

FALL  
20  
23



**HARVEY TOOL™**

*Our Specialty Are Our Standards™*

From hard-to-find Keyseat Cutters to countless other industry-leading selections of miniature and specialty cutting tools. Think Harvey Tool First for the obscure tool dimensions your next job demands.

**28,500+**  
Miniature &  
Specialty  
Cutting Tools

# Think Harvey Tool First

## Unique Selection

We offer a comprehensive selection of more than 25,000 routers and specialty cutting tools that are all fully stocked. The breadth and depth of our product 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 any of your order. We offer second day delivery in ground pricing, and air overnight orders for all 48 contiguous US. For additional shipping information and details, including prices, visit [HarveyTool.com](http://HarveyTool.com).

## HARVEY PERFORMANCE COMPANY

### **HARVEY TOOL**

Time-saving  
Tool that

Maximize tool lifespan and productivity. Maximize your productivity.

### **Helical**

Let Helical  
Empower You

Maximize tool life and productivity. Maximize your productivity.

### **HELMOLD**

Make Your Work  
Easier

Maximize tool life and productivity. Maximize your productivity.

### **TITAN USA**

Start in  
Titan USA

Maximize tool life and productivity. Maximize your productivity.

### **CONFORM**

Innovative Tools for  
Innovative Materials

Maximize tool life and productivity. Maximize your productivity.

### **VALORI**

Victory Starts with  
Your Machining

Maximize tool life and productivity. Maximize your productivity.

# What We Offer

## Miniature End Mills [pg 37](#)

Select from over 5,000 miniature end mills, down to .007" outer diameter, available in a variety of styles and grades.



## Material Specific End Mills [pg 37](#)

Access the best results in high temp alloys, titanium alloys, free machining steels, aluminum alloys, plastics, composites, wood, and more with over 8,118 high-performance end mills.



## Undercutting End Mills [pg 37](#)

Over 1,000 options, with 2 different end lengths: .001"-.005" and .001"-.002"



## Drill-End Mills [pg 38](#)

Over 600 options, with outer diameters from 1/8" to 1"



## Chamfer Cutters [pg 38](#)

Over 1,200 options, with chamfers from .150" to 1" and 17 different chamfered ends.



## Engraving Cutters [pg 38](#)

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



## Double Angle Shank Cutters [pg 38](#)

Over 500 options in multiple styles and lead lengths and 14 included angles.

## Keyway Cutters [pg 39](#)



Over 2,200 options, with cutter diameters from .118" to 1.12"

## Sitting Saws [pg 39](#)



Over 150 coated and uncoated options, with thicknesses from .010" to .200"

## Holemaking & Threading [pg 40](#)

[pg 40](#)

Meet a variety of holemaking challenges from spring-to-threading with over 5,200 options for hole-making drills, reamers, counters, chamfers, and engravers, plus brots, and cross-drill bits.



## Corner Rounding End Mills [pg 39](#)

Over 800 options, with outer diameters from .002" to .500"



## Dovetail Cutters [pg 39](#)

Over 800 options, with 17 included angles.

## Tool Holders [pg 50](#)

For your toughest tooling with different sizes and lengths of inserts, choose from standard Reach Tool Holders, over 600 integrated Tool Holders, Tool Adaptors, CH Cutters, and 100 Performance Collets.

# 28,500+ Tools




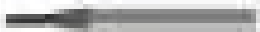


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## FEATURED SOLUTIONS

### Mold Tool & Die Solutions

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



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### Corner Conditioning Solutions

Whether preparing a corner for functional or aesthetic reasons, Heavy 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 manufacturer, 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 surface marks.



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## Deburring Solutions

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



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# MACHINING ADVISOR PRO

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

## Optimized for More Than 36,000 Products

Increase material removal rates and boost shop productivity with customized running parameters, specifically tailored for both Harvey Tool and Helical Solutions products.

## Customizable Speeds & Feeds

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

## Free to Use

Access the app quickly on your desktop, tablet, or mobile phone with no fee or subscription required.

Scan the QR Code  
to Learn More or Visit  
[machiningadvisorpro.com](http://machiningadvisorpro.com)



Available on the App Store

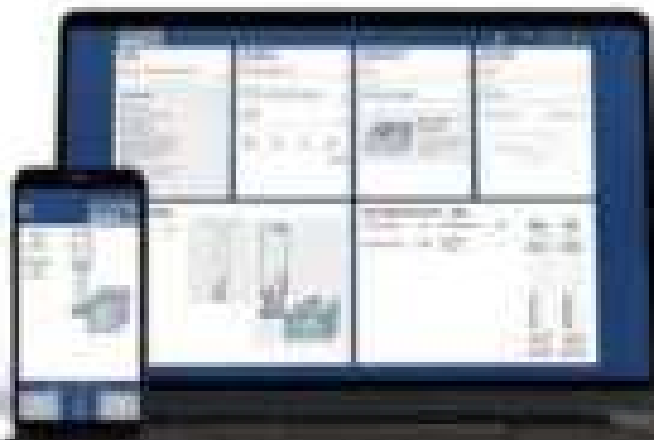
## A Machinist Favorite

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

— Ryan S. —

Ryan S.

Shop Owner, Avonia, PA





## MINIATURE END MILLS


## SQUARE

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## MINIATURE END MILLS

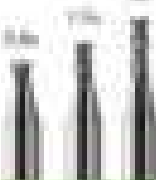
Figures – Straub & Standard



- Cutter diameter range to .001"
- Various cutting
- Hard coatings
- CNC ground to the 1/16"



Standard  
Ball Nose  
Ball Nose



DIA	L	CUTTER	MATERIAL	MATERIAL				MATERIAL				
				1/2"	1/4"	1/8"	1/16"	1/2"	1/4"	1/8"	1/16"	
.001	.001	1.00	1.00	1.00								
.002	.002	1.00	1.00	1.00								
.005	.005	1.00	1.00	1.00								
.010	.010	1.00	1.00	1.00								
.015	.015	1.00	1.00	1.00								
.020	.020	1.00	1.00	1.00								
.030	.030	1.00	1.00	1.00								
.040	.040	1.00	1.00	1.00								
.050	.050	1.00	1.00	1.00								
.060	.060	1.00	1.00	1.00								
.070	.070	1.00	1.00	1.00								
.080	.080	1.00	1.00	1.00								
.100	.100	1.00	1.00	1.00								
.125	.125	1.00	1.00	1.00								
.150	.150	1.00	1.00	1.00								
.175	.175	1.00	1.00	1.00								
.200	.200	1.00	1.00	1.00								
.250	.250	1.00	1.00	1.00								
.300	.300	1.00	1.00	1.00								
.375	.375	1.00	1.00	1.00								
.450	.450	1.00	1.00	1.00								
.500	.500	1.00	1.00	1.00								
.600	.600	1.00	1.00	1.00								
.750	.750	1.00	1.00	1.00								
.900	.900	1.00	1.00	1.00								
1.000	1.000	1.00	1.00	1.00								
1.250	1.250	1.00	1.00	1.00								
1.500	1.500	1.00	1.00	1.00								
1.750	1.750	1.00	1.00	1.00								
2.000	2.000	1.00	1.00	1.00								
2.500	2.500	1.00	1.00	1.00								
3.000	3.000	1.00	1.00	1.00								
3.500	3.500	1.00	1.00	1.00								
4.000	4.000	1.00	1.00	1.00								
4.500	4.500	1.00	1.00	1.00								
5.000	5.000	1.00	1.00	1.00								
6.000	6.000	1.00	1.00	1.00								
7.000	7.000	1.00	1.00	1.00								
8.000	8.000	1.00	1.00	1.00								
9.000	9.000	1.00	1.00	1.00								
10.000	10.000	1.00	1.00	1.00								



Following are other sizes.

continued on next page









## MINIATURE END MILLS

Square - Stub & Standard (cont.)

Continued from previous page

ITEM NO.	DIA.		L		LENGTH	MATERIAL	CUTTING SPEEDS				RECOMMENDED FEEDS				
	IN.	MM.	IN.	MM.			FT. / MIN.	SF. / MIN.	IPM	MM / MIN.	IPM	MM / MIN.	IPM	MM / MIN.	
50-2540	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100				
50-2545	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2550	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2555	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2560	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2565	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2570	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2575	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2580	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2585	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2590	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2595	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2600	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2605	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2610	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2615	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2620	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2625	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2630	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2635	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2640	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2645	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2650	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2655	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2660	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2665	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2670	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2675	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2680	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2685	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2690	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2695	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100
50-2700	.25	6.35	.14	3.56		7042	7042	1100	1100	1100	1100	1100	1100	1100	1100

\*Standard length only



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## MINIATURE END MILLS

Square - 5/16" & Standard - 3 Flute



- Coarse geometry design for 202°
- Better cutting
- Good rigidity
- Good precision on the hole

ITEM NUMBER	LENGTH (IN)	FLUTES	DIAMETER (IN)	LENGTH (IN)	MATERIAL		UNIT WEIGHT	
					ITEM #	ITEM #	ITEM #	ITEM #
100110000	0.05	3	0.010	0.010	100110000	100110000	0.0001	0.0001
100110001	0.05	3	0.010	0.010	100110001	100110001	0.0001	0.0001
100110002	0.05	3	0.010	0.010	100110002	100110002	0.0001	0.0001
100110003	0.05	3	0.010	0.010	100110003	100110003	0.0001	0.0001
100110004	0.05	3	0.010	0.010	100110004	100110004	0.0001	0.0001
100110005	0.05	3	0.010	0.010	100110005	100110005	0.0001	0.0001
100110006	0.05	3	0.010	0.010	100110006	100110006	0.0001	0.0001
100110007	0.05	3	0.010	0.010	100110007	100110007	0.0001	0.0001
100110008	0.05	3	0.010	0.010	100110008	100110008	0.0001	0.0001
100110009	0.05	3	0.010	0.010	100110009	100110009	0.0001	0.0001
100110010	0.05	3	0.010	0.010	100110010	100110010	0.0001	0.0001
100110011	0.05	3	0.010	0.010	100110011	100110011	0.0001	0.0001
100110012	0.05	3	0.010	0.010	100110012	100110012	0.0001	0.0001
100110013	0.05	3	0.010	0.010	100110013	100110013	0.0001	0.0001
100110014	0.05	3	0.010	0.010	100110014	100110014	0.0001	0.0001
100110015	0.05	3	0.010	0.010	100110015	100110015	0.0001	0.0001
100110016	0.05	3	0.010	0.010	100110016	100110016	0.0001	0.0001
100110017	0.05	3	0.010	0.010	100110017	100110017	0.0001	0.0001
100110018	0.05	3	0.010	0.010	100110018	100110018	0.0001	0.0001
100110019	0.05	3	0.010	0.010	100110019	100110019	0.0001	0.0001
100110020	0.05	3	0.010	0.010	100110020	100110020	0.0001	0.0001



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## MINIATURE END MILLS

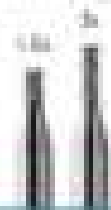
Square - Stub & Standard - Metric



- All dimensions and tolerances in millimeters
- Outer diameter does not exceed 1.0mm
- Center cutting
- Stock surface
- HSS ground to Ra 0.20



Max. Fluting  
Standard Length



OUTER DIAMETER	LENGTH	FLUTE LENGTH	TOTAL LENGTH	SQUARED			STANDARD		
				2 FL.	4 FL.	MAX FL.	2 FL.	4 FL.	MAX FL.
0.2mm	10.0mm	5.0mm	10.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	15.0mm	5.0mm	15.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	20.0mm	5.0mm	20.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	25.0mm	5.0mm	25.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	30.0mm	5.0mm	30.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	35.0mm	5.0mm	35.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	40.0mm	5.0mm	40.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	45.0mm	5.0mm	45.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	50.0mm	5.0mm	50.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	55.0mm	5.0mm	55.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	60.0mm	5.0mm	60.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	65.0mm	5.0mm	65.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	70.0mm	5.0mm	70.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	75.0mm	5.0mm	75.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	80.0mm	5.0mm	80.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	85.0mm	5.0mm	85.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	90.0mm	5.0mm	90.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	95.0mm	5.0mm	95.0mm	10001	10001	10001	10001.00	10001.00	10001
0.2mm	100.0mm	5.0mm	100.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	10.0mm	5.0mm	10.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	15.0mm	5.0mm	15.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	20.0mm	5.0mm	20.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	25.0mm	5.0mm	25.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	30.0mm	5.0mm	30.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	35.0mm	5.0mm	35.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	40.0mm	5.0mm	40.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	45.0mm	5.0mm	45.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	50.0mm	5.0mm	50.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	55.0mm	5.0mm	55.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	60.0mm	5.0mm	60.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	65.0mm	5.0mm	65.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	70.0mm	5.0mm	70.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	75.0mm	5.0mm	75.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	80.0mm	5.0mm	80.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	85.0mm	5.0mm	85.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	90.0mm	5.0mm	90.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	95.0mm	5.0mm	95.0mm	10001	10001	10001	10001.00	10001.00	10001
0.3mm	100.0mm	5.0mm	100.0mm	10001	10001	10001	10001.00	10001.00	10001

# MINIATURE END MILLS

Square - Long Flute



Shown in 8 Samples of Cut

- Long Flute and long shank design for deep cutting
- 60° Lead geometry • 2 Flute cutting • IsoSorb™ • SAC grade to 60 LPM

