90	890330-C3	82.70
M6	4.80 mm	2.880 mm	<b>14.00 mm</b>	4	6 mm	50 mm	882130	77.00	882130-C3	83.80
M6	4.80 mm	2.880 mm	<b>23.00 mm</b>	4	6 mm	63 mm	826530	83.00	826530-C3	89.80
M8	6.00 mm	3.600 mm	<b>11.00 mm</b>	4	6 mm	50 mm	890332	77.00	890332-C3	83.80
M8	6.00 mm	3.600 mm	<b>18.00 mm</b>	4	6 mm	50 mm	882132	81.90	882132-C3	88.70
M10	8.00 mm	4.800 mm	<b>15.00 mm</b>	4	8 mm	63 mm	890334	99.80	890334-C3	107.70
M10	8.00 mm	4.800 mm	<b>24.00 mm</b>	4	8 mm	63 mm	882134	105.00	882134-C3	112.90
M16	13.70 mm	8.220 mm	<b>25.00 mm</b>	6	14 mm	75 mm	890339	117.70	890339-C3	131.10
M16	13.70 mm	8.220 mm	<b>42.00 mm</b>	6	14 mm	89 mm	882139	129.60	882139-C3	143.00



"Love these @harveytool lollipop. Undercutting a full radius for a pillow block bearing."

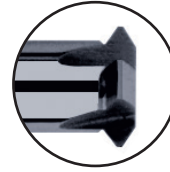
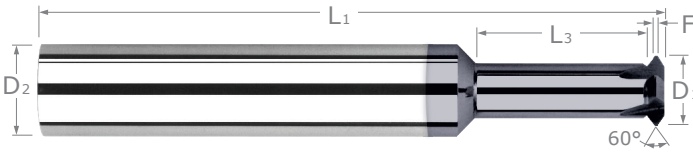
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# THREAD MILLING CUTTERS

## Single Form – UN Threads – For Hardened Steels



Tip of Included Angle Ground to a Flat for Increased Wear Resistance

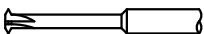
- **Designed for threading hardened steels 46-68Rc**
- Single thread form designed to mill common pitch sizes
- Cuts internal and external 60° UN threads
- Tip of included angle ground to a flat for increased wear resistance
- Large rigid core diameter and eccentric relief for improved strength
- Mills 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
		$D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	$F \begin{smallmatrix} +.0000'' \\ -.0005'' \end{smallmatrix}$		$L_3 \begin{smallmatrix} +.020'' \\ -.000'' \end{smallmatrix}$		$D_2$ (h6)	$L_1$		
0	80	.044	.0013	.028	<b>3/32</b>	3	1/8	1-1/2	986602-C6	85.50
0	80	.044	.0013	.028	<b>1/8</b>	3	1/8	1-1/2	993102-C6	89.10
0	80	.044	.0013	.028	<b>3/16</b>	3	1/8	1-1/2	959502-C6	93.20
0	80	.044	.0013	.028	<b>1/4</b>	3	1/8	1-1/2	930302-C6	97.30
0	80	.044	.0013	.028	<b>5/16</b>	3	1/8	1-1/2	898902-C6	101.00
1	64-72	.054	.0014	.034	<b>1/8</b>	3	1/8	1-1/2	986604-C6	85.50
1	64-72	.054	.0014	.034	<b>3/16</b>	3	1/8	1-1/2	993104-C6	89.10
1	64-72	.054	.0014	.034	<b>1/4</b>	3	1/8	1-1/2	959504-C6	93.20
1	64-72	.054	.0014	.034	<b>5/16</b>	3	1/8	1-1/2	930304-C6	97.10
2	56-64	.064	.0016	.041	<b>5/32</b>	3	1/8	1-1/2	986606-C6	85.50
2	56-64	.064	.0016	.041	<b>7/32</b>	3	1/8	1-1/2	993106-C6	89.10
2	56-64	.064	.0016	.041	<b>5/16</b>	3	1/8	1-1/2	959506-C6	93.20
2	56-64	.064	.0016	.041	<b>7/16</b>	3	1/8	1-1/2	930306-C6	97.30
3	48-56	.072	.0018	.046	<b>5/32</b>	3	1/8	1-1/2	986608-C6	85.50
3	48-56	.072	.0018	.046	<b>1/4</b>	3	1/8	1-1/2	993108-C6	89.10
3	48-56	.072	.0018	.046	<b>3/8</b>	3	1/8	1-1/2	959508-C6	93.20
4	40-48	.080	.0021	.050	<b>5/32</b>	3	3/16	2	986610-C6	86.10
4	40-48	.080	.0021	.050	<b>1/4</b>	3	3/16	2	993110-C6	91.20
4	40-48	.080	.0021	.050	<b>3/8</b>	3	3/16	2	959510-C6	95.00
4	40-48	.080	.0021	.050	<b>1/2</b>	3	3/16	2	930310-C6	99.00
4	40-48	.080	.0021	.050	<b>5/8</b>	3	3/16	2	898910-C6	102.90
5	40-44	.093	.0023	.063	<b>3/16</b>	4	3/16	2	986615-C6	91.20
5	40-44	.093	.0023	.063	<b>1/2</b>	4	3/16	2	959515-C6	95.00
5	40-44	.093	.0023	.063	<b>5/8</b>	4	3/16	2	930315-C6	99.00
6	32-40	.098	.0025	.062	<b>1/4</b>	4	3/16	2	986620-C6	86.10
6	32-40	.098	.0025	.062	<b>3/8</b>	4	3/16	2	993120-C6	91.20
6	32-40	.098	.0025	.062	<b>1/2</b>	4	3/16	2	959520-C6	95.00
6	32-40	.098	.0025	.062	<b>5/8</b>	4	3/16	2	930320-C6	99.00
8	32-36	.120	.0028	.084	<b>5/16</b>	4	1/4	2-1/2	986630-C6	90.40
8	32-36	.120	.0028	.084	<b>1/2</b>	4	1/4	2-1/2	993130-C6	95.70
8	32-36	.120	.0028	.084	<b>5/8</b>	4	1/4	2-1/2	959530-C6	100.70
8	32-36	.120	.0028	.084	<b>3/4</b>	4	1/4	2-1/2	930330-C6	105.70
8	32-36	.120	.0028	.084	<b>7/8</b>	4	1/4	2-1/2	898930-C6	110.70
10	24-36	.135	.0028	.086	<b>5/16</b>	5	1/4	2-1/2	986640-C6	90.40
10	24-36	.135	.0028	.086	<b>1/2</b>	5	1/4	2-1/2	993140-C6	95.70

\*Tools are designed to produce an 83% depth of thread maximum.

continued on next page

THREAD MILLING CUTTERS




# THREAD MILLING CUTTERS

Single Form – UN Threads – For Hardened Steels (cont.)