CUTTER DIAMETER	LENGTH OF FLUTE	FLUTES	SHANK DIAMETER	TOTAL LENGTH	AVAILABLE		OTHER OPTIONS		STANDARD GRAINING	
					ISO 1	ISO 2	ISO 3	ISO 6	ISO 1	ISO 2
.050	.050	2	.050	0.150	1000	1500				
.050	.050	2	.050	0.200	1000	1700				
.050	.050	2	.050	0.250	1000	1900				
.050	.050	2	.050	0.300	1000	2100				
.050	.050	2	.050	0.350	1000	2300				
.050	.050	2	.050	0.400	1000	2500				
.050	.050	2	.050	0.450	1000	2700	2000	2500		
.050	.050	2	.050	0.500	1000	2900	2200	2700	500	500
.050	.050	4	.050	0.150	1000	1500	2000	2500		
.050	.050	4	.050	0.200	1000	1700	2200	2700		
.050	.050	4	.050	0.250	1000	1900	2400	2900		
.050	.050	4	.050	0.300	1000	2100	2600	3100		
.050	.050	4	.050	0.350	1000	2300	2800	3300		
.050	.050	4	.050	0.400	1000	2500	3000	3500		
.050	.050	4	.050	0.450	1000	2700	3200	3700		
.050	.050	4	.050	0.500	1000	2900	3400	3900		
.050	.050	4	.050	0.550	1000	3100	3600	4100		
.050	.050	4	.050	0.600	1000	3300	3800	4300		
.050	.050	4	.050	0.650	1000	3500	4000	4500		
.050	.050	4	.050	0.700	1000	3700	4200	4700		
.050	.050	4	.050	0.750	1000	3900	4400	4900		
.050	.050	4	.050	0.800	1000	4100	4600	5100		
.050	.050	4	.050	0.850	1000	4300	4800	5300		
.050	.050	4	.050	0.900	1000	4500	5000	5500		
.050	.050	4	.050	0.950	1000	4700	5200	5700		
.050	.050	4	.050	1.000	1000	4900	5400	5900		
.050	.050	4	.050	1.050	1000	5100	5600	6100		
.050	.050	4	.050	1.100	1000	5300	5800	6300		
.050	.050	4	.050	1.150	1000	5500	6000	6500		
.050	.050	4	.050	1.200	1000	5700	6200	6700		
.050	.050	4	.050	1.250	1000	5900	6400	6900		
.050	.050	4	.050	1.300	1000	6100	6600	7100		
.050	.050	4	.050	1.350	1000	6300	6800	7300		
.050	.050	4	.050	1.400	1000	6500	7000	7500		
.050	.050	4	.050	1.450	1000	6700	7200	7700		
.050	.050	4	.050	1.500	1000	6900	7400	7900		
.050	.050	4	.050	1.550	1000	7100	7600	8100		
.050	.050	4	.050	1.600	1000	7300	7800	8300		
.050	.050	4	.050	1.650	1000	7500	8000	8500		
.050	.050	4	.050	1.700	1000	7700	8200	8700		
.050	.050	4	.050	1.750	1000	7900	8400	8900		
.050	.050	4	.050	1.800	1000	8100	8600	9100		
.050	.050	4	.050	1.850	1000	8300	8800	9300		
.050	.050	4	.050	1.900	1000	8500	9000	9500		
.050	.050	4	.050	1.950	1000	8700	9200	9700		
.050	.050	4	.050	2.000	1000	8900	9400	9900		

(continued on next page)









### MINIATURE END MILLS

Square - Long Flute Mills

Continuation from previous page

CUTTER NUMBER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	MATERIAL		CUTTING SPEED		RECOMMENDED FEEDS	
					FEEDS	FEEDS	FINISH	FEEDS	FEEDS	FEEDS
9850	1.00 (.04)	2	.03	1.10	0.003	0.004	1000-1200	0.002		
9851	1.75 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9852	1.75 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9853	2.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9854	2.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9855	2.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9856	2.75 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9857	2.75 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9858	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9859	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9860	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9861	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9862	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9863	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9864	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9865	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9866	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9867	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9868	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9869	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9870	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9871	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9872	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9873	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9874	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9875	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9876	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9877	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9878	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9879	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9880	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9881	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9882	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9883	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9884	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9885	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9886	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9887	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9888	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9889	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9890	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9891	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9892	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9893	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9894	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9895	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9896	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9897	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9898	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		
9899	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002	0.0005	0.001
9900	3.00 (.04)	2	.04	1.10	0.003	0.004	1000-1200	0.002		

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## MINIATURE END MILLS

### Square - Deburring End Mill



End Mill Tolerances with RoundStyle Germany!

- Deliver in your CAD machine with great high precision hole mill to cut and chamfer.
- Best machining experience built due to lamellar coated inserts.
- High flute count allows for low feed rates which reduces cycle times.
- Reduced forces from chips and milling temperatures.
- Best geometry is optimized for removing burrs and/or getting a great finished edge finish with square finish.
- Shows you high flute options.
- No chip and allows for shallow cuts, not suited for plunge cutting.
- ISO metric.
- ISO grades in the USA.

Overall Diameter	Length of Cut	Inserts/Length 100%	Left Hand 100%	Flute Diameter	Flute Length	Overall Dia.		Overall Length	
						Min. Dia.	Max. Dia.	Min. Len.	Max. Len.
0.1250	0.1250			0.1250	0.1250	0.1250	0.1250	0.1250	0.1250
0.1500	0.1500	0	0	0.1500	0.1500	0.1500	0.1500	0.1500	0.1500
0.1750	0.1750	0	0	0.1750	0.1750	0.1750	0.1750	0.1750	0.1750
0.2000	0.2000	4	4	0.2000	0.2000	0.2000	0.2000	0.2000	0.2000
0.2500	0.2500	10	0	0.2500	0.2500	0.2500	0.2500	0.2500	0.2500
0.3000	0.3000	10	0	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000
0.4000	0.4000			0.4000	0.4000	0.4000	0.4000	0.4000	0.4000
0.5000	0.5000	10	0	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000
0.6000	0.6000	10	0	0.6000	0.6000	0.6000	0.6000	0.6000	0.6000
0.7500	0.7500	10	0	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500
1.0000	1.0000	10	0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000



### Tip for Maintaining Tight Tolerances

Tolerances are vital important for machining operations, but do you know what they mean? Do you know how to maintain tight tolerances even in difficult scenarios, such as machining free water? Our "10 Free Cuts" bring you **Tip for Maintaining Tight Tolerances** is a must-read before beginning any job.

Read more on [Performance](#) over to the page!

# MINIATURE END MILLS

Square - Long Reach, Standard Flute



Standard Flute  
Square  
End Mill

- Length of Cut = 3x Shank Dia. • Center cutting • Double-flute • Uncoated, HSS-E

ITEM NUMBER	LENGTH OF CUT	CYLIND. SHAFT	SHANK DIA.	FLUTE LENGTH	MATERIAL			FINISH			WEIGHT (G/PCS)	
					ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM	ITEM
001	01	001	0.10	0.10	001	001	0.00					
002	01	002	0.15	0.15	001	001	0.00					
003	01	003	0.20	0.20	001	001	0.00					
004	01	004	0.25	0.25	001	001	0.00					
010	02	010	0.10	0.10	001	001	0.00	001	001	0.00		
015	02	015	0.15	0.15	001	001	0.00	001	001	0.00		
020	02	020	0.20	0.20	001	001	0.00	001	001	0.00		
025	02	025	0.25	0.25	001	001	0.00	001	001	0.00		
030	03	030	0.10	0.10	001	001	0.00	001	001	0.00		
035	03	035	0.15	0.15	001	001	0.00	001	001	0.00		
040	03	040	0.20	0.20	001	001	0.00	001	001	0.00		
045	03	045	0.25	0.25	001	001	0.00	001	001	0.00		
050	04	050	0.10	0.10	001	001	0.00	001	001	0.00		
055	04	055	0.15	0.15	001	001	0.00	001	001	0.00		
060	04	060	0.20	0.20	001	001	0.00	001	001	0.00		
065	04	065	0.25	0.25	001	001	0.00	001	001	0.00		
070	05	070	0.10	0.10	001	001	0.00	001	001	0.00		
075	05	075	0.15	0.15	001	001	0.00	001	001	0.00		
080	05	080	0.20	0.20	001	001	0.00	001	001	0.00		
085	05	085	0.25	0.25	001	001	0.00	001	001	0.00		
090	06	090	0.10	0.10	001	001	0.00	001	001	0.00		
095	06	095	0.15	0.15	001	001	0.00	001	001	0.00		
100	06	100	0.20	0.20	001	001	0.00	001	001	0.00		
105	06	105	0.25	0.25	001	001	0.00	001	001	0.00		
110	07	110	0.10	0.10	001	001	0.00	001	001	0.00		
115	07	115	0.15	0.15	001	001	0.00	001	001	0.00		
120	07	120	0.20	0.20	001	001	0.00	001	001	0.00		
125	07	125	0.25	0.25	001	001	0.00	001	001	0.00		
130	08	130	0.10	0.10	001	001	0.00	001	001	0.00		
135	08	135	0.15	0.15	001	001	0.00	001	001	0.00		
140	08	140	0.20	0.20	001	001	0.00	001	001	0.00		
145	08	145	0.25	0.25	001	001	0.00	001	001	0.00		
150	09	150	0.10	0.10	001	001	0.00	001	001	0.00		
155	09	155	0.15	0.15	001	001	0.00	001	001	0.00		
160	09	160	0.20	0.20	001	001	0.00	001	001	0.00		
165	09	165	0.25	0.25	001	001	0.00	001	001	0.00		
170	10	170	0.10	0.10	001	001	0.00	001	001	0.00		
175	10	175	0.15	0.15	001	001	0.00	001	001	0.00		
180	10	180	0.20	0.20	001	001	0.00	001	001	0.00		
185	10	185	0.25	0.25	001	001	0.00	001	001	0.00		

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# MINIATURE END MILLS

Square – Long Reach, Standard Flute (cont.)

(continued from previous page)

ITEM NUMBER	GROUP #2 Flute	OVERALL LENGTH	HEAD DIA.		DIMENSIONS			LENGTHS			MATERIALS	
			D1	D2	F18	F18	F18	F18	F18	F18	F18	F18
868	868	45	3.00	3.00	0.5	2	4666	4666	48.00	4666	48.00	
869	869	45	2.75	2.75	0.5	2	4666	4666	48.00	4666	48.00	
870	870	45	2.50	2.50	0.5	2	4666	4666	48.00	4666	48.00	
871	871	45	2.25	2.25	0.5	2	4666	4666	48.00	4666	48.00	
872	872	45	2.00	2.00	0.5	2	4666	4666	48.00	4666	48.00	
873	873	45	1.75	1.75	0.5	2	4666	4666	48.00	4666	48.00	
874	874	45	1.50	1.50	0.5	2	4666	4666	48.00	4666	48.00	
875	875	45	1.25	1.25	0.5	2	4666	4666	48.00	4666	48.00	
876	876	45	1.00	1.00	0.5	2	4666	4666	48.00	4666	48.00	
877	877	45	0.75	0.75	0.5	2	4666	4666	48.00	4666	48.00	
878	878	45	0.50	0.50	0.5	2	4666	4666	48.00	4666	48.00	
879	879	45	0.25	0.25	0.5	2	4666	4666	48.00	4666	48.00	
880	880	50	3.00	3.00	0.5	2	4666	4666	48.00	4666	48.00	
881	881	50	2.75	2.75	0.5	2	4666	4666	48.00	4666	48.00	
882	882	50	2.50	2.50	0.5	2	4666	4666	48.00	4666	48.00	
883	883	50	2.25	2.25	0.5	2	4666	4666	48.00	4666	48.00	
884	884	50	2.00	2.00	0.5	2	4666	4666	48.00	4666	48.00	
885	885	50	1.75	1.75	0.5	2	4666	4666	48.00	4666	48.00	
886	886	50	1.50	1.50	0.5	2	4666	4666	48.00	4666	48.00	
887	887	50	1.25	1.25	0.5	2	4666	4666	48.00	4666	48.00	
888	888	50	1.00	1.00	0.5	2	4666	4666	48.00	4666	48.00	
889	889	50	0.75	0.75	0.5	2	4666	4666	48.00	4666	48.00	
890	890	50	0.50	0.50	0.5	2	4666	4666	48.00	4666	48.00	
891	891	50	0.25	0.25	0.5	2	4666	4666	48.00	4666	48.00	
892	892	50	0.00	0.00	0.5	2	4666	4666	48.00	4666	48.00	

# MINIATURE END MILLS

Square - Long Reach, Flat Flute



- Long length design for deep cavities
- Flat flutes for maximum rigidity
- Length of cut = 10x diameter
- Ground cutting
- Hard coating - TiN (green) or TiAlN



Features from  
Diameter  
& Flute Length

Features from  
Diameter  
& Flute Length



ITEM NUMBER	LENGTH OF CUT	ITEM CODE	FLUTE NUMBER	SHAPE	Diameter (mm)	ITEM PRICE		ITEM WEIGHT		ITEM STOCK	
						PRICE	UNIT	PRICE	UNIT	PRICE	UNIT
001	101	001 101	1	1.0	0.100	10.00	0.100				
002	101	002 101	1	0.8	0.100	10.00	0.100				
003	101	003 101	1	0.6	0.100	10.00	0.100				
004	101	004 101	1	0.5	0.100	10.00	0.100				
005	101	005 101	1	0.4	0.100	10.00	0.100				
006	101	006 101	1	0.3	0.100	10.00	0.100				
007	101	007 101	1	0.2	0.100	10.00	0.100				
008	101	008 101	1	0.15	0.100	10.00	0.100				
009	101	009 101	1	0.12	0.100	10.00	0.100				
010	101	010 101	1	0.1	0.100	10.00	0.100				
011	101	011 101	1	0.08	0.100	10.00	0.100				
012	101	012 101	1	0.06	0.100	10.00	0.100				
013	101	013 101	1	0.05	0.100	10.00	0.100				
014	101	014 101	1	0.04	0.100	10.00	0.100				
015	101	015 101	1	0.03	0.100	10.00	0.100				
016	101	016 101	1	0.02	0.100	10.00	0.100				
017	101	017 101	1	0.015	0.100	10.00	0.100				
018	101	018 101	1	0.01	0.100	10.00	0.100				
019	101	019 101	1	0.008	0.100	10.00	0.100				
020	101	020 101	1	0.006	0.100	10.00	0.100				
021	101	021 101	1	0.005	0.100	10.00	0.100				
022	101	022 101	1	0.004	0.100	10.00	0.100				
023	101	023 101	1	0.003	0.100	10.00	0.100				
024	101	024 101	1	0.002	0.100	10.00	0.100				
025	101	025 101	1	0.001	0.100	10.00	0.100				
026	101	026 101	1	0.0008	0.100	10.00	0.100				
027	101	027 101	1	0.0006	0.100	10.00	0.100				
028	101	028 101	1	0.0005	0.100	10.00	0.100				
029	101	029 101	1	0.0004	0.100	10.00	0.100				
030	101	030 101	1	0.0003	0.100	10.00	0.100				
031	101	031 101	1	0.0002	0.100	10.00	0.100				
032	101	032 101	1	0.0001	0.100	10.00	0.100				
033	101	033 101	1	0.00008	0.100	10.00	0.100				
034	101	034 101	1	0.00006	0.100	10.00	0.100				
035	101	035 101	1	0.00005	0.100	10.00	0.100				
036	101	036 101	1	0.00004	0.100	10.00	0.100				
037	101	037 101	1	0.00003	0.100	10.00	0.100				
038	101	038 101	1	0.00002	0.100	10.00	0.100				
039	101	039 101	1	0.00001	0.100	10.00	0.100				
040	101	040 101	1	0.000008	0.100	10.00	0.100				
041	101	041 101	1	0.000006	0.100	10.00	0.100				
042	101	042 101	1	0.000005	0.100	10.00	0.100				
043	101	043 101	1	0.000004	0.100	10.00	0.100				
044	101	044 101	1	0.000003	0.100	10.00	0.100				
045	101	045 101	1	0.000002	0.100	10.00	0.100				
046	101	046 101	1	0.000001	0.100	10.00	0.100				
047	101	047 101	1	0.0000008	0.100	10.00	0.100				
048	101	048 101	1	0.0000006	0.100	10.00	0.100				
049	101	049 101	1	0.0000005	0.100	10.00	0.100				
050	101	050 101	1	0.0000004	0.100	10.00	0.100				
051	101	051 101	1	0.0000003	0.100	10.00	0.100				
052	101	052 101	1	0.0000002	0.100	10.00	0.100				
053	101	053 101	1	0.0000001	0.100	10.00	0.100				
054	101	054 101	1	0.00000008	0.100	10.00	0.100				
055	101	055 101	1	0.00000006	0.100	10.00	0.100				
056	101	056 101	1	0.00000005	0.100	10.00	0.100				
057	101	057 101	1	0.00000004	0.100	10.00	0.100				
058	101	058 101	1	0.00000003	0.100	10.00	0.100				
059	101	059 101	1	0.00000002	0.100	10.00	0.100				
060	101	060 101	1	0.00000001	0.100	10.00	0.100				

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## MINIATURE END MILLS

Square - Long Reach, Slab Flute (cont.)

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ITEM NUMBER	LENGTH INches	OVERALL LENGTH	FLUTE DEPTH	DIA. INches	OVERALL LENGTH	ITEM #		ITEM #		ITEM #	
						7052	7053	7054	7055	7056	7057
011	.005	.005	0	.01	0.13	7052	011	7054	011		
012	.005	.005	0	.01	0.14	7052	012	7054	012		
013	.005	.005	0	.01	0.15	7052	013	7054	013		
014	.005	.005	0	.01	0.16	7052	014	7054	014		
015	.005	.005	0	.01	0.17	7052	015	7054	015		
016	.005	.005	0	.01	0.18	7052	016	7054	016		
018 (new)	.005	.005	0	.01	0.18	7052	018	7054	018		
019 (new)	.005	.005	0	.01	0.19	7052	019	7054	019	7056-02	0119
020 (new)	.005	.005	0	.01	0.20	7052	020	7054	020		
021 (new)	.005	.005	0	.01	0.21	7052	021	7054	021	7056-03	0121
022 (new)	.005	.005	0	.01	0.22	7052	022	7054	022	7056-03	0122
023 (new)	.005	.005	0	.01	0.23	7052	023	7054	023	7056-03	0123
024 (new)	.005	.005	0	.01	0.24	7052	024	7054	024	7056-03	0124
025 (new)	.005	.005	0	.01	0.25	7052	025	7054	025	7056-03	0125
026 (new)	.005	.005	0	.01	0.26	7052	026	7054	026	7056-03	0126
027 (new)	.005	.005	0	.01	0.27	7052	027	7054	027	7056-03	0127
028 (new)	.005	.005	0	.01	0.28	7052	028	7054	028	7056-03	0128
029 (new)	.005	.005	0	.01	0.29	7052	029	7054	029	7056-03	0129
030 (new)	.005	.005	0	.01	0.30	7052	030	7054	030	7056-03	0130
031 (new)	.005	.005	0	.01	0.31	7052	031	7054	031	7056-03	0131
032 (new)	.005	.005	0	.01	0.32	7052	032	7054	032	7056-03	0132
033 (new)	.005	.005	0	.01	0.33	7052	033	7054	033	7056-03	0133
034 (new)	.005	.005	0	.01	0.34	7052	034	7054	034	7056-03	0134
035 (new)	.005	.005	0	.01	0.35	7052	035	7054	035	7056-03	0135
036 (new)	.005	.005	0	.01	0.36	7052	036	7054	036	7056-03	0136
037 (new)	.005	.005	0	.01	0.37	7052	037	7054	037	7056-03	0137
038 (new)	.005	.005	0	.01	0.38	7052	038	7054	038	7056-03	0138
039 (new)	.005	.005	0	.01	0.39	7052	039	7054	039	7056-03	0139
040 (new)	.005	.005	0	.01	0.40	7052	040	7054	040	7056-03	0140
041 (new)	.005	.005	0	.01	0.41	7052	041	7054	041	7056-03	0141
042 (new)	.005	.005	0	.01	0.42	7052	042	7054	042	7056-03	0142
043 (new)	.005	.005	0	.01	0.43	7052	043	7054	043	7056-03	0143
044 (new)	.005	.005	0	.01	0.44	7052	044	7054	044	7056-03	0144
045 (new)	.005	.005	0	.01	0.45	7052	045	7054	045	7056-03	0145
046 (new)	.005	.005	0	.01	0.46	7052	046	7054	046	7056-03	0146
047 (new)	.005	.005	0	.01	0.47	7052	047	7054	047	7056-03	0147
048 (new)	.005	.005	0	.01	0.48	7052	048	7054	048	7056-03	0148
049 (new)	.005	.005	0	.01	0.49	7052	049	7054	049	7056-03	0149
050 (new)	.005	.005	0	.01	0.50	7052	050	7054	050	7056-03	0150
051 (new)	.005	.005	0	.01	0.51	7052	051	7054	051	7056-03	0151
052 (new)	.005	.005	0	.01	0.52	7052	052	7054	052	7056-03	0152
053 (new)	.005	.005	0	.01	0.53	7052	053	7054	053	7056-03	0153
054 (new)	.005	.005	0	.01	0.54	7052	054	7054	054	7056-03	0154
055 (new)	.005	.005	0	.01	0.55	7052	055	7054	055	7056-03	0155
056 (new)	.005	.005	0	.01	0.56	7052	056	7054	056	7056-03	0156
057 (new)	.005	.005	0	.01	0.57	7052	057	7054	057	7056-03	0157
058 (new)	.005	.005	0	.01	0.58	7052	058	7054	058	7056-03	0158
059 (new)	.005	.005	0	.01	0.59	7052	059	7054	059	7056-03	0159
060 (new)	.005	.005	0	.01	0.60	7052	060	7054	060	7056-03	0160
061 (new)	.005	.005	0	.01	0.61	7052	061	7054	061	7056-03	0161
062 (new)	.005	.005	0	.01	0.62	7052	062	7054	062	7056-03	0162
063 (new)	.005	.005	0	.01	0.63	7052	063	7054	063	7056-03	0163
064 (new)	.005	.005	0	.01	0.64	7052	064	7054	064	7056-03	0164
065 (new)	.005	.005	0	.01	0.65	7052	065	7054	065	7056-03	0165
066 (new)	.005	.005	0	.01	0.66	7052	066	7054	066	7056-03	0166
067 (new)	.005	.005	0	.01	0.67	7052	067	7054	067	7056-03	0167
068 (new)	.005	.005	0	.01	0.68	7052	068	7054	068	7056-03	0168
069 (new)	.005	.005	0	.01	0.69	7052	069	7054	069	7056-03	0169
070 (new)	.005	.005	0	.01	0.70	7052	070	7054	070	7056-03	0170

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**MINIATURE END MILLS**

Square - Long Reach, Double Flute series

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ITEM #	LENGTH mm	OVERALL LENGTH mm	FLUTE DEPTH	SHAFT DIAMETER mm	OVERALL LENGTH mm	WEIGHT		SQR. CHUCK		MATERIAL BY WEIGHT	
						MM/IN	MM/IN	MM/IN	MM/IN	MM/IN	MM/IN
203-71000	100	100	0	10	0.13	1000	0.45	1000-02	0.15		
203-71001	125	125	0	10	0.13	1665	0.59	1000-02	0.20		
203	150	150	0	10	0.13	1920	0.74	1000-02	0.25		
203	175	175	0	10	0.13	2465	0.94	1000-02	0.30		
203	200	200	0	10	0.13	3010	1.14	1000-02	0.35		
203	225	225	0	10	0.13	3555	1.34	1000-02	0.40		
203	250	250	0	10	0.13	4100	1.54	1000-02	0.45	1000-02	0.15
203	275	275	0	10	0.13	4645	1.74	1000-02	0.50		
203	300	300	0	10	0.13	5190	1.94	1000-02	0.55		
203	325	325	0	10	0.13	5735	2.14	1000-02	0.60		
203	350	350	0	10	0.13	6280	2.34	1000-02	0.65		
203	375	375	0	10	0.13	6825	2.54	1000-02	0.70		
203	400	400	0	10	0.13	7370	2.74	1000-02	0.75		
203	425	425	0	10	0.13	7915	2.94	1000-02	0.80		
203-81000	100	100	0	10	0.13	1060	0.39	1000-02	0.15	1000-02	0.15
203-81001	125	125	0	10	0.13	1505	0.59	1000-02	0.20	1000-02	0.15
203-81002	150	150	0	10	0.13	1950	0.79	1000-02	0.25	1000-02	0.15
203-81003	175	175	0	10	0.13	2395	0.99	1000-02	0.30	1000-02	0.15
203-81004	200	200	0	10	0.13	2840	1.19	1000-02	0.35	1000-02	0.15
203-81005	225	225	0	10	0.13	3285	1.39	1000-02	0.40	1000-02	0.15
203-81006	250	250	0	10	0.13	3730	1.59	1000-02	0.45	1000-02	0.15
203-81007	275	275	0	10	0.13	4175	1.79	1000-02	0.50	1000-02	0.15
203-81008	300	300	0	10	0.13	4620	1.99	1000-02	0.55	1000-02	0.15
203-81009	325	325	0	10	0.13	5065	2.19	1000-02	0.60	1000-02	0.15
203-81010	350	350	0	10	0.13	5510	2.39	1000-02	0.65	1000-02	0.15
203-81011	375	375	0	10	0.13	5955	2.59	1000-02	0.70	1000-02	0.15
203-81012	400	400	0	10	0.13	6400	2.79	1000-02	0.75	1000-02	0.15
203-81013	425	425	0	10	0.13	6845	2.99	1000-02	0.80	1000-02	0.15
203-81014	450	450	0	10	0.13	7290	3.19	1000-02	0.85	1000-02	0.15
203-81015	475	475	0	10	0.13	7735	3.39	1000-02	0.90	1000-02	0.15
203-81016	500	500	0	10	0.13	8180	3.59	1000-02	0.95	1000-02	0.15
203-81017	525	525	0	10	0.13	8625	3.79	1000-02	1.00	1000-02	0.15
203-81018	550	550	0	10	0.13	9070	3.99	1000-02	1.05	1000-02	0.15
203-81019	575	575	0	10	0.13	9515	4.19	1000-02	1.10	1000-02	0.15
203-81020	600	600	0	10	0.13	9960	4.39	1000-02	1.15	1000-02	0.15
203-81021	625	625	0	10	0.13	10405	4.59	1000-02	1.20	1000-02	0.15
203-81022	650	650	0	10	0.13	10850	4.79	1000-02	1.25	1000-02	0.15
203-81023	675	675	0	10	0.13	11295	4.99	1000-02	1.30	1000-02	0.15
203-81024	700	700	0	10	0.13	11740	5.19	1000-02	1.35	1000-02	0.15
203-81025	725	725	0	10	0.13	12185	5.39	1000-02	1.40	1000-02	0.15
203-81026	750	750	0	10	0.13	12630	5.59	1000-02	1.45	1000-02	0.15
203-81027	775	775	0	10	0.13	13075	5.79	1000-02	1.50	1000-02	0.15
203-81028	800	800	0	10	0.13	13520	5.99	1000-02	1.55	1000-02	0.15
203-81029	825	825	0	10	0.13	13965	6.19	1000-02	1.60	1000-02	0.15
203-81030	850	850	0	10	0.13	14410	6.39	1000-02	1.65	1000-02	0.15
203-81031	875	875	0	10	0.13	14855	6.59	1000-02	1.70	1000-02	0.15
203-81032	900	900	0	10	0.13	15300	6.79	1000-02	1.75	1000-02	0.15
203-81033	925	925	0	10	0.13	15745	6.99	1000-02	1.80	1000-02	0.15
203-81034	950	950	0	10	0.13	16190	7.19	1000-02	1.85	1000-02	0.15
203-81035	975	975	0	10	0.13	16635	7.39	1000-02	1.90	1000-02	0.15
203-81036	1000	1000	0	10	0.13	17080	7.59	1000-02	1.95	1000-02	0.15

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## MINIATURE END MILLS

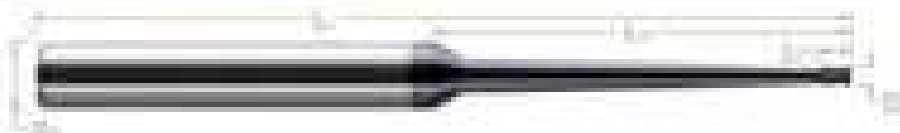
Square - Long Reach, Slab Flute (cont.)