continued from previous page

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> $\begin{matrix} +.000" \\ -.002" \end{matrix}$	F $\begin{matrix} +.0000" \\ -.0005" \end{matrix}$		L <sub>3</sub> $\begin{matrix} +.020" \\ -.000" \end{matrix}$		D <sub>2</sub> (h6)	L <sub>1</sub>		
10	24-36	.135	.0028	.086	<b>5/8</b>	5	1/4	2-1/2	959540-C6	100.70
10	24-36	.135	.0028	.086	<b>7/8</b>	5	1/4	2-1/2	930340-C6	105.70
10	24-36	.135	.0028	.086	<b>1-1/8</b>	5	1/4	2-1/2	898940-C6	110.70
12	24-32	.160	.0030	.111	<b>3/8</b>	5	1/4	2-1/2	986645-C6	90.40
12	24-32	.160	.0030	.111	<b>5/8</b>	5	1/4	2-1/2	993145-C6	100.70
1/4	20-32	.180	.0030	.122	<b>5/16</b>	5	1/4	2-1/2	845750-C6	90.40
1/4	20-32	.180	.0030	.122	<b>1/2</b>	5	1/4	2-1/2	986650-C6	95.70
1/4	20-32	.180	.0030	.122	<b>3/4</b>	5	1/4	2-1/2	993150-C6	100.70
1/4	20-32	.180	.0030	.122	<b>1</b>	5	1/4	2-1/2	959550-C6	105.70
1/4	20-32	.180	.0030	.122	<b>1-1/4</b>	5	1/4	2-1/2	930350-C6	110.50
5/16	18-28	.240	.0036	.174	<b>3/8</b>	5	1/4	2-1/2	845755-C6	90.40
5/16	18-28	.240	.0036	.174	<b>1/2</b>	5	1/4	2-1/2	986655-C6	95.70
5/16	18-28	.240	.0036	.174	<b>3/4</b>	5	1/4	2-1/2	993155-C6	100.70
5/16	18-28	.240	.0036	.174	<b>1</b>	5	1/4	2-1/2	959555-C6	105.70
5/16	18-28	.240	.0036	.174	<b>1-1/4</b>	5	1/4	2-1/2	930355-C6	110.50
3/8	16-28	.300	.0036	.227	<b>1/2</b>	5	3/8	2-1/2	845760-C6	116.60
3/8	16-28	.300	.0036	.227	<b>3/4</b>	5	3/8	2-1/2	986660-C6	121.70
3/8	16-28	.300	.0036	.227	<b>1</b>	5	3/8	2-1/2	993160-C6	126.80
3/8	16-28	.300	.0036	.227	<b>1-1/4</b>	5	3/8	2-1/2	959560-C6	131.90
3/8	16-28	.300	.0036	.227	<b>1-1/2</b>	5	3/8	3	930360-C6	136.90
1/2	12-18	.388	.0056	.294	<b>3/4</b>	5	1/2	3	986670-C6	134.40
1/2	12-18	.388	.0056	.294	<b>1-1/4</b>	5	1/2	3	993170-C6	143.40
1/2	12-18	.388	.0056	.294	<b>1-3/4</b>	5	1/2	4	959570-C6	148.60
1/2	12-18	.388	.0056	.294	<b>2-1/4</b>	5	1/2	4	930370-C6	153.60
3/4	10-16	.495	.0063	.385	<b>1</b>	6	1/2	3	986680-C6	142.50
3/4	10-16	.495	.0063	.385	<b>1-3/8</b>	6	1/2	3	993180-C6	154.40
3/4	10-16	.495	.0063	.385	<b>1-3/4</b>	6	1/2	3	959580-C6	166.50
3/4	10-16	.495	.0063	.385	<b>2-1/4</b>	6	1/2	4	930380-C6	178.50
1	8-14	.620	.0071	.480	<b>1-5/16</b>	6	5/8	3-1/2	986690-C6	168.70
1	8-14	.620	.0071	.480	<b>1-3/4</b>	6	5/8	3-1/2	993190-C6	180.80

\*Tools are designed to produce an 83% depth of thread maximum.



**SINGLE FORM THREAD FIT CHART**

Single Form Thread Mills Series 440A, 540A, 700A, 9600C and Double Angle Shank Cutters Series 400A, 275A, 475A are well suited for machining steel, cast iron, titanium, Inconel and various non-ferrous metals. They are available in both standard and long flute designs. However, use single form cutter in cases of cutting multiple different thread sizes. The charts below display typical UN/NC threads and the single form cutter that are capable of machining them.

Chart assumptions:  
 1. With conventional chip, except DIN thread height or taper  
 2. Cutter will fit over minimum diameter drill hole

Tool Selection:  
 1. Choose largest cutter possible to avoid deflection  
 2. Choose cutter with flank length & axial depth of thread

Thread	Standard	Long Flute	Standard	Long Flute	Standard	Long Flute	Standard	Long Flute
5-40	5-40	5-40	5-40	5-40	5-40	5-40	5-40	5-40
5-44	5-44	5-44	5-44	5-44	5-44	5-44	5-44	5-44
6-32	6-32	6-32	6-32	6-32	6-32	6-32	6-32	6-32
6-40	6-40	6-40	6-40	6-40	6-40	6-40	6-40	6-40
8-32	8-32	8-32	8-32	8-32	8-32	8-32	8-32	8-32

## 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**.

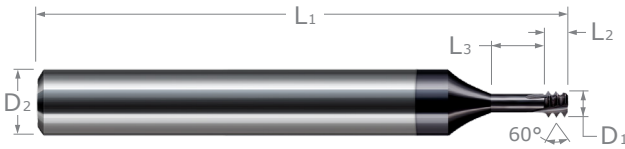
**To download the thread fit charts, search for keyword **THREADFIT** on [www.harveytool.com](http://www.harveytool.com)**

THREAD MILLING CUTTERS



# 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

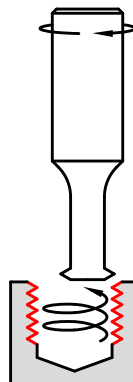
THREAD SIZE	CUTTER DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	NECK DIAMETER	MAX DEPTH OF THREAD L <sub>3</sub>	FLUTES	SHANK DIAMETER D <sub>2</sub> (h6)	OVERALL LENGTH L <sub>1</sub>	AITIN NANO COATED	
								3 FL	PRICE
2-56	$+.0005''$ $-.0005''$	.053	.042	<b>3/32</b>	3	1/4	2-1/2	899910-C6	166.20
2-56	.065	.053	.042	<b>5/32</b>	3	1/4	2-1/2	896410-C6	173.10
4-40	.085	.075	.053	<b>3/32</b>	3	1/4	2-1/2	899916-C6	166.20
4-40	.085	.075	.053	<b>5/32</b>	3	1/4	2-1/2	896416-C6	173.10
6-32	.100	.093	.061	<b>5/32</b>	3	1/4	2-1/2	899922-C6	166.20
6-32	.100	.093	.061	<b>1/4</b>	3	1/4	2-1/2	896422-C6	173.10
8-32	.126	.093	.087	<b>7/32</b>	3	1/4	2-1/2	899928-C6	154.40
8-32	.126	.093	.087	<b>5/16</b>	3	1/4	2-1/2	896428-C6	161.40
10-24	.138	.125	.086	<b>7/32</b>	3	1/4	2-1/2	899934-C6	154.40
10-24	.138	.125	.086	<b>5/16</b>	3	1/4	2-1/2	896434-C6	161.40
10-32	.145	.093	.106	<b>7/32</b>	3	1/4	2-1/2	899936-C6	154.40
10-32	.145	.093	.106	<b>5/16</b>	3	1/4	2-1/2	896436-C6	161.40
1/4-20	.187	.150	.124	<b>5/16</b>	3	1/4	2-1/2	899944-C6	154.40
1/4-20	.187	.150	.124	<b>1/2</b>	3	1/4	2-1/2	896444-C6	161.40
1/4-28	.197	.107	.151	<b>5/16</b>	3	1/4	2-1/2	899946-C6	154.40
1/4-28	.197	.107	.151	<b>1/2</b>	3	1/4	2-1/2	896446-C6	161.40
5/16-18	.236	.166	.166	<b>3/8</b>	3	1/4	2-1/2	899954-C6	154.40
5/16-18	.236	.166	.166	<b>1/2</b>	3	1/4	2-1/2	896454-C6	161.40
3/8-16	.264	.187	.186	<b>1/2</b>	3	5/16	2-1/2	899964-C6	162.80
3/8-16	.264	.187	.186	<b>3/4</b>	3	5/16	2-1/2	896464-C6	169.80

### Tri-Form Thread Mills

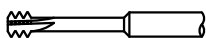
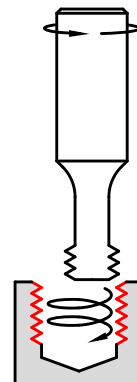
Our Tri-Form Thread Mills are unlike traditional right-handed thread mills, as they have a left-hand cut, left-hand spiral design.