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CUTTER ID NUMBER	LENGTH OF CUT	OVERALL LENGTH	NUMBER FLUTES	SHANK DIAMETER	OVERALL LENGTH	DIMENSIONS		STEP LENGTH		RECOMMENDED SPEEDS	
						TYPE 1	TYPE 2	TYPE 1	TYPE 2	TYPE 1	TYPE 2
200-113	.275	.275	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-114	.275	1.000	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-115	.275	1.200	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-116	.275	1.400	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-117	.275	1.600	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-118	.275	1.800	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-119	.275	2.000	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-120	.275	2.200	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-121	.275	2.400	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-122	.275	2.600	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-123	.275	2.800	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-124	.275	3.000	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-125	.275	3.200	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-126	.275	3.400	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-127	.275	3.600	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-128	.275	3.800	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-129	.275	4.000	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-130	.275	4.200	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-131	.275	4.400	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-132	.275	4.600	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-133	.275	4.800	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-134	.275	5.000	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-135	.275	5.200	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-136	.275	5.400	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-137	.275	5.600	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-138	.275	5.800	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-139	.275	6.000	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-140	.275	6.200	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-141	.275	6.400	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-142	.275	6.600	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-143	.275	6.800	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-144	.275	7.000	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-145	.275	7.200	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-146	.275	7.400	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-147	.275	7.600	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-148	.275	7.800	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-149	.275	8.000	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-150	.275	8.200	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-151	.275	8.400	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-152	.275	8.600	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-153	.275	8.800	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-154	.275	9.000	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-155	.275	9.200	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-156	.275	9.400	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-157	.275	9.600	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-158	.275	9.800	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
200-159	.275	10.000	10	.125	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

## MINIATURE END MILLS

Square – Tapered Reach (Clearance Cutters)



Maximum Reach & Maximum Rigidity

- Designed for deep cavity drilling
- 2° tapered reach design minimizes deflection and mechanical stresses
- Length of cut = 10 x diameter
- Back (total) length of cut is reduced for 1.5 diameters
- 40 degree clearance for high precision tool holders
- 5mm overall
- 0.01mm ground in the hole

DIAMETER DIA	TOTAL LENGTH L	REACH		TAPERED REACH DEPTH OF CUT							REACH			RIGIDITY		
		REACH L1	RADIUS R	1	2	3	4	5	6	7	8	9	10	11	12	13
0.5	5.0	1.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
0.6	6.0	1.8	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
0.8	8.0	2.4	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
1.0	10.0	3.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1.2	12.0	3.6	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
1.5	15.0	4.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
2.0	20.0	6.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
2.5	25.0	7.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
3.0	30.0	9.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
4.0	40.0	12.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
5.0	50.0	15.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
6.0	60.0	18.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
8.0	80.0	24.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
10.0	100.0	30.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
12.0	120.0	36.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
15.0	150.0	45.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
20.0	200.0	60.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
25.0	250.0	75.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
30.0	300.0	90.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0	30.0
40.0	400.0	120.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
50.0	500.0	150.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
60.0	600.0	180.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0	60.0
80.0	800.0	240.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
100.0	1000.0	300.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

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## MINIATURE END MILLS

Square - Long Reach, Long Flute



- Long length design for deep cavities
- Long flutes for deep pocket milling
- Length of cut is 2/3 the diameter
- 2 and 4 flutes
- Double coating
- Super carbide
- CMC ground to the 100's



Reduced Heat  
Generation  
In Deep Cutting

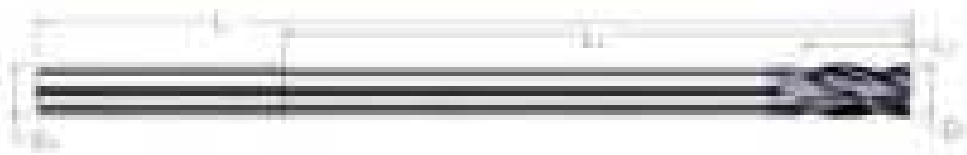
D	LENGTH OF CUT	OVERALL LENGTH	FLUTES	SHARP POINT	OVERALL LENGTH	COATING		4 FLUTE MODEL		MATERIALS TO ORDER	
						TYPE 1	TYPE 2	TYPE 1	TYPE 2	TYPE 1	TYPE 2
0.100	0.067	0.167	2	10	0.170	0.100	0.100	0.100	0.100	0.100	0.100
0.125	0.083	0.208	2	10	0.210	0.125	0.125	0.125	0.125	0.125	0.125
0.150	0.100	0.250	2	10	0.250	0.150	0.150	0.150	0.150	0.150	0.150
0.200	0.133	0.333	2	10	0.330	0.200	0.200	0.200	0.200	0.200	0.200
0.250	0.167	0.417	2	10	0.410	0.250	0.250	0.250	0.250	0.250	0.250
0.300	0.200	0.500	2	10	0.500	0.300	0.300	0.300	0.300	0.300	0.300
0.375	0.250	0.625	2	10	0.620	0.375	0.375	0.375	0.375	0.375	0.375
0.400	0.267	0.667	2	10	0.660	0.400	0.400	0.400	0.400	0.400	0.400
0.500	0.333	0.833	2	10	0.830	0.500	0.500	0.500	0.500	0.500	0.500
0.600	0.400	1.000	2	10	1.000	0.600	0.600	0.600	0.600	0.600	0.600
0.750	0.500	1.250	2	10	1.250	0.750	0.750	0.750	0.750	0.750	0.750
0.800	0.533	1.333	2	10	1.330	0.800	0.800	0.800	0.800	0.800	0.800
1.000	0.667	1.667	2	10	1.660	1.000	1.000	1.000	1.000	1.000	1.000
1.250	0.833	2.083	2	10	2.080	1.250	1.250	1.250	1.250	1.250	1.250
1.500	1.000	2.500	2	10	2.500	1.500	1.500	1.500	1.500	1.500	1.500
1.750	1.167	2.917	2	10	2.910	1.750	1.750	1.750	1.750	1.750	1.750
2.000	1.333	3.333	2	10	3.330	2.000	2.000	2.000	2.000	2.000	2.000
2.500	1.667	4.167	2	10	4.160	2.500	2.500	2.500	2.500	2.500	2.500
3.000	2.000	5.000	2	10	5.000	3.000	3.000	3.000	3.000	3.000	3.000
3.750	2.500	6.250	2	10	6.250	3.750	3.750	3.750	3.750	3.750	3.750
4.000	2.667	6.667	2	10	6.660	4.000	4.000	4.000	4.000	4.000	4.000
5.000	3.333	8.333	2	10	8.330	5.000	5.000	5.000	5.000	5.000	5.000
6.000	4.000	10.000	2	10	10.000	6.000	6.000	6.000	6.000	6.000	6.000
7.500	5.000	12.500	2	10	12.500	7.500	7.500	7.500	7.500	7.500	7.500
8.000	5.333	13.333	2	10	13.330	8.000	8.000	8.000	8.000	8.000	8.000
10.000	6.667	16.667	2	10	16.660	10.000	10.000	10.000	10.000	10.000	10.000
12.500	8.333	20.833	2	10	20.830	12.500	12.500	12.500	12.500	12.500	12.500
15.000	10.000	25.000	2	10	25.000	15.000	15.000	15.000	15.000	15.000	15.000
17.500	11.667	29.167	2	10	29.160	17.500	17.500	17.500	17.500	17.500	17.500
20.000	13.333	33.333	2	10	33.330	20.000	20.000	20.000	20.000	20.000	20.000

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**MINIATURE END MILLS**

Square - Extra Long Length

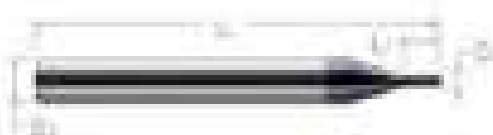


- Up to 18" overall length
- Available overall length includes your mill quantity in stock
- Ground ends - 4 Flutes - Double-fluting - Solid carbide - CBN ground to the edge

Overall Length	Length of Cut	Overall Dia.	Diameter Tolerance	Overall Length Tolerance	FINISHES			CUTTING SPEEDS		
					SP	SS	IN	SP	SS	IN
18" (457)	1.750	0.125	±0.0005	±0.001	SP	SS	IN	SP	SS	IN
16" (406)	1.500	0.125	±0.0005	±0.001	SP	SS	IN	SP	SS	IN
14" (354)	1.250	0.125	±0.0005	±0.001	SP	SS	IN	SP	SS	IN
12" (305)	1.000	0.125	±0.0005	±0.001	SP	SS	IN	SP	SS	IN
10" (254)	0.750	0.125	±0.0005	±0.001	SP	SS	IN	SP	SS	IN
8" (203)	0.500	0.125	±0.0005	±0.001	SP	SS	IN	SP	SS	IN
6" (152)	0.250	0.125	±0.0005	±0.001	SP	SS	IN	SP	SS	IN
4" (102)	0.125	0.125	±0.0005	±0.001	SP	SS	IN	SP	SS	IN

**MINIATURE END MILLS**

Square - Router Style



- Router style design with long overall length for quick and convenient tool changes
- Double-fluting - 4 Flute carbide - CBN ground to the edge

Overall Length	Length of Cut	Overall Dia.	Diameter Tolerance	FINISHES			CUTTING SPEEDS		
				SP	SS	IN	SP	SS	IN
18" (457)	1.750	0.125	±0.0005	SP	SS	IN	SP	SS	IN
16" (406)	1.500	0.125	±0.0005	SP	SS	IN	SP	SS	IN
14" (354)	1.250	0.125	±0.0005	SP	SS	IN	SP	SS	IN
12" (305)	1.000	0.125	±0.0005	SP	SS	IN	SP	SS	IN
10" (254)	0.750	0.125	±0.0005	SP	SS	IN	SP	SS	IN
8" (203)	0.500	0.125	±0.0005	SP	SS	IN	SP	SS	IN
6" (152)	0.250	0.125	±0.0005	SP	SS	IN	SP	SS	IN
4" (102)	0.125	0.125	±0.0005	SP	SS	IN	SP	SS	IN