- 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

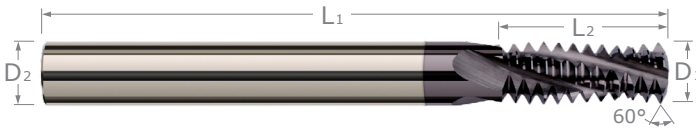


Tri-Form Thread Mill



# 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

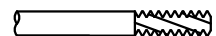
THREAD SIZE	CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
	$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2$		$D_2$	$L_1$						
2-56	.065	.125	3*	1/8	2	70010	85.10	70010-C3	89.70	70010-C8	91.90
3-48	.075	.167	3*	1/8	2	70012	89.90	70012-C3	94.50		
4-40	.085	.175	3*	1/8	2	70016	89.90	70016-C3	94.50	70016-C8	96.70
5-44	.095	.228	3	1/8	2	70020	89.90	70020-C3	94.50		
6-32	.100	.218	3	1/8	2	70022	93.00	70022-C3	97.60	70022-C8	99.80
8-32	.115	.250	3	1/8	2	70028	99.80	70028-C3	104.40	70028-C8	106.60
8-36	.115	.250	3	1/8	2	70031	99.80	70031-C3	104.40		
10-24	.120	.312	3	1/8	2	70034	104.90	70034-C3	109.50	70034-C8	111.70
10-28	.120	.312	3	1/8	2	70035	107.00	70035-C3	111.60		
10-32	.120	.312	3	1/8	2	70036	104.90	70036-C3	109.50	70036-C8	111.70
1/4-20	.180	.500	3	3/16	2-1/2	70044	125.50	70044-C3	130.50	70044-C8	132.30
1/4-28	.180	.500	3	3/16	2-1/2	70046	125.50	70046-C3	130.50	70046-C8	132.30
5/16-18	.235	.625	3	1/4	2-1/2	70054	135.80	70054-C3	142.60	70054-C8	143.10
5/16-24	.235	.625	3	1/4	2-1/2	70056	153.50	70056-C3	160.30	70056-C8	160.80
3/8-16	.285	.750	4	5/16	3	70064	182.70	70064-C3	190.60	70064-C8	198.20
3/8-24	.285	.750	4	5/16	3	70066	182.70	70066-C3	190.60	70066-C8	198.20
7/16-14	.305	.750	4	5/16	3	70074	182.70	70074-C3	190.60	70074-C8	198.20
7/16-20	.335	.875	4	3/8	3-1/2	70076	197.10	70076-C3	206.10	70076-C8	215.90
1/2-13	.350	.875	4	3/8	3-1/2	70084	203.60	70084-C3	212.60		
9/16-12	.370	.875	4	3/8	3-1/2	70092	203.60	70092-C3	212.60		
9/16-18	.370	.875	4	3/8	3-1/2	70094	203.60	70094-C3	212.60		
5/8-11	.470	1.250	4	1/2	3-1/2	70104	251.70	70104-C3	265.10		
3/4-10	.495	1.250	4	1/2	3-1/2	70124	251.70	70124-C3	265.10		
3/4-12	.495	1.250	4	1/2	3-1/2	70126	251.70	70126-C3	265.10		
3/4-16	.490	1.250	4	1/2	3-1/2	70128	256.90	70128-C3	270.30		
7/8-9	.620	1.375	4	5/8	4	70132	375.20	70132-C3	389.70		
7/8-14	.490	1.250	4	1/2	3-1/2	70134	256.90	70134-C3	270.30		
1-8	.620	1.375	4	5/8	4	70154	375.20	70154-C3	389.70		

\*Straight flutes



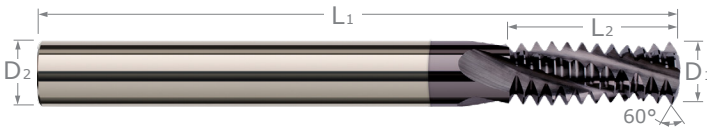
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## THREAD MILLING CUTTERS

### Multi-Form – UN Threads – For Hardened Steels



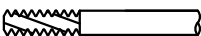
- ✦ Designed for threading hardened steels 46-68 Rc
- ✦ Cuts internal and external 60° UN threads
- ✦ Mill right hand and left hand threads
- ✦ Able to cut larger threads of the same pitch
- ✦ Variable helix design reduces chatter and harmonics and produces more accurate threads
- ✦ Latest generation 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 $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	LENGTH OF CUT $L_2$	FLUTES	SHANK DIAMETER $D_2$	OVERALL LENGTH $L_1$	AlTiN NANO COATED	
						TOOL #	PRICE
4-40	.085	.180	3	1/8	2	836716-C6	110.50
6-32	.100	.218	3	1/8	2	836722-C6	114.10
8-32	.115	.250	3	1/8	2	836728-C6	122.10
10-24	.120	.312	3	3/16	2	836734-C6	128.20
10-32	.120	.312	3	3/16	2	836736-C6	128.20
1/4-20	.180	.500	3	3/16	2-1/2	836744-C6	152.60
1/4-28	.180	.500	3	3/16	2-1/2	836746-C6	152.60
5/16-18	.240	.625	3	1/4	2-1/2	836754-C6	166.80
5/16-24	.240	.625	3	1/4	2-1/2	836756-C6	187.60
3/8-16	.285	.750	4	5/16	3	836764-C6	223.00
3/8-24	.285	.750	4	5/16	3	836766-C6	223.00
7/16-20	.335	.875	4	3/8	3-1/2	836776-C6	241.00
1/2-13	.350	.875	4	3/8	3-1/2	836784-C6	248.70
3/4-16	.495	1.250	4	1/2	3-1/2	836798-C6	316.10



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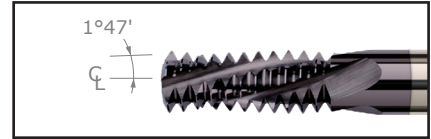


# THREAD MILLING CUTTERS

## 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
- ✦ Able to cut larger threads of the same pitch
- ✦ Helical flutes
- ✦ Solid carbide
- ✦ CNC ground in the USA 

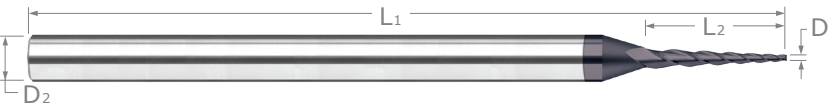


THREAD SIZE	CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AITIN COATED		TiB <sub>2</sub> COATED	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
	$D_1 \begin{smallmatrix} +.0005'' \\ -.0005'' \end{smallmatrix}$	$L_2$		$D_2$	$L_1$						
1/16, 1/8-27	.245*	.437	3	1/4	2-1/2	70204	136.50	70204-C3	143.30	70204-C8	143.80
1/4, 3/8-18	.305*	.625	4	5/16	3	70214	187.00	70214-C3	194.90	70214-C8	202.50
1/2, 3/4-14	.495*	.875	4	1/2	3-1/2	70226	218.10	70226-C3	231.50		
1, 2-11.5	.620*	1.125	4	5/8	4	70232	308.20	70232-C3	322.70		


\*Major cutter diameter

# THREAD MILLING CUTTERS

## N.P.T. Tapered End Mills – Square



◀ **1°47' Angle for NPT threads**

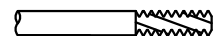
- ✦ 1°47' angle for preparation of parts prior to internal or external NPT thread milling
- ✦ Length of cut and diameters designed for range of standard NPT dimensions
- ✦ 3 flutes
- ✦ Center cutting
- ✦ Solid carbide
- ✦ CNC ground in the USA 



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 (3x)</b>	1/4	2	912282	56.10	912282-C6	66.10
	.300	<b>.900 (3x)</b>	3/8	2-1/2	912286	70.00	912286-C6	81.20
	.400	<b>1.250 (3x)</b>	1/2	3	912292	94.10	912292-C6	108.60

N.P.T. Thread Fit Chart

Thread Mill Tool #	Thread Size	Tapered End Mill Tool #
70204	1/16, 1/8-27	912282
70214	1/4, 3/8-18	912282, 912286
70226	1/2, 3/4-14	912286
70232	1, 2-11.5	912292



## THREAD MILLING CUTTERS

### Multi-Form – Metric



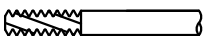
- ↻ Cuts internal and external 60° metric threads
- ↻ Mills right hand and left hand threads
- ↻ Able to cut larger threads of the same pitch
- ↻ Helical flutes
- ↻ Solid carbide
- ↻ CNC ground in the USA

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		AlTiN COATED	
						TOOL #	PRICE	TOOL #	PRICE
M3-0.50	.085	.178	3	1/8	2	16903	110.20	16903-C3	114.80
M4-0.70	.115	.276	3	1/8	2	16907	110.20	16907-C3	114.80
M4.5-0.75	.120	.250	3	1/8	2	16909	110.20	16909-C3	114.80
M5-0.80	.120	.312	3	1/8	2	16911	110.20	16911-C3	114.80
M6-1.00	.170	.500	3	3/16	2-1/2	16917	133.70	16917-C3	138.70
M8-1.25	.235	.625	3	1/4	2-1/2	16923	143.70	16923-C3	150.50
M10-1.50	.300	.750	4	5/16	3	16929	193.70	16929-C3	201.60
M12-1.75	.360	.875	4	3/8	3-1/2	16935	215.50	16935-C3	224.50
M14-1.50	.370	.875	4	3/8	3-1/2	16941	215.50	16941-C3	224.50
M16-2.00	.470	1.250	4	1/2	3-1/2	16947	265.30	16947-C3	278.70
M18-1.50	.490	1.250	4	1/2	3-1/2	16953	265.30	16953-C3	278.70
M20-2.50	.495	1.250	4	1/2	3-1/2	16959	265.30	16959-C3	278.70