## MINIATURE END MILLS

Ball - Stub & Standard series

continued from previous page

D. CODE	LATCH		SHANK		MATERIAL				SPIN SPEED				MAXIMUM FEEDING		
	MM	IN.	MM	IN.	1%	1%	1%	PRG2	1%	2%	1%	PRG2	1%	1%	PRG2
01	001	0.010	10	1.0	3001							10000	1000		
02	002	0.020	10	1.0	3001				30000			10000	1000		
03	003	0.030	10	1.0	3001							10000	1000		
04	004	0.040	10	1.0	3001							10000	1000		
05	005	0.050	10	1.0	3001							10000	1000		
06	006	0.060	10	1.0	3001				30000			10000	1000		
07	007	0.070	10	1.0	3001							10000	1000		
08	008	0.080	10	1.0	3001							10000	1000		
09	009	0.090	10	1.0	3001							10000	1000		
10	010	0.100	10	1.0	3001							10000	1000		
11	011	0.110	10	1.0	3001							10000	1000		
12	012	0.120	10	1.0	3001							10000	1000		
13	013	0.130	10	1.0	3001							10000	1000		
14	014	0.140	10	1.0	3001							10000	1000		
15	015	0.150	10	1.0	3001							10000	1000		
16	016	0.160	10	1.0	3001							10000	1000		
17	017	0.170	10	1.0	3001							10000	1000		
18	018	0.180	10	1.0	3001							10000	1000		
19	019	0.190	10	1.0	3001							10000	1000		
20	020	0.200	10	1.0	3001							10000	1000		
21	021	0.210	10	1.0	3001							10000	1000		
22	022	0.220	10	1.0	3001							10000	1000		
23	023	0.230	10	1.0	3001							10000	1000		
24	024	0.240	10	1.0	3001							10000	1000		
25	025	0.250	10	1.0	3001							10000	1000		
26	026	0.260	10	1.0	3001							10000	1000		
27	027	0.270	10	1.0	3001							10000	1000		
28	028	0.280	10	1.0	3001							10000	1000		
29	029	0.290	10	1.0	3001							10000	1000		
30	030	0.300	10	1.0	3001							10000	1000		
31	031	0.310	10	1.0	3001							10000	1000		
32	032	0.320	10	1.0	3001							10000	1000		
33	033	0.330	10	1.0	3001							10000	1000		
34	034	0.340	10	1.0	3001							10000	1000		
35	035	0.350	10	1.0	3001							10000	1000		
36	036	0.360	10	1.0	3001							10000	1000		
37	037	0.370	10	1.0	3001							10000	1000		
38	038	0.380	10	1.0	3001							10000	1000		
39	039	0.390	10	1.0	3001							10000	1000		
40	040	0.400	10	1.0	3001							10000	1000		
41	041	0.410	10	1.0	3001							10000	1000		
42	042	0.420	10	1.0	3001							10000	1000		
43	043	0.430	10	1.0	3001							10000	1000		
44	044	0.440	10	1.0	3001							10000	1000		
45	045	0.450	10	1.0	3001							10000	1000		
46	046	0.460	10	1.0	3001							10000	1000		
47	047	0.470	10	1.0	3001							10000	1000		
48	048	0.480	10	1.0	3001							10000	1000		
49	049	0.490	10	1.0	3001							10000	1000		
50	050	0.500	10	1.0	3001							10000	1000		
51	051	0.510	10	1.0	3001							10000	1000		
52	052	0.520	10	1.0	3001							10000	1000		
53	053	0.530	10	1.0	3001							10000	1000		
54	054	0.540	10	1.0	3001							10000	1000		
55	055	0.550	10	1.0	3001							10000	1000		
56	056	0.560	10	1.0	3001							10000	1000		
57	057	0.570	10	1.0	3001							10000	1000		
58	058	0.580	10	1.0	3001							10000	1000		
59	059	0.590	10	1.0	3001							10000	1000		
60	060	0.600	10	1.0	3001							10000	1000		
61	061	0.610	10	1.0	3001							10000	1000		
62	062	0.620	10	1.0	3001							10000	1000		
63	063	0.630	10	1.0	3001							10000	1000		
64	064	0.640	10	1.0	3001							10000	1000		
65	065	0.650	10	1.0	3001							10000	1000		
66	066	0.660	10	1.0	3001							10000	1000		
67	067	0.670	10	1.0	3001							10000	1000		
68	068	0.680	10	1.0	3001							10000	1000		
69	069	0.690	10	1.0	3001							10000	1000		
70	070	0.700	10	1.0	3001							10000	1000		
71	071	0.710	10	1.0	3001							10000	1000		
72	072	0.720	10	1.0	3001							10000	1000		
73	073	0.730	10	1.0	3001							10000	1000		
74	074	0.740	10	1.0	3001							10000	1000		
75	075	0.750	10	1.0	3001							10000	1000		
76	076	0.760	10	1.0	3001							10000	1000		
77	077	0.770	10	1.0	3001							10000	1000		
78	078	0.780	10	1.0	3001							10000	1000		
79	079	0.790	10	1.0	3001							10000	1000		
80	080	0.800	10	1.0	3001							10000	1000		
81	081	0.810	10	1.0	3001							10000	1000		
82	082	0.820	10	1.0	3001							10000	1000		
83	083	0.830	10	1.0	3001							10000	1000		
84	084	0.840	10	1.0	3001							10000	1000		
85	085	0.850	10	1.0	3001							10000	1000		
86	086	0.860	10	1.0	3001							10000	1000		
87	087	0.870	10	1.0	3001							10000	1000		
88	088	0.880	10	1.0	3001							10000	1000		
89	089	0.890	10	1.0	3001							10000	1000		
90	090	0.900	10	1.0	3001							10000	1000		
91	091	0.910	10	1.0	3001							10000	1000		
92	092	0.920	10	1.0	3001							10000	1000		
93	093	0.930	10	1.0	3001							10000	1000		
94	094	0.940	10	1.0	3001							10000	1000		
95	095	0.950	10	1.0	3001							10000	1000		
96	096	0.960	10	1.0	3001							10000	1000		
97	097	0.970	10	1.0	3001							10000	1000		
98	098	0.980	10	1.0	3001							10000	1000		
99	099	0.990	10	1.0	3001							10000	1000		
100	100	1.000	10	1.0	3001							10000	1000		

continued on next page







## MINIATURE END MILLS

Ball - Stock & Standard - Metric



- All dimensions and tolerances in metric unless noted
- Corner chamfers shown in 0.25mm
- Center grinding
- Stock & Standard
- CNC ground in the USA



Ball Flute & Standard Length



OUTER DIAMETER	LENGTH	INNER DIAMETER	LENGTH WIDTH	STOCK			STANDARD		
				1FL	2FL	4FL	1FL	2FL	4FL
0.10mm	30.00mm	0.00mm	0.00mm	79711	79811	8041	79711-02	79811-02	8041-02
0.10mm	100.00mm	0.00mm	0.00mm	79811	79911	8041	79811-02	79911-02	8041-02
0.15mm	100.00mm	0.00mm	0.00mm	79702	79802	8042	79702-02	79802-02	8042-02
0.20mm	100.00mm	0.00mm	0.00mm	79703	79803	8043	79703-02	79803-02	8043-02
0.25mm	100.00mm	0.00mm	0.00mm	79704	79804	8044	79704-02	79804-02	8044-02
0.30mm	100.00mm	0.00mm	0.00mm	79705	79805	8045	79705-02	79805-02	8045-02
0.35mm	100.00mm	0.00mm	0.00mm	79706	79806	8046	79706-02	79806-02	8046-02
0.40mm	100.00mm	0.00mm	0.00mm	79707	79807	8047	79707-02	79807-02	8047-02
0.50mm	100.00mm	0.00mm	0.00mm	79708	79808	8048	79708-02	79808-02	8048-02
0.60mm	100.00mm	0.00mm	0.00mm	79709	79809	8049	79709-02	79809-02	8049-02
0.70mm	100.00mm	0.00mm	0.00mm	79710	79810	8050	79710-02	79810-02	8050-02
0.80mm	100.00mm	0.00mm	0.00mm	79711	79811	8051	79711-02	79811-02	8051-02
1.00mm	100.00mm	0.00mm	0.00mm	79712	79812	8052	79712-02	79812-02	8052-02
1.25mm	100.00mm	0.00mm	0.00mm	79713	79813	8053	79713-02	79813-02	8053-02
1.50mm	100.00mm	0.00mm	0.00mm	79714	79814	8054	79714-02	79814-02	8054-02
2.00mm	100.00mm	0.00mm	0.00mm	79715	79815	8055	79715-02	79815-02	8055-02
2.50mm	100.00mm	0.00mm	0.00mm	79716	79816	8056	79716-02	79816-02	8056-02
3.00mm	100.00mm	0.00mm	0.00mm	79717	79817	8057	79717-02	79817-02	8057-02
4.00mm	100.00mm	0.00mm	0.00mm	79718	79818	8058	79718-02	79818-02	8058-02
5.00mm	100.00mm	0.00mm	0.00mm	79719	79819	8059	79719-02	79819-02	8059-02
6.00mm	100.00mm	0.00mm	0.00mm	79720	79820	8060	79720-02	79820-02	8060-02
8.00mm	100.00mm	0.00mm	0.00mm	79721	79821	8061	79721-02	79821-02	8061-02
10.00mm	100.00mm	0.00mm	0.00mm	79722	79822	8062	79722-02	79822-02	8062-02
12.50mm	100.00mm	0.00mm	0.00mm	79723	79823	8063	79723-02	79823-02	8063-02
15.00mm	100.00mm	0.00mm	0.00mm	79724	79824	8064	79724-02	79824-02	8064-02
20.00mm	100.00mm	0.00mm	0.00mm	79725	79825	8065	79725-02	79825-02	8065-02
25.00mm	100.00mm	0.00mm	0.00mm	79726	79826	8066	79726-02	79826-02	8066-02
30.00mm	100.00mm	0.00mm	0.00mm	79727	79827	8067	79727-02	79827-02	8067-02
40.00mm	100.00mm	0.00mm	0.00mm	79728	79828	8068	79728-02	79828-02	8068-02
50.00mm	100.00mm	0.00mm	0.00mm	79729	79829	8069	79729-02	79829-02	8069-02
60.00mm	100.00mm	0.00mm	0.00mm	79730	79830	8070	79730-02	79830-02	8070-02
80.00mm	100.00mm	0.00mm	0.00mm	79731	79831	8071	79731-02	79831-02	8071-02
100.00mm	100.00mm	0.00mm	0.00mm	79732	79832	8072	79732-02	79832-02	8072-02



## MINIATURE END MILLS

Ball - Long Flute (cont.)

Continued from previous page

CUTTER NUMBER	LENGTH OF CUT	FLUTES	GRIND OR PROFILE	CORNER RADIUS	DIMENSIONS		TOLERANCES		APPROXIMATE CUT SPEEDS	
					DIAMETER	LENGTH	DIA. ±	LEN. ±	FEED	SPINDLE RPM
1001	.100	2	RA	.010	.005	.010	±.0005	±.0005	300-500	3000
1002	.080	2	RA	.010	.005	.008	±.0005	±.0005	300-500	3000
1003	.060	2	RA	.010	.005	.006	±.0005	±.0005	300-500	3000
1004	.040	2	RA	.010	.005	.004	±.0005	±.0005	300-500	3000
1005	.030	2	RA	.010	.005	.003	±.0005	±.0005	300-500	3000
1006	.020	2	RA	.010	.005	.002	±.0005	±.0005	300-500	3000
1007	.015	2	RA	.010	.005	.0015	±.0005	±.0005	300-500	3000
1008	.010	2	RA	.010	.005	.001	±.0005	±.0005	300-500	3000
1009	.008	2	RA	.010	.005	.0008	±.0005	±.0005	300-500	3000
1010	.007	2	RA	.010	.005	.0007	±.0005	±.0005	300-500	3000
1011	.006	2	RA	.010	.005	.0006	±.0005	±.0005	300-500	3000
1012	.005	2	RA	.010	.005	.0005	±.0005	±.0005	300-500	3000
1013	.004	2	RA	.010	.005	.0004	±.0005	±.0005	300-500	3000
1014	.003	2	RA	.010	.005	.0003	±.0005	±.0005	300-500	3000
1015	.002	2	RA	.010	.005	.0002	±.0005	±.0005	300-500	3000
1016	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1017	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1018	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1019	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1020	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1021	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1022	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1023	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1024	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1025	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1026	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1027	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1028	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1029	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1030	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1031	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1032	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1033	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1034	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1035	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1036	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1037	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1038	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1039	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000
1040	.001	2	RA	.010	.005	.0001	±.0005	±.0005	300-500	3000

Continued on next page





## MINIATURE END MILLS

### Ball - Deburring End Mill



End Mill Tolerances with Scan-Style Geometry!

- Develop in your CMM machine with three-step process and ball round off & chamfered
- Best wrapping experience with top to handoff (operator error)
- High flute count allows for increased feeds which reduced cycle times
- Reduced corner wear from end milling operations
- Ball geometry is preferred for removing hard profiles cutting a small controlled edge break with superior finish
- Standard 101 Alpha Nano carbide - 10 flutes coating (2 flutes chamfered)
- Solid carbide - CNC ground in the USA

BALL DIAMETER (mm)	LENGTH (mm)	RIGHT HAND FLUTE COUNT	LEFT HAND FLUTE COUNT	SHANK DIA. (mm)	OVERALL LENGTH (mm)	WEIGHTS (g)		APPROXIMATE	
						FLUTE 1	FLUTE 2	FLUTE 1	FLUTE 2
0.125 (0.005)	1.250 (0.050)	10	10	0.125	2.170	0.0175	0.110	0.0175 (0.0007)	0.110
0.150 (0.006)	1.500 (0.060)	10	10	0.150	2.170	0.0225	0.110	0.0225 (0.0009)	0.110
0.175 (0.007)	1.750 (0.070)	10	10	0.175	2.170	0.0280	0.110	0.0280 (0.0011)	0.110
0.200 (0.008)	2.000 (0.080)	10	10	0.200	2.170	0.0340	0.110	0.0340 (0.0013)	0.110
0.250 (0.010)	2.500 (0.100)	10	10	0.250	2.170	0.0450	0.110	0.0450 (0.0018)	0.110
0.300 (0.012)	3.000 (0.120)	10	10	0.300	2.170	0.0600	0.110	0.0600 (0.0024)	0.110
0.375 (0.015)	3.750 (0.150)	10	10	0.375	2.170	0.0825	0.110	0.0825 (0.0033)	0.110
0.450 (0.018)	4.500 (0.180)	10	10	0.450	2.170	0.1125	0.110	0.1125 (0.0045)	0.110
0.500 (0.020)	5.000 (0.200)	10	10	0.500	2.170	0.1500	0.110	0.1500 (0.0060)	0.110
0.600 (0.024)	6.000 (0.240)	10	10	0.600	2.170	0.2250	0.110	0.2250 (0.0090)	0.110
0.750 (0.030)	7.500 (0.300)	10	10	0.750	2.170	0.3375	0.110	0.3375 (0.0135)	0.110
0.900 (0.036)	9.000 (0.360)	10	10	0.900	2.170	0.4950	0.110	0.4950 (0.0198)	0.110
1.000 (0.040)	10.000 (0.400)	10	10	1.000	2.170	0.6000	0.110	0.6000 (0.0240)	0.110



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## MINIATURE END MILLS

Ball - Long Reach, Standard Flute (cont.)