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## THREAD MILLING CUTTERS

### Multi-Form – Coolant-Through – UN Threads



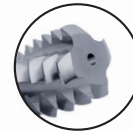
Coolant-Fed for  
Chip Removal

- ↻ 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

THREAD SIZE	CUTTER DIAMETER $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	LENGTH OF CUT $L_2$	FLUTES	SHANK DIAMETER $D_2$	OVERALL LENGTH $L_1$	UNCOATED		AISI IN COATED	
						TOOL #	PRICE	TOOL #	PRICE
10-24	.145	.312	3	3/16	2-3/8	17334	106.20	17334-C3	111.20
10-32	.150	.312	3	3/16	2-3/8	17336	106.20	17336-C3	111.20
1/4-20	.180	.500	3	3/16	2-3/8	17344	128.70	17344-C3	133.70
1/4-28	.180	.500	3	3/16	2-3/8	17346	128.70	17346-C3	133.70
5/16-18	.235	.625	3	1/4	2-3/8	17354	138.60	17354-C3	145.40
5/16-24	.235	.625	3	1/4	2-3/8	17356	161.90	17356-C3	168.70
3/8-16	.285	.750	4	5/16	3	17364	186.70	17364-C3	194.60
3/8-24	.285	.750	4	5/16	3	17366	186.70	17366-C3	194.60
7/16-14	.305	.750	4	5/16	3	17374	186.70	17374-C3	194.60
7/16-20	.335	.875	4	3/8	3	17376	201.20	17376-C3	210.20
1/2-13	.350	.875	4	3/8	3	17384	207.60	17384-C3	216.60

## THREAD MILLING CUTTERS

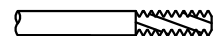
### Multi-Form – Coolant-Through – Metric



Coolant-Fed for  
Chip Removal

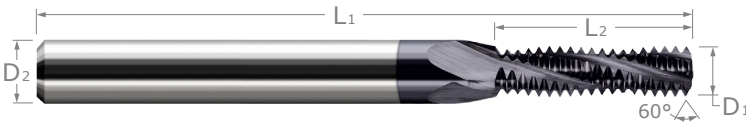
- ↻ Coolant through design for maximum chip ejection in blind holes
- ↻ Mills right hand and left hand 60° Metric threads
- ↻ Able to cut larger threads of the same pitch
- ↻ Helical flutes
- ↻ Solid carbide
- ↻ CNC ground in the USA

THREAD SIZE	CUTTER DIAMETER $D_1 \begin{smallmatrix} +.000'' \\ -.002'' \end{smallmatrix}$	LENGTH OF CUT $L_2$	FLUTES	SHANK DIAMETER $D_2$	OVERALL LENGTH $L_1$	UNCOATED		AISI IN COATED	
						TOOL #	PRICE	TOOL #	PRICE
M3-0.50	.085	.1780	3	1/8	2	819624	116.20	819624-C3	120.80
M4-0.70	.115	.2760	3	1/8	2	819626	116.20	819626-C3	120.80
M5-0.80	.120	.3125	3	1/8	2	819628	116.20	819628-C3	123.00
M6-1.00	.170	.5000	3	3/16	2-1/2	819630	141.10	819630-C3	145.70
M8-1.25	.235	.6250	3	1/4	2-1/2	819632	151.60	819632-C3	158.40



# 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 🇺🇸

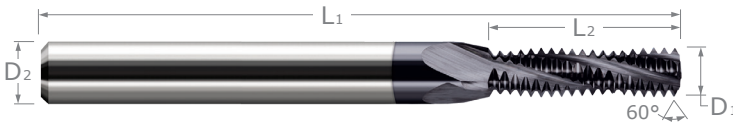
THREAD SIZE	CUTTER DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNCOATED		AlTiN COATED		TiB <sub>2</sub> COATED	
						TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
	D <sub>1</sub> <sup>+0.0005"</sup> / <sub>-0.0005"</sub>	L <sub>2</sub>		D <sub>2</sub>	L <sub>1</sub>						
2-56	.069	.215	3*	1/8	2	987110	104.00	987110-C3	108.60	987110-C8	110.80
3-48	.079	.250	3	1/8	2	987112	109.20	987112-C3	113.80		
4-40	.089	.275	3	1/8	2	987116	109.20	987116-C3	113.80	987116-C8	116.00
6-32	.110	.375	3	1/8	2	987122	109.20	987122-C3	113.80	987122-C8	116.00
8-32	.131	.407	3	3/16	2-1/2	987128	116.20	987128-C3	121.20	987128-C8	123.00
8-36	.131	.417	3	3/16	2-1/2	987131	122.20	987131-C3	127.20		
10-24	.145	.500	3	3/16	2-1/2	987134	143.40	987134-C3	148.40	987134-C8	150.20
10-32	.150	.500	3	3/16	2-1/2	987136	143.40	987136-C3	148.40	987136-C8	150.20
1/4-20	.195	.750	3	1/4	2-1/2	987144	145.80	987144-C3	152.60	987144-C8	153.10
1/4-28	.195	.750	3	1/4	2-1/2	987146	145.80	987146-C3	152.60	987146-C8	153.10
5/16-18	.245	.944	3	5/16	3	987154	189.20	987154-C3	197.10		
5/16-24	.245	.958	3	5/16	3	987156	194.20	987156-C3	202.10		
3/8-16	.300	1.125	4	3/8	3-1/2	987164	225.60	987164-C3	234.60		
3/8-24	.300	1.125	4	3/8	3-1/2	987166	232.10	987166-C3	241.10		
7/16-20	.350	1.300	4	3/8	3-1/2	987176	232.10	987176-C3	241.10		
1/2-13	.400	1.308	4	1/2	3-1/2	987184	235.50	987184-C3	248.90		

\*Straight flutes




## 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		AITIN COATED	
						TOOL #	PRICE	TOOL #	PRICE
M3-0.50	.090	.276	3	1/8	2	842903	128.60	842903-C3	133.20
M4-0.70	.124	.441	3	3/16	2-1/2	842907	131.80	842907-C3	136.80
M5-0.80	.155	.504	3	3/16	2-1/2	842911	129.00	842911-C3	134.00
M6-1.00	.186	.748	3	1/4	2-1/2	842917	152.50	842917-C3	159.30
M8-1.25	.245	.984	3	5/16	2-1/2	842923	196.10	842923-C3	204.00
M10-1.50	.311	1.122	4	3/8	3-1/2	842929	246.00	842929-C3	255.00
M16-2.00	.490	1.890	4	1/2	3-1/2	842947	318.00	842947-C3	331.40



"Using my @harveytool 60 degree double angle cutter to mill some texture into a crown for a 1 in 30 piece."

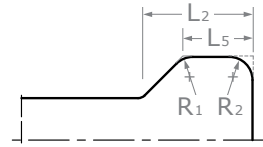
— @horological

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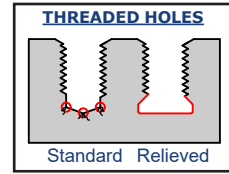


# THREAD MILLING CUTTERS

## 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



CUTTER DIA.	LOC	WIDTH (TSC)	RADIUS 1	RADIUS 2	NECK DIA.	NECK LENGTH	RADIAL DOC	SHANK DIA.	OAL	UNCOATED		A1TiN 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	53.50	896602-C3	58.10
.075	.030	.015	.000	.005	.042	.187	.015	1/8	1-1/2	877502	51.30	877502-C3	55.90
.084	.038	.020	.000	.005	.045	.218	.018	3/16	2	988804	49.80	988804-C3	54.80
.102	.049	.025	.000	.010	.051	.281	.024	3/16	2	985707	50.70	985707-C3	55.70

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	4 FL	PRICE
.125	.054	.030	.000	.010	.074	.343	.024	1/4	2-1/2	979609	61.60	979609-C3	68.40
.142	.050	.020	.000	.010	.078	.359	.030	1/4	2-1/2	975405	63.00	975405-C3	69.80
.168	.050	.020	.000	.010	.103	.422	.030	1/4	2-1/2	955305	61.60	955305-C3	68.40
.193	.055	.020	.000	.010	.118	.547	.035	1/4	2-1/2	952505	63.30	952505-C3	70.10
.193	.075	.040	.015	.015	.118	.547	.035	1/4	2-1/2	952516	63.30	952516-C3	70.10
.245	.072	.030	.000	.010	.155	.797	.042	1/4	2-1/2	946009	65.70	946009-C3	72.50
.245	.102	.060	.020	.020	.155	.797	.042	1/4	2-1/2	946027	65.70	946027-C3	72.50
.355	.086	.030	.000	.010	.236	1.078	.056	3/8	2-1/2	942909	102.30	942909-C3	111.30
.355	.116	.060	.020	.020	.236	1.078	.056	3/8	2-1/2	942927	102.30	942927-C3	111.30
.355	.136	.080	.030	.030	.236	1.078	.056	3/8	2-1/2	942931	102.30	942931-C3	111.30









View a comprehensive library of **Speeds & Feeds** charts for every Harvey Tool End Mill on the new [Harveytool.com](http://Harveytool.com).