continued from previous page

ITEM NUMBER	LENGTH IN/OD	TOTAL LENGTH	SHAFT Ø IN	Ø IN	UNFINISHED			FINISHED		MATERIAL FINISHED	
					Ø IN	Ø IN	Ø IN	Ø IN	Ø IN	Ø IN	Ø IN
001110	.075	.400	.050	1.10	0.015	0.020	0.030	0.000	0.015	0.015	0.015
001115	.075	.350	.050	1.0		0.020	0.030	0.000	0.015	0.015	
001120	.075	.300	.050	0.9		0.020	0.030	0.000	0.015	0.015	
001130	.075	1.000	.050	1.0	0.015	0.020	0.030	0.000	0.015	0.015	0.015
001140	.075	1.000	.050	1.0	0.015	0.020	0.030	0.000	0.015	0.015	0.015
001150	.075	1.000	.050	0.9	0.015	0.020	0.030	0.000	0.015	0.015	0.015
001160	.075	1.000	.050	0.8	0.015	0.020	0.030	0.000	0.015	0.015	0.015
001170	.075	1.000	.050	0.7	0.015	0.020	0.030	0.000	0.015	0.015	0.015
001180	.075	1.000	.050	0.6	0.015	0.020	0.030	0.000	0.015	0.015	0.015
001190	.075	1.000	.050	0.5	0.015	0.020	0.030	0.000	0.015	0.015	0.015
001200	.075	1.000	.050	0.4	0.015	0.020	0.030	0.000	0.015	0.015	0.015
001210	.075	1.000	.050	0.3	0.015	0.020	0.030	0.000	0.015	0.015	0.015
001220	.075	1.000	.050	0.2	0.015	0.020	0.030	0.000	0.015	0.015	0.015
001230	.075	1.000	.050	0.1	0.015	0.020	0.030	0.000	0.015	0.015	0.015



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# MINIATURE END MILLS

## Ball - Long Reach, Slot Plate



Reduced Feed  
Direction  
of Machining

- Long length design for deep cavities
- Slot Plate for maximum rigidity
- Length of cut = 1.5x Diameter
- Corner cutting • 4 flute design • 100% ground to the size

ITEM #	LENGTH OF CUT	TOTAL LENGTH	FLUTES	DIA.	LENGTH	DIN 6350		ISO 1000		MATERIAL GROUPS	
						PSK.1	PSK.2	PSK.1	PSK.2	PSK.1	PSK.2
100	101	400	3	1/8	3.175	1000	1010				
100	101	200	3	1/8	3.175	1000	1010				
100	110	200	3	1/8	3.175	1000	1010				
100	110	400	3	1/8	3.175	1000	1010				
100	120	200	3	1/8	3.175	1000	1010	100000	1010	100000	1010
100	120	400	3	1/8	3.175	1000	1010	100000	1010	100000	1010
100	130	200	4	1/8	3.175	1000	1010	100000	1010	100000	1010
100	130	400	4	1/8	3.175	1000	1010	100000	1010	100000	1010
100	140	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	140	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	150	200	4	1/8	3.175	1000	1010	100000	1010	100000	1010
100	150	400	4	1/8	3.175	1000	1010	100000	1010	100000	1010
100	160	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	160	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	170	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	170	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	180	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	180	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	190	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	190	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	200	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	200	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	210	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	210	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	220	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	220	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	230	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	230	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	240	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	240	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	250	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	250	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	260	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	260	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	270	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	270	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	280	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	280	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	290	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	290	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	300	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	300	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	310	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	310	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	320	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	320	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	330	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	330	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	340	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	340	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	350	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	350	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	360	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	360	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	370	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	370	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	380	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	380	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	390	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	390	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	400	200	5	1/8	3.175	1000	1010	100000	1010	100000	1010
100	400	400	5	1/8	3.175	1000	1010	100000	1010	100000	1010

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## MINIATURE END MILLS

Ball - Long Reach, Flat Flute (cont.)

continued from previous page

CUTTER NUMBER	LENGTH OF CUT	OVERALL HEIGHT	FLUTE SPACING AT ENTRANCE	DRAM. FLUTE	OVERALL LENGTH	DIMENSIONS		WEIGHTS		RECOMMENDED SPEEDS	
						DIA.	L	TOL. ±	PKG. PKGS.	TOL. ±	PKG.
227	.005	.004	0	12	0.170	.3417	0.002	5000/25	01.00		
227	.010	.008	0	12	0.170	.3417	0.004	5000/25	01.00		
228	.007	.004	0	12	0.160	.3260	0.002	5000/25	01.00		
228	.014	.010	0	12	0.160	.3260	0.004	5000/25	01.00		
229	.005	.004	0	12	0.150	.3090	0.002	5000/25	01.00		
229	.010	.008	0	12	0.150	.3090	0.004	5000/25	01.00		
230	.007	.004	0	12	0.140	.2920	0.002	5000/25	01.00		
230	.014	.010	0	12	0.140	.2920	0.004	5000/25	01.00		
231	.005	.004	0	12	0.130	.2740	0.002	5000/25	01.00	3000/25	01.00
231	.010	.008	0	12	0.130	.2740	0.004	5000/25	01.00		
232	.007	.004	0	12	0.120	.2570	0.002	5000/25	01.00	3000/25	01.00
232	.014	.010	0	12	0.120	.2570	0.004	5000/25	01.00		
233	.005	.004	0	12	0.110	.2400	0.002	5000/25	01.00	3000/25	01.00
233	.010	.008	0	12	0.110	.2400	0.004	5000/25	01.00		
234	.007	.004	0	12	0.100	.2230	0.002	5000/25	01.00	3000/25	01.00
234	.014	.010	0	12	0.100	.2230	0.004	5000/25	01.00		
235	.005	.004	0	12	0.090	.2050	0.002	5000/25	01.00	3000/25	01.00
235	.010	.008	0	12	0.090	.2050	0.004	5000/25	01.00		
236	.007	.004	0	12	0.080	.1880	0.002	5000/25	01.00	3000/25	01.00
236	.014	.010	0	12	0.080	.1880	0.004	5000/25	01.00		
237	.005	.004	0	12	0.070	.1710	0.002	5000/25	01.00	3000/25	01.00
237	.010	.008	0	12	0.070	.1710	0.004	5000/25	01.00		
238	.007	.004	0	12	0.060	.1540	0.002	5000/25	01.00	3000/25	01.00
238	.014	.010	0	12	0.060	.1540	0.004	5000/25	01.00		
239	.005	.004	0	12	0.050	.1360	0.002	5000/25	01.00	3000/25	01.00
239	.010	.008	0	12	0.050	.1360	0.004	5000/25	01.00		
240	.007	.004	0	12	0.040	.1190	0.002	5000/25	01.00	3000/25	01.00
240	.014	.010	0	12	0.040	.1190	0.004	5000/25	01.00		
241	.005	.004	0	12	0.030	.1010	0.002	5000/25	01.00	3000/25	01.00
241	.010	.008	0	12	0.030	.1010	0.004	5000/25	01.00		
242	.007	.004	0	12	0.020	.0830	0.002	5000/25	01.00	3000/25	01.00
242	.014	.010	0	12	0.020	.0830	0.004	5000/25	01.00		
243	.005	.004	0	12	0.010	.0650	0.002	5000/25	01.00	3000/25	01.00
243	.010	.008	0	12	0.010	.0650	0.004	5000/25	01.00		
244	.007	.004	0	12	0.005	.0470	0.002	5000/25	01.00	3000/25	01.00
244	.014	.010	0	12	0.005	.0470	0.004	5000/25	01.00		
245	.005	.004	0	12	0.002	.0290	0.002	5000/25	01.00	3000/25	01.00
245	.010	.008	0	12	0.002	.0290	0.004	5000/25	01.00		
246	.007	.004	0	12	0.001	.0170	0.002	5000/25	01.00	3000/25	01.00
246	.014	.010	0	12	0.001	.0170	0.004	5000/25	01.00		

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## MINIATURE END MILLS

Ball - Tapered Reach (Clearance Cutters)



Maximum  
Reach &  
Maximum  
Rigidity!

- Designed for steel steady drilling
- 2° tapered front edge minimizes deflection and maximizes tool clearance
- Length of cut = 1.5x diameter → Best tapered length of cut is achieved for 1x diameter
- All sizes optimized for high precision tool holders → 200mm working
- Ball radius = 0.250 ground in the USA

MILLER SIZE	DIA.	GEOMETRIC		WEAR		REFERENCE DEPTH AT SMALL DEPTH			LENGTH			STANDARD LENGTH			MAXIMUM LENGTH	
		REACH MM	TOTAL ANGLE	0.1% MM	0.5% MM	0"	0.1"	0.2"	0.1"	0.2"	0.3"	0.1"	0.2"	0.3"	0.1"	0.2"
0.05	0.05	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.06	0.06	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.08	0.08	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.10	0.10	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.12	0.12	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.15	0.15	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.20	0.20	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.25	0.25	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.30	0.30	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.35	0.35	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.40	0.40	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.50	0.50	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.60	0.60	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.75	0.75	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.90	0.90	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.00	1.00	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.25	1.25	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.50	1.50	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1.75	1.75	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.00	2.00	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.50	2.50	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.00	3.00	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3.50	3.50	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4.00	4.00	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5.00	5.00	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6.00	6.00	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7.50	7.50	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9.00	9.00	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10.00	10.00	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12.50	12.50	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15.00	15.00	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17.50	17.50	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20.00	20.00	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25.00	25.00	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30.00	30.00	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35.00	35.00	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40.00	40.00	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50.00	50.00	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60.00	60.00	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
75.00	75.00	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90.00	90.00	0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100.00	100.00	0.0	0.0°	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

These are approximate values for reference only. Specifications subject to change. (continued on next page)



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## MINIATURE END MILLS

Ball - Tapered Reach (Chamfered Cutters) (cont.)

Continued from previous page

PART NUMBER	ITEM NO.	ITEM DESCRIPTION	ITEM QTY.	UNIT	MATERIAL	ITEM WEIGHT	ITEM PRICE	ITEM WEIGHT			ITEM PRICE		
								NET WT.	GROSS WT.	UNIT WT.	NET PRICE	GROSS PRICE	UNIT PRICE
100	100	1/16" Dia. Ball End Mill	100	EA	Aluminum Oxide	0.005	10.00	0.005	10.00	0.005	10.00	10.00	10.00
101	101	1/8" Dia. Ball End Mill	100	EA	Aluminum Oxide	0.015	15.00	0.015	15.00	0.015	15.00	15.00	15.00
102	102	3/16" Dia. Ball End Mill	100	EA	Aluminum Oxide	0.030	30.00	0.030	30.00	0.030	30.00	30.00	30.00
103	103	1/4" Dia. Ball End Mill	100	EA	Aluminum Oxide	0.045	45.00	0.045	45.00	0.045	45.00	45.00	45.00
104	104	5/16" Dia. Ball End Mill	100	EA	Aluminum Oxide	0.060	60.00	0.060	60.00	0.060	60.00	60.00	60.00
105	105	3/8" Dia. Ball End Mill	100	EA	Aluminum Oxide	0.075	75.00	0.075	75.00	0.075	75.00	75.00	75.00
106	106	1/2" Dia. Ball End Mill	100	EA	Aluminum Oxide	0.100	100.00	0.100	100.00	0.100	100.00	100.00	100.00
107	107	5/8" Dia. Ball End Mill	100	EA	Aluminum Oxide	0.125	125.00	0.125	125.00	0.125	125.00	125.00	125.00
108	108	3/4" Dia. Ball End Mill	100	EA	Aluminum Oxide	0.150	150.00	0.150	150.00	0.150	150.00	150.00	150.00
109	109	7/8" Dia. Ball End Mill	100	EA	Aluminum Oxide	0.175	175.00	0.175	175.00	0.175	175.00	175.00	175.00
110	110	1" Dia. Ball End Mill	100	EA	Aluminum Oxide	0.200	200.00	0.200	200.00	0.200	200.00	200.00	200.00

\*Minimum quantities and may vary without notice. †Based on 2023 prices only.

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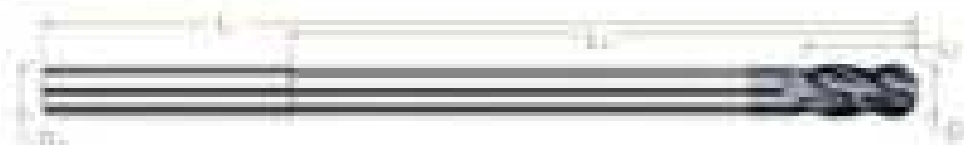
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## MINIATURE END MILLS

Ball - Extra Long Length



- Up to 4" overall length
- Compact enough length to fit into most standard machines
- Standard sizes
- 4 Flute
- Double-fluting
- HSS or HSS-Co
- ISO ground to the ball

Overall Length	Overall Length	Overall Length	Ball Diameter	Flute Count	Material		Item Weight	
					HSS	HSS-Co	HSS	HSS-Co
1/2" (12.7)	1/2" (12.7)	1/2" (12.7)	1/16"	4	1.00	1.00	0.0000	0.0000
3/8" (9.5)	3/8" (9.5)	3/8" (9.5)	1/16"	4	0.60	0.60	0.0000	0.0000
1/4" (6.3)	1/4" (6.3)	1/4" (6.3)	1/16"	4	0.30	0.30	0.0000	0.0000
3/16" (4.8)	3/16" (4.8)	3/16" (4.8)	1/16"	4	0.20	0.20	0.0000	0.0000
1/8" (3.2)	1/8" (3.2)	1/8" (3.2)	1/16"	4	0.10	0.10	0.0000	0.0000



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## MINIATURE END MILLS

Ball - Reduced Shank



- Reduced design that allows any standard length
- Ball end mill construction for excellent quality
- Long length design for best results in drilling
- Length of cut is 1.5x diameter
- Corner cutting
- Hard variable
- ISO grade H 9A-10B

Check of  
Any Depth.