Access **Simulation Files** in DXF format for every Harvey Tool product, downloadable now from the new [Harveytool.com](http://Harveytool.com)



## TOOL HOLDERS

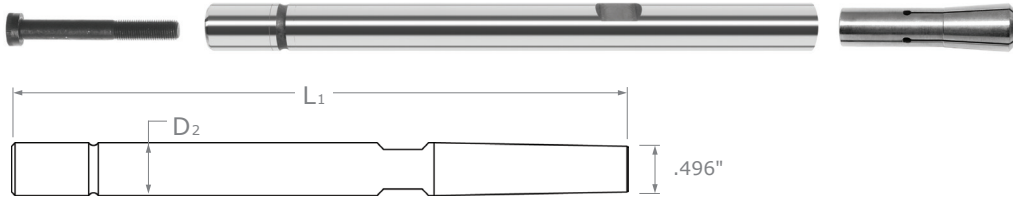
Browse a fully stocked and expanded offering of Tool Holders and Collets, including Extended Reach Tool Holders, Solid ER Integrated Tool Holders, Saw Arbors, ER Collets, ER Performance Collets, and accompanying nuts and wrenches. When your machine setup includes a Harvey Tool holder and collet, you can rest assured that you'll maximize tool performance and repeatability.

<b>Tool Holders</b> .....		439
Extended Reach Tool Holders & Collets .....		440
Solid ER Integrated Tool Holders .....		441
Solid ER Integrated Tool Holders – Coolant-Through .....		441
Saw Arbors .....		442
<b>Collets</b> .....		443
ER Collets .....		443
ER Performance Collets .....		444

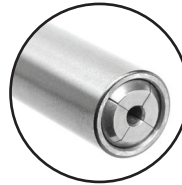
# TOOL HOLDERS

## 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
- ↪ 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)	
D <sub>2</sub>	L <sub>1</sub>	TOOL #	PRICE
1/2	3	36730	214.40
1/2	5	36750	225.80
1/2	6	36760	239.30

### Collets

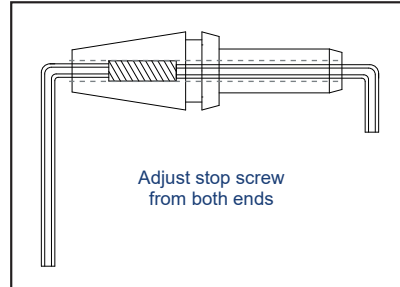
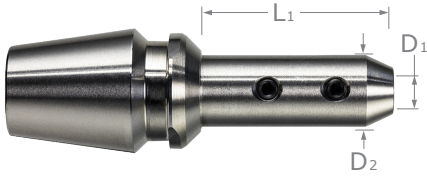
COLLET SIZE	TOOL #	PRICE
1/8	36810	71.40
3/16	36820	71.40
1/4	36830	71.40
3 mm	36840	71.40
4 mm	36850	71.40
6 mm	36860	71.40





## TOOL HOLDERS

### Solid ER Integrated Tool Holders



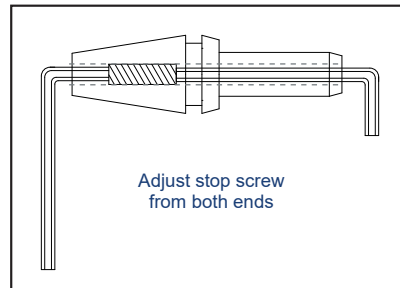
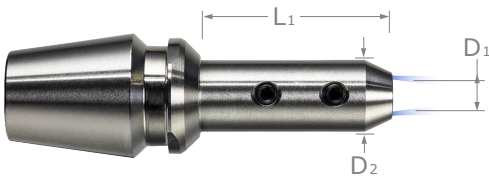
TOOL HOLDERS

- 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	262.50
.1250	9.5 mm	25 mm	ER16	83003	262.50
.1875	9.5 mm	16 mm	ER16	83002	262.50
.1875	9.5 mm	25 mm	ER16	83004	262.50
.2500	12.5 mm	14 mm	ER20	83005	307.50
.2500	12.5 mm	25 mm	ER20	83006	307.50

## 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

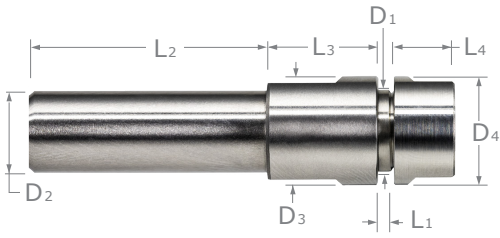
BORE DIAMETER	SHAFT DIAMETER	PROJECTION LENGTH	TAPER	TOOL HOLDERS	
				TOOL #	PRICE
D <sub>1</sub>	D <sub>2</sub>	L <sub>1</sub>			
.1250	9.5 mm	25 mm	ER16	83203	337.50



# SAW ARBORS

## Straight Shank

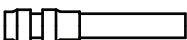
TOOL HOLDERS



- Maximum T.I.R. of .0001"
- Straight shank allows for chucking at multiple depths
- Key not included

									SAW ARBORS	
ARBOR DIAMETER	ARBOR LENGTH	SHANK DIAMETER	SHANK LENGTH	FLANGE DIAMETER	FLANGE LENGTH	NUT DIAMETER	NUT LENGTH	THREAD LENGTH (IN FRONT OF ARBOR)	TOOL #	PRICE
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>			
.375	.050	.375	1.40	.500	.500	.500	.276	.300	84101	234.00
.500	.050	.500	1.40	.625	.500	.625	.276	.300	84102	234.00
1.000	.125	.750	2.00	1.250	1.500	1.250	.437	.500	84103	299.00

*For Slitting Saws, see pages 330 and 331.*



## ER COLLETS

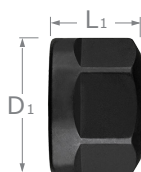


- Maximum T.I.R. of .0004"
- High polished finish helps resist oxidation
- Related nut and wrench sold separately

SIZE	BORE DIAMETER	CLAMP RANGE	ER COLLETS	
			TOOL #	PRICE
	D <sub>1</sub>			
ER11	1/8	.086 - .125	82401	15.20
ER16	1/8	.086 - .125	82402	16.60
ER16	3/16	.148 - .187	82403	16.60
ER16	1/4	.211 - .250	82404	16.60

## ER COLLETS

## Nuts



- Special anti-friction coating increases clamping pressure of tool shank

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	25 ft. lbs	82461	28.40
ER16	27.5 mm	18 mm	M22 x 1.5	42 ft. lbs	82462	28.40

## ER COLLETS

## Wrenches



SIZE	LENGTH	WIDTH	THICKNESS	ER WRENCHES	
				TOOL #	PRICE
ER11	4.80	1.50	0.20	82481	13.60
ER16	5.60	2.00	0.20	82482	13.60



## ER PERFORMANCE COLLETS

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	.105 - .125	85501	35.40
ER16	1/8	.105 - .125	85502	35.40
ER16	3/16	.147 - .187	85503	35.40
ER16	1/4	.210 - .250	85504	35.40

## 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	34.60
ER16	26 mm	14 mm	M22 x 1.5	42 ft. lbs	85562	34.60

## ER PERFORMANCE COLLETS

### Wrenches



SIZE	LENGTH	WIDTH	THICKNESS	ER PERFORMANCE WRENCHES	
				TOOL #	PRICE
ER11	Please see page 443 for ER11 Wrench size				
ER16	6.50	2.20	0.20	85582	33.80





# IN THE LOUPE

Your Source for Machining Solutions

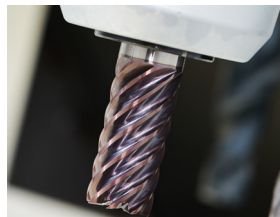
Our corporate blog, In the Loupe, is dedicated to machining how-tos, technical tips, and tool selection guides. Access helpful resources at any time and share them easily with fellow machinists at [www.harveypformance.com/in-the-loupe/](http://www.harveypformance.com/in-the-loupe/).