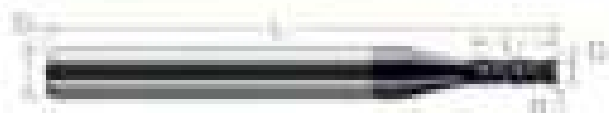
CUTTING DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	TOTAL LENGTH	WEIGHT (G)		APPROX. PRICE (€)	
					TYPE A	TYPE B	TYPE A	TYPE B
0.4 (0.0157)	0.75	2	0.400	0.75	0.008	0.008	0.070 (C)	0.070 (C)
0.4	0.75	4	0.400	0.75	0.008	0.008	0.070 (C)	0.070 (C)
0.50	0.75	2	0.4	0.75	0.010	0.010	0.070 (C)	0.070 (C)
0.50	0.75	4	0.4	0.75	0.010	0.010	0.070 (C)	0.070 (C)
0.50	0.75	2	0.500	0.75	0.010	0.010	0.070 (C)	0.070 (C)
0.50	0.75	4	0.500	0.75	0.010	0.010	0.070 (C)	0.070 (C)
0.6	0.6	2	0.500	0.6	0.010	0.010	0.070 (C)	0.070 (C)
0.6	0.6	4	0.500	0.6	0.010	0.010	0.070 (C)	0.070 (C)
0.60	0.60	2	0.6	0.6	0.010	0.010	0.070 (C)	0.070 (C)
0.60	0.60	4	0.6	0.6	0.010	0.010	0.070 (C)	0.070 (C)
0.8	0.60	2	0.600	0.8	0.010	0.010	0.070 (C)	0.070 (C)
0.8	0.60	4	0.600	0.8	0.010	0.010	0.070 (C)	0.070 (C)
0.8	0.75	2	0.6	0.8	0.010	0.010	0.070 (C)	0.070 (C)
0.8	0.75	4	0.6	0.8	0.010	0.010	0.070 (C)	0.070 (C)
0.8	0.75	2	0.8	0.8	0.010	0.010	0.070 (C)	0.070 (C)
0.8	0.75	4	0.8	0.8	0.010	0.010	0.070 (C)	0.070 (C)

For Square Reduced Shank, please see page 44.

For Corner Radius Reduced Shank, please see page 45.

# MINIATURE END MILLS

Corner Radius - Short & Standard



- Corner radius for increased strength
- Flute design
- Short version
- CNC ground to the 1/100



ITEM NO.	LENGTH (mm)	DIA. (mm)	CORNER RADIUS (mm)	FLUTE TYPE	MATERIAL				APPLICABLE			APPLICABLE MATERIAL		
					CO.	AL.	IN.	PM.	AL.	IN.	PM.	AL.	IN.	PM.
001	005	020	0.00	FL	AL				ALUMINUM	IN.				
002	005	025	0.00	FL	AL				ALUMINUM	IN.				
003	005	030	0.00	FL	AL				ALUMINUM	IN.				
004	005	040	0.00	FL	AL				ALUMINUM	IN.				
005	005	050	0.00	FL	AL				ALUMINUM	IN.				
010	005	020	0.05	FL	AL				ALUMINUM	IN.				
011	005	025	0.05	FL	AL				ALUMINUM	IN.				
012	005	030	0.05	FL	AL				ALUMINUM	IN.				
013	005	040	0.05	FL	AL				ALUMINUM	IN.				
014	005	050	0.05	FL	AL				ALUMINUM	IN.				
020	005	020	0.00	FL	AL				ALUMINUM	IN.				
021	005	025	0.00	FL	AL				ALUMINUM	IN.				
022	005	030	0.00	FL	AL				ALUMINUM	IN.				
023	005	040	0.00	FL	AL				ALUMINUM	IN.				
024	005	050	0.00	FL	AL				ALUMINUM	IN.				
030	005	020	0.00	FL	AL				ALUMINUM	IN.				
031	005	025	0.00	FL	AL				ALUMINUM	IN.				
032	005	030	0.00	FL	AL				ALUMINUM	IN.				
033	005	040	0.00	FL	AL				ALUMINUM	IN.				
034	005	050	0.00	FL	AL				ALUMINUM	IN.				
040	005	020	0.00	FL	AL				ALUMINUM	IN.				
041	005	025	0.00	FL	AL				ALUMINUM	IN.				
042	005	030	0.00	FL	AL				ALUMINUM	IN.				
043	005	040	0.00	FL	AL				ALUMINUM	IN.				
044	005	050	0.00	FL	AL				ALUMINUM	IN.				
050	005	020	0.00	FL	AL				ALUMINUM	IN.				
051	005	025	0.00	FL	AL				ALUMINUM	IN.				
052	005	030	0.00	FL	AL				ALUMINUM	IN.				
053	005	040	0.00	FL	AL				ALUMINUM	IN.				
054	005	050	0.00	FL	AL				ALUMINUM	IN.				
060	005	020	0.00	FL	AL				ALUMINUM	IN.				
061	005	025	0.00	FL	AL				ALUMINUM	IN.				
062	005	030	0.00	FL	AL				ALUMINUM	IN.				
063	005	040	0.00	FL	AL				ALUMINUM	IN.				
064	005	050	0.00	FL	AL				ALUMINUM	IN.				
070	005	020	0.00	FL	AL				ALUMINUM	IN.				
071	005	025	0.00	FL	AL				ALUMINUM	IN.				
072	005	030	0.00	FL	AL				ALUMINUM	IN.				
073	005	040	0.00	FL	AL				ALUMINUM	IN.				
074	005	050	0.00	FL	AL				ALUMINUM	IN.				
080	005	020	0.00	FL	AL				ALUMINUM	IN.				
081	005	025	0.00	FL	AL				ALUMINUM	IN.				
082	005	030	0.00	FL	AL				ALUMINUM	IN.				
083	005	040	0.00	FL	AL				ALUMINUM	IN.				
084	005	050	0.00	FL	AL				ALUMINUM	IN.				
090	005	020	0.00	FL	AL				ALUMINUM	IN.				
091	005	025	0.00	FL	AL				ALUMINUM	IN.				
092	005	030	0.00	FL	AL				ALUMINUM	IN.				
093	005	040	0.00	FL	AL				ALUMINUM	IN.				
094	005	050	0.00	FL	AL				ALUMINUM	IN.				
100	005	020	0.00	FL	AL				ALUMINUM	IN.				
101	005	025	0.00	FL	AL				ALUMINUM	IN.				
102	005	030	0.00	FL	AL				ALUMINUM	IN.				
103	005	040	0.00	FL	AL				ALUMINUM	IN.				
104	005	050	0.00	FL	AL				ALUMINUM	IN.				

continued on next page













## MINIATURE END MILLS

Corner Radius - Small & Standard (mm)

continued from previous page

CATALOG NO.	CORNER RADIUS	L/2	SHAPE DIA	L/4	L	HORIZONTAL			45° BEVEL			LENGTH OF GRIND				
						1/2	1/4	1/8	1/16	1/8	1/4	1/2	1/8	1/4	1/2	
90-0050	005	0.25	0.20	0.15	0.10											
90-0060	006	0.30	0.25	0.20	0.15											
90-0070	007	0.35	0.30	0.25	0.20											
90-0080	008	0.40	0.35	0.30	0.25											
90-0090	009	0.45	0.40	0.35	0.30											
90-0100	010	0.50	0.45	0.40	0.35											
90-0110	011	0.55	0.50	0.45	0.40											
90-0120	012	0.60	0.55	0.50	0.45											
90-0130	013	0.65	0.60	0.55	0.50											
90-0140	014	0.70	0.65	0.60	0.55											
90-0150	015	0.75	0.70	0.65	0.60											
90-0160	016	0.80	0.75	0.70	0.65											
90-0170	017	0.85	0.80	0.75	0.70											
90-0180	018	0.90	0.85	0.80	0.75											
90-0190	019	0.95	0.90	0.85	0.80											
90-0200	020	1.00	0.95	0.90	0.85											
90-0210	021	1.05	1.00	0.95	0.90											
90-0220	022	1.10	1.05	1.00	0.95											
90-0230	023	1.15	1.10	1.05	1.00											
90-0240	024	1.20	1.15	1.10	1.05											
90-0250	025	1.25	1.20	1.15	1.10											
90-0260	026	1.30	1.25	1.20	1.15											
90-0270	027	1.35	1.30	1.25	1.20											
90-0280	028	1.40	1.35	1.30	1.25											
90-0290	029	1.45	1.40	1.35	1.30											
90-0300	030	1.50	1.45	1.40	1.35											
90-0310	031	1.55	1.50	1.45	1.40											
90-0320	032	1.60	1.55	1.50	1.45											
90-0330	033	1.65	1.60	1.55	1.50											
90-0340	034	1.70	1.65	1.60	1.55											
90-0350	035	1.75	1.70	1.65	1.60											
90-0360	036	1.80	1.75	1.70	1.65											
90-0370	037	1.85	1.80	1.75	1.70											
90-0380	038	1.90	1.85	1.80	1.75											
90-0390	039	1.95	1.90	1.85	1.80											
90-0400	040	2.00	1.95	1.90	1.85											
90-0410	041	2.05	2.00	1.95	1.90											
90-0420	042	2.10	2.05	2.00	1.95											
90-0430	043	2.15	2.10	2.05	2.00											
90-0440	044	2.20	2.15	2.10	2.05											
90-0450	045	2.25	2.20	2.15	2.10											
90-0460	046	2.30	2.25	2.20	2.15											
90-0470	047	2.35	2.30	2.25	2.20											
90-0480	048	2.40	2.35	2.30	2.25											
90-0490	049	2.45	2.40	2.35	2.30											
90-0500	050	2.50	2.45	2.40	2.35											
90-0510	051	2.55	2.50	2.45	2.40											
90-0520	052	2.60	2.55	2.50	2.45											
90-0530	053	2.65	2.60	2.55	2.50											
90-0540	054	2.70	2.65	2.60	2.55											
90-0550	055	2.75	2.70	2.65	2.60											
90-0560	056	2.80	2.75	2.70	2.65											
90-0570	057	2.85	2.80	2.75	2.70											
90-0580	058	2.90	2.85	2.80	2.75											
90-0590	059	2.95	2.90	2.85	2.80											
90-0600	060	3.00	2.95	2.90	2.85											

continued on next page

## MINIATURE END MILLS

Corner Radius - Stub & Standard Length

Continued from previous page

CUTTER DIA.	LENGTH INCHES	CORN. RADIUS	DIA. INCHES	L. INCHES	FINISHED				STOCKING			UNFINISHED STOCK				
					ST.	ST.	ST.	FIN.	ST.	ST.	FIN.	ST.	ST.	FIN.		
011030	.049	.000	.100	.049	0											
011030	.049	.000	.062	.049	0	0110										
011030	.049	.000	.050	.049	0											
011030	.049	.000	.025	.049	0											
011030	.049	.000	.010	.049	0	0110	0110	0110	0110	0110	0110	0110	0110			
011030	.049	.000	.005	.049	0	0110	0110	0110	0110	0110	0110	0110	0110			
011030	.049	.000	.000	.049	0											
011040	.049	.000	.125	.049	0											
011040	.049	.000	.075	.049	0	0110										
011040	.049	.000	.050	.049	0											
011040	.049	.000	.025	.049	0											
011040	.049	.000	.010	.049	0	0110										
011040	.049	.000	.005	.049	0	0110										
011040	.049	.000	.000	.049	0											
011050	.049	.000	.150	.049	0											
011050	.049	.000	.100	.049	0	0110	0110	0110	0110	0110	0110	0110	0110			
011050	.049	.000	.075	.049	0											
011050	.049	.000	.050	.049	0											
011050	.049	.000	.025	.049	0	0110										
011050	.049	.000	.010	.049	0	0110										
011050	.049	.000	.005	.049	0	0110										
011050	.049	.000	.000	.049	0											
011060	.049	.000	.175	.049	0											
011060	.049	.000	.125	.049	0	0110	0110	0110	0110	0110	0110	0110	0110			
011060	.049	.000	.100	.049	0											
011060	.049	.000	.075	.049	0											
011060	.049	.000	.050	.049	0	0110										
011060	.049	.000	.025	.049	0	0110										
011060	.049	.000	.010	.049	0	0110										
011060	.049	.000	.005	.049	0	0110										
011060	.049	.000	.000	.049	0											
011070	.049	.000	.200	.049	0											
011070	.049	.000	.150	.049	0	0110	0110	0110	0110	0110	0110	0110	0110			
011070	.049	.000	.125	.049	0											
011070	.049	.000	.100	.049	0											
011070	.049	.000	.075	.049	0	0110										
011070	.049	.000	.050	.049	0	0110										
011070	.049	.000	.025	.049	0	0110										
011070	.049	.000	.010	.049	0	0110										
011070	.049	.000	.005	.049	0	0110										
011070	.049	.000	.000	.049	0											
011080	.049	.000	.225	.049	0											
011080	.049	.000	.175	.049	0	0110	0110	0110	0110	0110	0110	0110	0110			
011080	.049	.000	.150	.049	0											
011080	.049	.000	.125	.049	0											
011080	.049	.000	.100	.049	0	0110										
011080	.049	.000	.075	.049	0	0110										
011080	.049	.000	.050	.049	0	0110										
011080	.049	.000	.025	.049	0	0110										
011080	.049	.000	.010	.049	0	0110										
011080	.049	.000	.005	.049	0	0110										
011080	.049	.000	.000	.049	0											
011090	.049	.000	.250	.049	0											
011090	.049	.000	.200	.049	0	0110	0110	0110	0110	0110	0110	0110	0110			
011090	.049	.000	.175	.049	0											
011090	.049	.000	.150	.049	0											
011090	.049	.000	.125	.049	0	0110										
011090	.049	.000	.100	.049	0	0110										
011090	.049	.000	.075	.049	0	0110										
011090	.049	.000	.050	.049	0	0110										
011090	.049	.000	.025	.049	0	0110										
011090	.049	.000	.010	.049	0	0110										
011090	.049	.000	.005	.049	0	0110										
011090	.049	.000	.000	.049	0											