**How to Avoid Common Part Finish Problems**



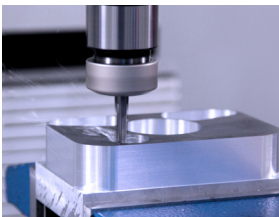
**Optimize Roughing with Chipbreaker Tooling**



**Why Flute Count Matters**



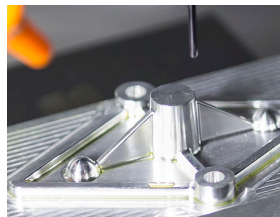
**Titanium Machining Guide**



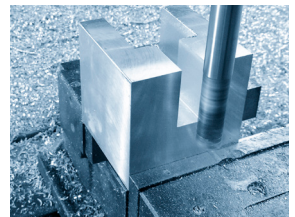
**How to Avoid 4 Major Types of Tool Wear**



**Ball Nose Milling Strategy**



**Corner Engagement: How to Machine Corners**



**Introduction to High Efficiency Milling**

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## COATINGS & SUBSTRATES CHART

Coating/ Substrate:	<b>TiN</b>  Titanium Nitride -C1	<b>AlTiN</b>  Aluminum Titanium Nitride -C3	<b>AlTiN Nano</b>  Aluminum Titanium Nitride Nano -C6
<b>Application/ Benefits:</b>	<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>
<b>Materials:</b>	<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
<b>Color:</b>	Gold	Dark Gray / Black	Blue / Black
<b>Structure:</b>	Mono-layer	Multi-layer	Nano Composite Multi-layer
<b>Hardness (HV 0.05):</b>	2447 (24 GPa)	3569 (35 GPa)	4181 (41 GPa)
<b>Coefficient of Friction:</b>	.40	.70	.40
<b>Coating Thickness (microns):</b>	2 - 5	2 - 5	1 - 4
<b>Max. Working Temp:</b>	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 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 <u>extremely</u> 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>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>Thicker 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>
<b>Non-Ferrous &amp; Non-Metallic Materials</b>				
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	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 / Black
Mono-layer	Mono-layer	Mono-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)
.40	.35	.10	.05 - .30	.05 - .20
2 - 5	1 - 3	.5 - 2.5	8 - 10	.010" - .030" Solid PCD Layer
1100° F	900° F	750° 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	34	17100	337	22200	303	27300	301	32200	41	36900	143
10100	35	17200	338	22300	304	27400	245	32300	43	37100	68
10200	54	17300	435	22400	306	27500	293	32400	61	37200	71
10300	54	17400	33	22500	307	27600	279	32600	80	37300	143
10800	60	17500	33	22600	308	27800	184	32800	332	37400	143
11000	423	17600	73	22700	232	27900	184	32900	329	37500	409
11400	408	17700	53	22800	232	28000	77	33000	98	37700	143
11500	409	17800	53	22900	232	28100	57	33100	99	37800	92
11600	410	17900	423	23100	228	28200	301	33200	24	37900	94
11700	410	18000	264	23200	228	28300	33	33300	30	38000	24
12000	196	18100	264	23300	421	28400	33	33400	47	38100	31
12100	195	18200	279	23400	421	28500	348	33500	51	38200	410
12200	196	18300	249	23500	317	28600	59	33600	15	38300	68
12500	19	18400	249	23600	288	29000	345	33700	18	38400	71
12600	43	18500	249	23700	288	29100	345	33800	92	38500	143
12700	15	18600	255	23800	353	29200	345	33900	94	38700	92
12800	41	18700	249	23900	352	29300	345	34000	41	38800	94
12900	247	18800	53	24000	72	29400	78	34100	43	38900	143
13600	34	18900	53	24100	182	29500	229	34200	47	39000	144
13700	35	19000	142	24200	182	29600	287	34300	51	39100	296
13800	54	19100	294	24300	151	29700	292	34400	80	39200	144
13900	10	19200	294	24400	153	29800	53	34600	24	39300	144
14000	10	19500	294	24500	37	30000	272	34700	30	39400	68
14100	197	20000	404	24600	37	30100	272	34800	62	39500	71
14200	197	20100	404	24700	55	30200	279	34900	15	39700	228
14300	248	20200	405	24800	53	30300	279	35000	19	39800	410
14600	215	20300	406	24900	53	30400	272	35100	41	39900	411
14800	54	20400	407	25000	271	30500	272	35200	43	40000	144
14900	52	20500	75	25100	271	30600	98	35300	80	40100	47
15100	14	20600	75	25200	278	30700	99	35400	24	40200	98
15200	14	20700	75	25300	278	30800	33	35500	30	40300	99
15300	244	20800	76	25400	422	30900	33	35600	47	40400	144
15300-2	240	20900	76	25500	422	31000	98	35700	51	40500	144
15400	243	21000	333	25600	423	31100	99	35800	16	40600	98
16000	343	21100	337	26300	56	31200	33	35900	19	40700	99
16100	344	21200	338	26400	301	31300	33	36000	41	40800	144
16200	293	21300	338	26500	244	31400	92	36100	43	40900	144
16400	347	21400	53	26600	33	31500	94	36200	62	41000	411
16500	347	21500	79	26700	33	31600	333	36300	188	41100	78
16600	348	21600	79	26800	294	31700	337	36400	188	41300	229
16700	349	21700	79	26900	279	31800	15	36500	192	41400	425
16800	350	21800	79	27000	346	31900	18	36600	192	41500	68
16900	434	21900	79	27100	76	32000	92	36700	440	41600	71
17000	333	22100	302	27200	56	32100	94	36800	440	41700	68



## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
41800	71	46300	340	51200	197	55700	341	60300	201	65000	194
41900	68	46400	61	51300	58	55800	409	60400	343	65100	349
42000	71	46500	246	51400	197	55900	315	60500	275	65200	190
42100	71	46600	298	51500	197	56000	341	60600	343	65300	191
42200	71	46700	62	51600	58	56100	110	60700	20	65400	140
42300	71	46800	113	51700	275	56200	111	60800	20	65500	141
42400	71	46900	117	51800	197	56300	353	60900	343	65600	194
42600	71	47200	56	51900	197	56400	210	61000	190	65700	300
42700	69	47300	293	52000	314	56500	354	61100	191	65800	300
42800	71	47400	62	52100	260	56600	140	61500	346	65900	194
42900	69	47500	275	52200	113	56700	141	61600	194	66000	292
43000	71	47600	249	52300	117	56800	260	61700	174	66100	292
43100	69	47700	287	52400	197	56900	341	61800	176	66200	194
43200	71	47800	24	52500	197	57000	300	61900	194	66300	350
43300	327	47900	47	52600	145	57100	300	62000	190	66400	194
43400	328	48100	275	52700	147	57200	260	62100	191	66500	194
43500	302	48300	287	52800	228	57300	341	62200	194	66600	143
43600	325	48400	276	52900	229	57400	341	62300	347	66700	180
43700	303	48500	249	53000	174	57500	341	62400	149	66800	181
43800	325	48600	200	53100	176	57600	275	62500	150	66900	143
43900	304	48700	201	53300	151	57700	343	62600	124	67000	143
44000	339	48800	275	53400	153	57800	124	62700	127	67100	180
44100	340	48900	24	53500	260	57900	127	62800	151	67200	181
44200	340	49000	30	53600	113	58000	343	62900	194	67300	143
44300	326	49100	276	53700	117	58100	263	63000	120	67400	333
44400	325	49200	47	53800	145	58200	275	63100	122	67500	327
44500	325	49300	51	53900	147	58300	24	63200	194	67600	333
44600	326	49400	275	54000	210	58400	31	63300	194	67700	327
44700	56	49500	208	54100	210	58500	343	63400	347	67800	335
44800	198	49600	208	54200	425	58600	275	63500	153	67900	327
44900	198	49700	275	54300	341	58700	343	63600	110	68000	333
45000	342	49800	200	54400	171	58900	275	63700	111	68100	337
45100	294	49900	201	54500	171	59000	124	63800	149	68200	338
45200	56	50000	174	54600	228	59100	127	63900	150	68300	327
45300	333	50100	176	54700	260	59200	343	64000	191	68400	327
45400	56	50200	13	54800	120	59300	275	64100	194	68500	151
45500	57	50300	13	54900	122	59400	47	64200	140	68600	154
45600	145	50400	288	55000	149	59500	51	64300	141	68700	126
45700	147	50600	249	55100	150	59700	343	64400	120	68800	128
45800	298	50700	279	55200	228	59800	343	64500	122	68900	152
45900	332	50800	276	55300	341	59900	276	64600	348	69000	154
46000	339	50900	39	55400	210	60000	265	64700	194	69100	125
46100	340	51000	39	55500	210	60100	343	64800	110	69200	128
46200	340	51100	197	55600	260	60200	200	64900	112	69300	210

## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
69400	303	74500	63	806200	309	811600	286	817500	286	823300	235
69500	215	74600	40	806300	307	811700	286	817600	286	823400	37
69600	215	75000	269	806400	305	811800	121	817700	286	823500	39
69700	306	75100	269	806500	304	81200	265	817900	286	823600	279
69800	210	75200	61	806600	302	812100	120	818000	17	823800	242
69900	210	75500	60	806700	351	812300	105	818100	19	823900	244
70000	431	75800	60	806800	351	812500	88	818200	280	82400	443
70100	431	76000	190	806900	294	812600	88	818300	277	824000	244
70200	433	76200	21	807000	295	812700	88	818500	217	824200	244
70300	307	76300	22	807100	295	812800	88	818600	189	824400	245
70400	215	76400	21	807200	295	812900	92	818700	189	824600	243
70500	215	76500	22	807300	294	813000	94	818800	280	824700	281
70600	210	76600	45	807400	294	813100	92	818900	277	824900	82
70700	210	76700	46	807600	294	813200	94	819000	84	825000	83
70800	304	76800	45	807800	295	813500	86	819100	84	825100	215
70900	310	76900	46	807900	294	813600	87	819300	193	825200	215
71000	425	77000	19	808000	293	813800	133	819400	280	825300	84
71100	307	77100	43	808100	255	813900	166	819600	435	825400	84
71200	308	77800	337	808200	255	814000	167	819800	235	825500	284
71300	208	801900	217	808300	236	814100	166	819900	235	825600	261
71400	208	802000	217	808500	234	814200	167	820000	280	825700	284
71500	308	802800	252	808600	233	814300	166	820100	277	825800	284
71600	294	803000	217	808900	222	814400	167	820200	251	825900	285
71700	294	803300	54	809000	222	814500	107	820300	426	826000	296
71800	308	803500	54	809100	222	814700	281	820400	193	826200	239
71900	61	803700	217	809200	222	814800	134	820600	424	826300	206
72000	10	803800	217	809300	221	814900	135	820800	285	826400	206
72100	13	803900	409	809400	221	815300	406	820900	284	826500	427
72200	240	804000	410	809500	221	815400	407	821000	284	826700	232
72300	240	804100	411	809600	221	815600	150	821100	285	826800	15
72400	249	804300	63	809700	252	815700	150	821200	284	826900	19
72500	249	804500	58	809900	237	815800	410	821400	425	827100	71
72600	294	804800	74	810000	404	815900	411	821800	294	827200	282
72700	275	804900	74	810100	404	816000	408	821900	260	827300	282
72800	63	805000	74	810200	405	816100	409	822000	274	827400	204
72900	60	805100	74	810500	62	816200	119	822100	294	827500	205
73000	10	805200	74	810600	59	816400	119	822200	295	827700	203
73100	13	805300	50	810800	62	816500	150	822400	296	827800	251
73900	60	805400	51	810900	61	816600	150	822500	423	827900	350
74000	37	805500	46	811000	46	816800	148	822600	295	828100	280
74100	39	805700	46	811200	107	817000	276	822700	425	828200	277
74200	60	805900	338	811300	109	817100	275	823000	10	828400	229
74300	37	806000	336	811400	349	817300	150	823100	13	828500	283
74400	39	806100	333	811500	286	817400	286	823200	235	828700	280

## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
828800	277	833500	295	838400	260	843500	85	848200	109	853300	87
828900	277	833600	255	838500	323	843600	269	848300	56	853400	60
829000	73	833800	232	838600	21	843700	284	848400	114	853500	271
829100	21	833900	350	838700	23	843800	276	848500	117	853600	114
829200	23	834000	274	838800	294	843900	58	848600	329	853800	80
829300	280	834100	15	838900	282	844000	118	848700	249	853900	261
829400	180	834200	18	839000	282	844100	261	848800	116	854000	273
829500	181	834300	280	839100	323	844200	282	848900	118	854100	56
829700	176	834400	277	839200	249	844400	47	849000	284	854200	56
829800	280	834600	226	839300	28	844500	51	849100	246	854400	291
829900	277	834700	277	839400	30	844600	257	849200	65	854500	273
83000	441	834800	177	839500	410	844700	276	849300	314	854600	212
830000	267	834900	280	839600	410	844800	288	849400	261	854700	212
830100	57	835000	277	839700	322	844900	73	849500	423	854800	89
830300	58	835100	89	839900	71	845000	275	849600	21	85500	444
830500	296	835200	89	840000	252	845100	349	849700	23	855000	273
830600	260	835300	151	840200	71	845200	90	849800	312	855200	193
830700	289	835500	280	840300	322	845300	90	849900	355	855300	62
830800	66	835600	80	840400	80	845400	118	850000	169	855400	260
830900	66	835700	134	840600	117	845500	41	850100	170	855500	271
831000	298	835800	135	840800	176	845600	43	850200	28	855600	311
831200	176	835900	37	840900	322	845700	429	850300	30	855700	294
831300	257	836000	39	84100	442	845800	284	850400	329	855900	198
831400	289	836100	277	841000	41	845900	164	850500	90	856000	56
831500	235	836200	280	841100	43	846000	261	850600	90	856300	43
831600	235	836300	10	841300	283	846100	21	850700	114	856400	115
831700	63	836400	13	841400	283	846200	23	850800	99	856500	270
831800	62	836500	127	841500	322	846300	300	850900	99	856600	159
831900	62	836600	128	841600	101	846400	300	851000	45	856700	160
83200	441	836700	432	841800	190	846600	229	851100	46	856900	181
832000	61	836800	319	841900	191	846700	125	851200	284	857000	273
832100	61	836900	17	842000	277	846800	25	851300	171	857100	61
832300	350	837000	19	842100	117	846900	30	851400	257	857200	163
832400	294	837100	285	842200	199	847000	410	851500	105	857300	164
832500	257	837200	318	842300	199	847100	291	851700	86	857400	159
832600	283	837300	233	842400	255	847200	275	851800	87	857500	284
832700	283	837500	284	842500	116	847300	196	852000	212	857600	118
832800	78	837600	318	842600	59	847400	294	852100	86	857700	58
832900	61	837700	252	842800	274	847600	122	852200	87	857800	294
833000	62	837800	16	842900	437	847700	238	852400	176	857900	320
833100	251	837900	19	843000	261	847800	114	852800	87	858000	92
833200	62	838000	321	843200	225	847900	117	852900	101	858100	94
833300	61	838100	284	843300	114	848000	101	853100	285	858200	159
833400	61	838300	176	843400	85	848100	107	853200	86	858300	284

## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
858400	164	863500	62	868500	125	873500	163	878400	252	883300	237
858500	168	863700	233	868600	128	873600	164	878500	175	883500	90
858600	168	863800	252	868700	316	873800	214	878600	176	883600	346
858700	59	863900	62	868800	253	873900	255	878700	200	883800	197
858900	196	864000	355	868900	275	874000	60	878800	201	883900	138
859000	160	864100	67	869000	115	874100	26	878900	324	884000	139
859100	160	864200	67	869100	117	874200	30	879100	90	884100	272
859200	268	864300	214	869300	211	874300	261	879200	166	884200	64
859300	284	864400	214	869400	285	874400	268	879300	167	884400	121
859400	82	864500	118	869500	199	874500	348	879400	171	884600	355
859500	83	864600	58	869600	199	874600	133	879500	171	884700	253
859600	238	864800	268	869700	261	874800	201	879600	286	884900	217
859700	258	864900	67	869800	114	874900	201	879700	263	885000	64
859800	159	865000	67	869900	117	875000	258	879800	79	885200	82
860000	284	865100	57	870200	245	875100	286	879900	316	885300	83
860100	311	865300	286	870300	99	875200	67	880100	133	885400	133
860200	115	865400	239	870500	64	875300	67	880200	79	885600	118
860400	326	865500	355	870600	116	875400	101	880300	251	885700	355
860500	258	865600	62	870700	118	875500	297	880400	213	885800	65
860600	47	865700	67	870800	260	875600	267	880500	213	886100	237
860700	51	865800	67	870900	61	875700	225	880600	80	886200	101
860800	57	865900	355	871000	253	875800	225	880700	105	886300	104
861000	178	866000	72	871100	258	875900	311	880800	106	886400	136
861100	179	866100	249	871200	185	876000	67	880900	286	886500	202
861200	45	866200	203	871300	186	876100	67	881000	80	886600	65
861300	46	866300	203	871400	117	876200	178	881100	239	886800	178
861400	41	866400	297	871500	118	876300	179	881200	253	886900	179
861500	43	866500	67	871600	211	876400	249	881300	125	887000	316
861600	25	866600	67	871700	211	876500	286	881400	128	887100	136
861700	30	866700	286	871800	251	876600	34	881500	92	887200	110
861800	210	866900	122	871900	294	876700	35	881600	94	887300	112
861900	210	867000	34	872000	60	876800	67	881700	93	887400	64
862100	193	867200	57	872100	259	876900	67	881800	146	887600	184
862200	99	867300	324	872300	133	877000	275	882000	286	887700	184
862400	210	867400	311	872400	107	877100	41	882100	427	888000	101
862500	210	867500	263	872500	238	877200	43	882300	90	888100	104
862600	268	867600	259	872600	69	877300	284	882400	151	888200	64
862700	260	867700	228	872700	86	877400	355	882500	154	888400	15
862800	131	867800	270	872900	326	877500	438	882600	133	888500	19
862900	132	868000	91	873000	133	877600	67	882700	133	888600	138
863100	210	868100	286	873100	133	877700	67	882800	142	888700	139
863200	92	868200	47	873200	251	877900	226	882900	93	888800	259
863300	94	868300	51	873300	284	878100	213	883100	197	889000	65
863400	259	868400	286	873400	347	878300	197	883200	236	889200	220

## INDEX BY SERIES ID (CONT.)

SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG	SERIES	PG
889400	176	894300	18	899900	430	905100	229	910200	122	915100	157
889500	176	894500	218	900000	319	905200	322	910300	262	915200	63
889600	286	894600	86	900100	257	905300	65	910400	262	915300	121
889700	257	894700	311	900200	252	905400	65	910500	102	915400	122
889800	65	894800	184	900300	303	905600	292	910600	318	915500	180
890100	125	894900	184	900400	163	905700	287	910700	296	915600	211
890200	128	895000	324	900500	155	905800	255	910800	90	915700	211
890300	427	895100	249	900600	155	905900	320	910900	90	915800	324
890500	133	895200	327	900700	212	906000	262	911000	261	915900	82
890600	315	895300	236	900800	212	906100	262	911100	321	916000	83
890700	298	895500	105	901000	320	906300	193	911200	298	916100	80
890800	236	895600	106	901100	301	906400	122	911300	107	916300	194
890900	237	895700	41	901200	425	906500	122	911400	105	916400	161
891000	255	895800	43	901300	105	906600	261	911500	158	916500	257
891100	263	896200	168	901500	174	907000	324	911600	158	916600	319
891200	346	896300	168	901600	177	907100	180	911700	319	916700	60
891300	311	896400	430	901800	159	907200	145	911900	226	916800	319
891400	276	896500	348	901900	69	907300	147	912000	121	917000	292
891500	185	896600	438	902100	212	907400	82	912200	76	917100	66
891600	186	896700	286	902200	212	907500	83	912300	175	917200	144
891700	313	896800	21	902300	255	907600	178	912400	176	917300	120
891800	178	897100	255	902400	77	907700	117	912500	65	917400	122
891900	179	897200	258	902500	318	907800	36	912600	65	917500	313
892000	197	897400	197	902600	121	907900	306	912700	68	917600	180
892100	44	897500	323	902800	261	908000	219	912800	71	917700	181
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893500	233	898900	428	904300	77	909300	68	914300	289	919300	166
893600	411	899000	257	904400	45	909400	71	914400	189	919400	167
893700	411	899100	355	904500	319	909500	156	914500	189	919500	78
893800	176	899200	239	904600	174	909600	157	914600	288	919700	71
893900	176	899500	252	904700	176	909700	289	914700	194	919800	121
894000	322	899600	236	904800	58	909900	292	914800	355	919900	122
894100	299	899700	237	904900	324	910000	322	914900	315	920100	216
894200	15	899800	314	905000	105	910100	122	915000	156	920200	156

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920600	36	925900	176	930900	167	935500	182	940200	260	945100	63
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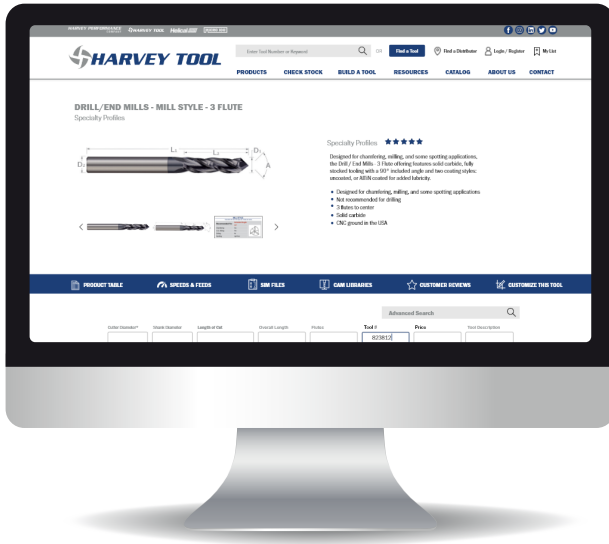
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950700	114	955600	324	960500	32	965400	329	970000	319	974500	124
950800	117	955700	208	960600	229	965500	293	970100	69	974600	187
950900	65	955800	208	960700	318	965600	69	970200	71	974700	187
951100	233	955900	409	960800	21	965700	71	970300	312	974800	138
951200	233	956000	275	960900	22	965800	113	970400	233	974900	275
951300	15	956100	224	961000	315	965900	266	970500	107	975000	120
951400	98	956200	303	961100	411	966000	47	970600	109	975100	273
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951600	18	956400	35	961300	178	966200	204	970800	51	975300	107
951700	325	956500	178	961400	179	966300	205	970900	325	975400	438
951800	131	956600	179	961500	207	966400	58	971000	140	975500	149
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952000	21	956900	22	961800	72	966600	255	971200	159	975700	308
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952300	226	957200	41	962000	316	966800	289	971400	327	975900	409
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953300	110	958200	170	963100	139	967700	301	972300	22	976800	145
953500	69	958300	92	963200	290	967800	161	972400	161	976900	327
953600	71	958400	94	963300	99	967900	162	972500	162	977000	249
953700	68	958500	134	963400	99	968000	107	972600	319	977100	193
953800	71	958600	135	963500	275	968100	288	972700	68	977200	193
953900	327	958700	289	963600	294	968200	68	972900	310	977300	24
954000	287	958800	59	963700	294	968400	319	973000	342	977400	30
954100	279	958900	307	964000	59	968500	327	973100	348	977500	169
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954300	117	959200	115	964200	117	968700	163	973300	94	977700	151

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977900	187	982300	149	986500	211	990800	103	995400	77	999700	271
978000	149	982400	253	986600	428	990900	341	995500	287	999800	204
978100	249	982500	302	986700	149	991000	76	995600	173	999900	205
978200	105	982600	98	986800	276	991100	45	995700	185	ACD	402
978300	106	982700	99	986900	249	991200	46	995800	185	ADS	368
978400	30	982800	45	987000	278	991300	307	995900	260	ARY	358
978500	51	982900	46	987100	436	991400	346	996000	173	AVA	381
978600	271	983000	328	987200	319	991500	99	996100	287	AWS	395
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978900	204	983200	408	987400	287	991800	75	996300	98	BAF	381
979000	205	983300	347	987500	56	991900	32	996400	99	BCF	393
979100	225	983400	296	987600	289	992000	350	996500	271	BGN	358
979200	225	983500	272	987700	320	992100	77	996600	173	BSW	397
979300	113	983600	161	987800	290	992200	341	996700	287	BVT	368
979400	347	983700	162	987900	408	992300	211	996800	260	CBG	381
979500	140	983800	271	988000	409	992400	211	996900	260	CHT	368
979600	438	983900	225	988100	245	992500	21	997000	75	CSG	358
979700	207	984000	225	988200	78	992600	22	997100	233	CXZ	402
979800	207	984100	113	988300	140	992700	75	997200	261	DDA	394
979900	270	984200	305	988400	255	992800	343	997300	271	DHE	368
980000	303	984300	312	988600	298	992900	344	997400	97	DQW	381
980100	151	984400	293	988700	110	993000	278	997500	260	DXT	358
980200	61	984500	314	988800	438	993100	428	997700	216	EFG	358
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980500	236	984800	346	989100	207	993700	216	998000	312	FBD	399
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981500	271	985700	438	990000	278	994600	341	998900	260	SAF	331
981600	319	985800	293	990100	346	994700	233	999000	98	SAW	331
981700	151	985900	318	990200	33	994800	260	999100	99		
981800	289	986000	347	990300	320	994900	97	999200	261		
981900	65	986100	304	990400	76	995000	216	999300	189		
982000	315	986200	174	990500	272	995100	216	999400	189		
982100	24	986300	60	990600	225	995200	349	999500	261		



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Square Upcut pg 221



Square Downcut pg 222



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