CONTINUED ON NEXT PAGE



# MINIATURE END MILLS

Corner Radius - Long Flute



Flute Length  
R Corner Radius

- Long Flute and long shank design for deep section
- High speed steels - 1 & 2 Flutes
- Corner radii - 1 Flute version - 1 CNC ground to the drill



Series	Series Reference	Series Material	Length of cut	Flutes	Length of Fl.	R <sub>c</sub>	HSS		Aluminum		Applications (mm/min)	
							V <sub>c</sub>	MRR	V <sub>c</sub>	MRR	V <sub>c</sub>	MRR
100	100-1000	100	100-100	2	10	0.10	10000	1000	100000	1000		
	100-1001	100	100-100	4	10	0.10	10000	1000	100000	1000		
	100-1002	100	100-100	4	10	0.10	10000	1000	100000	1000		
	100-1003	100	100-100	2	10	0.10	10000	1000	100000	1000		
	100-1004	100	100-100	2	10	0.10	10000	1000	100000	1000		
	100-1005	100	100-100	2	10	0.10	10000	1000	100000	1000		
	100-1006	100	100-100	2	10	0.10	10000	1000	100000	1000		
	100-1007	100	100-100	4	10	0.10	10000	1000	100000	1000		
	100-1008	100	100-100	4	10	0.10	10000	1000	100000	1000		
	100-1009	100	100-100	2	10	0.10	10000	1000	100000	1000		
200	200-2000	200	200-200	2	10	0.10	20000	2000	200000	2000		
	200-2001	200	200-200	4	10	0.10	20000	2000	200000	2000		
	200-2002	200	200-200	4	10	0.10	20000	2000	200000	2000		
	200-2003	200	200-200	2	10	0.10	20000	2000	200000	2000		
	200-2004	200	200-200	2	10	0.10	20000	2000	200000	2000		
	200-2005	200	200-200	2	10	0.10	20000	2000	200000	2000		
	200-2006	200	200-200	2	10	0.10	20000	2000	200000	2000		
	200-2007	200	200-200	4	10	0.10	20000	2000	200000	2000		
	200-2008	200	200-200	4	10	0.10	20000	2000	200000	2000		
	200-2009	200	200-200	2	10	0.10	20000	2000	200000	2000		
300	300-3000	300	300-300	2	10	0.10	30000	3000	300000	3000		
	300-3001	300	300-300	4	10	0.10	30000	3000	300000	3000		
	300-3002	300	300-300	4	10	0.10	30000	3000	300000	3000		
	300-3003	300	300-300	2	10	0.10	30000	3000	300000	3000		
	300-3004	300	300-300	2	10	0.10	30000	3000	300000	3000		
	300-3005	300	300-300	2	10	0.10	30000	3000	300000	3000		
	300-3006	300	300-300	2	10	0.10	30000	3000	300000	3000		
	300-3007	300	300-300	4	10	0.10	30000	3000	300000	3000		
	300-3008	300	300-300	4	10	0.10	30000	3000	300000	3000		
	300-3009	300	300-300	2	10	0.10	30000	3000	300000	3000		
400	400-4000	400	400-400	2	10	0.10	40000	4000	400000	4000		
	400-4001	400	400-400	4	10	0.10	40000	4000	400000	4000		
	400-4002	400	400-400	4	10	0.10	40000	4000	400000	4000		
	400-4003	400	400-400	2	10	0.10	40000	4000	400000	4000		
	400-4004	400	400-400	2	10	0.10	40000	4000	400000	4000		
	400-4005	400	400-400	2	10	0.10	40000	4000	400000	4000		
	400-4006	400	400-400	2	10	0.10	40000	4000	400000	4000		
	400-4007	400	400-400	4	10	0.10	40000	4000	400000	4000		
	400-4008	400	400-400	4	10	0.10	40000	4000	400000	4000		
	400-4009	400	400-400	2	10	0.10	40000	4000	400000	4000		
500	500-5000	500	500-500	2	10	0.10	50000	5000	500000	5000		
	500-5001	500	500-500	4	10	0.10	50000	5000	500000	5000		
	500-5002	500	500-500	4	10	0.10	50000	5000	500000	5000		
	500-5003	500	500-500	2	10	0.10	50000	5000	500000	5000		
	500-5004	500	500-500	2	10	0.10	50000	5000	500000	5000		
	500-5005	500	500-500	2	10	0.10	50000	5000	500000	5000		
	500-5006	500	500-500	2	10	0.10	50000	5000	500000	5000		
	500-5007	500	500-500	4	10	0.10	50000	5000	500000	5000		
	500-5008	500	500-500	4	10	0.10	50000	5000	500000	5000		
	500-5009	500	500-500	2	10	0.10	50000	5000	500000	5000		

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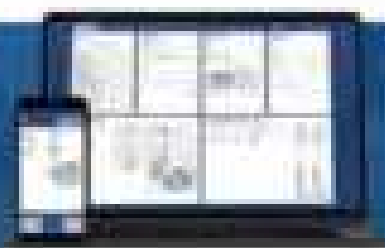
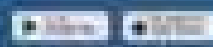


## MINIATURE END MILLS

Corner Radius - Long Flutes (cont.)

continued from previous page

ITEM #	ITEM NAME	LENGTH OF CUT	FLUTES	SHANK DIA.	DIA.	UNFINISHED		FINISHED		RECOMMENDED PRICES	
						1 FL.	2 FL.	1 FL.	2 FL.	1 FL.	2 FL.
201114	.005	1.000	5L	.14	.4	\$1.00	\$0.40	\$1100.00	\$1.00		
201114	.010	1.000	5L	.14	.4	\$1.10	\$0.50	\$1100.00	\$1.10		
201114	.020	1.000	5L	.14	.4	\$1.20	\$0.50	\$1100.00	\$1.20		
201114	.030	1.000	5L	.14	.4	\$1.30	\$0.50	\$1100.00	\$1.30		
201114	.040	1.000	5L	.14	.4	\$1.40	\$0.50	\$1100.00	\$1.40	\$1100.00	\$0.50
201114	.050	1.000	5L	.14	.4	\$1.50	\$0.50	\$1100.00	\$1.50		
201114	.060	1.000	5L	.14	.4	\$1.60	\$0.50	\$1100.00	\$1.60		
201114	.080	1.000	5L	.14	.4	\$1.80	\$0.50	\$1100.00	\$1.80		
201114	.100	1.000	5L	.14	.4	\$2.00	\$0.50	\$1100.00	\$2.00		
201114	.120	1.000	5L	.14	.4	\$2.20	\$0.50	\$1100.00	\$2.20		
201114	.150	1.000	5L	.14	.4	\$2.50	\$0.50	\$1100.00	\$2.50		
201114	.200	1.000	5L	.14	.4	\$3.00	\$0.50	\$1100.00	\$3.00		

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# MINIATURE END MILLS

## Corner Radius - Long Reach, Standard Flute


**Reduced Neck  
Diameter  
to Avoid Jamming**

- Shank polished for increased strength — length of neck = 2x diameter
- Baked coating — 1 Submicron — 100% ground to the size

JULIUS DIAMETER	CORNER RADIUS	LENGTH OF CUT	OVERALL LENGTH	SHANK DIAMETER	OVERALL LENGTH	MATERIAL		MPCR (MPa)		
						A1	A2	MPCR-A1	MPCR-A2	
1.0 (1/16)	0.05	10	140 (5 1/2)	1.0	1.00			47.5	600-125	500
1.5 (1/8)	0.05	10	140 (5 1/2)	1.5	1.50			47.5	600-125	500
2.0 (1/4)	0.05	10	140 (5 1/2)	2.0	1.75	M302	3020	47.5	600-125	500
3.0 (3/16)	0.05	10	140 (5 1/2)	3.0	2.10	M302	3020	47.5	600-125	500
4.0 (1/2)	0.05	10	140 (5 1/2)	4.0	2.10	M302	3020	47.5	600-125	500
5.0 (3/8)	0.05	10	140 (5 1/2)	5.0	2.10	M302	3020	47.5	600-125	500
6.0 (1/2)	0.05	10	140 (5 1/2)	6.0	2.10			47.5	600-125	500
8.0 (5/8)	0.05	10	140 (5 1/2)	8.0	2.10			47.5	600-125	500
10 (3/4)	0.05	10	140 (5 1/2)	10	2.10			47.5	600-125	500
12 (1)	0.05	10	140 (5 1/2)	12	2.10			47.5	600-125	500
15 (3/4)	0.05	10	140 (5 1/2)	15	2.10	M302	3020	47.5	600-125	500
20 (1 1/4)	0.05	10	140 (5 1/2)	20	2.10	M302	3020	47.5	600-125	500
25 (1 1/2)	0.05	10	140 (5 1/2)	25	2.10			47.5	600-125	500
30 (1 3/8)	0.05	10	140 (5 1/2)	30	2.10			47.5	600-125	500
35 (1 1/2)	0.05	10	140 (5 1/2)	35	2.10			47.5	600-125	500
40 (1 3/4)	0.05	10	140 (5 1/2)	40	2.10			47.5	600-125	500
50 (2)	0.05	10	140 (5 1/2)	50	2.10			47.5	600-125	500
60 (2 1/4)	0.05	10	140 (5 1/2)	60	2.10			47.5	600-125	500
75 (3)	0.05	10	140 (5 1/2)	75	2.10			47.5	600-125	500
90 (3 3/4)	0.05	10	140 (5 1/2)	90	2.10			47.5	600-125	500
100 (4)	0.05	10	140 (5 1/2)	100	2.10			47.5	600-125	500
120 (5)	0.05	10	140 (5 1/2)	120	2.10			47.5	600-125	500
150 (6)	0.05	10	140 (5 1/2)	150	2.10			47.5	600-125	500
180 (7 1/2)	0.05	10	140 (5 1/2)	180	2.10			47.5	600-125	500
200 (8)	0.05	10	140 (5 1/2)	200	2.10			47.5	600-125	500
250 (10)	0.05	10	140 (5 1/2)	250	2.10			47.5	600-125	500
300 (12)	0.05	10	140 (5 1/2)	300	2.10			47.5	600-125	500
350 (14)	0.05	10	140 (5 1/2)	350	2.10			47.5	600-125	500
400 (16)	0.05	10	140 (5 1/2)	400	2.10			47.5	600-125	500
500 (20)	0.05	10	140 (5 1/2)	500	2.10			47.5	600-125	500
600 (24)	0.05	10	140 (5 1/2)	600	2.10			47.5	600-125	500
750 (30)	0.05	10	140 (5 1/2)	750	2.10			47.5	600-125	500
900 (36)	0.05	10	140 (5 1/2)	900	2.10			47.5	600-125	500
1000 (40)	0.05	10	140 (5 1/2)	1000	2.10			47.5	600-125	500

continued on next page

## MINIATURE END MILLS

Corner Radius - Long Reach, Standard Flute (cont.)

retrieval from previous page

CUTTER NUMBER	CORNER RADIUS	LENGTH OF CUT	OVERALL LENGTH	SHANK DIAMETER	OVERALL LENGTH	MATERIAL			SPRUITING	
						AL.	T.P.	INCO.	T.P.	INCO.
100 110	.005	.250	.400	.010	0.100	80000	80000	80000	110000.00	110000.00
100 115	.005	.250	1.000	.010	1.000	80000	80000	80000	110000.00	110000.00
100 116	.010	.250	.400	.010	0.100	80000	80000	80000	110000.00	110000.00
100 117	.010	.250	.700	.010	.700		80000	80000	110000.00	110000.00
100 118	.010	.250	1.000	.010	1.000	80000	80000	80000	110000.00	110000.00
100 119	.010	.250	1.000	.010	0.100		80000	80000	110000.00	110000.00
100 120	.005	.250	.400	.010	0.100		80000	80000	110000.00	110000.00
100 121	.005	.250	1.000	.010	1.000		80000	80000	110000.00	110000.00
100 122	.010	.250	.400	.010	0.100		80000	80000	110000.00	110000.00
100 123	.010	.250	.700	.010	.700		80000	80000	110000.00	110000.00
100 124	.010	.250	1.000	.010	1.000		80000	80000	110000.00	110000.00
100 125	.010	.250	1.000	.010	0.100		80000	80000	110000.00	110000.00
100 126	.010	.250	.400	.010	0.100		80000	80000	110000.00	110000.00
100 127	.010	.250	.700	.010	.700		80000	80000	110000.00	110000.00
100 128	.010	.250	1.000	.010	1.000		80000	80000	110000.00	110000.00
100 129	.010	.250	.400	.010	0.100		80000	80000	110000.00	110000.00
100 130	.010	.250	.700	.010	.700		80000	80000	110000.00	110000.00
100 131	.010	.250	1.000	.010	1.000		80000	80000	110000.00	110000.00
100 132	.010	.250	.400	.010	0.100		80000	80000	110000.00	110000.00
100 133	.010	.250	.700	.010	.700		80000	80000	110000.00	110000.00
100 134	.010	.250	1.000	.010	1.000		80000	80000	110000.00	110000.00
100 135	.010	.250	.400	.010	0.100		80000	80000	110000.00	110000.00
100 136	.010	.250	.700	.010	.700		80000	80000	110000.00	110000.00
100 137	.010	.250	1.000	.010	1.000		80000	80000	110000.00	110000.00
100 138	.010	.250	.400	.010	0.100		80000	80000	110000.00	110000.00
100 139	.010	.250	.700	.010	.700		80000	80000	110000.00	110000.00
100 140	.010	.250	1.000	.010	1.000		80000	80000	110000.00	110000.00



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## MINIATURE END MILLS

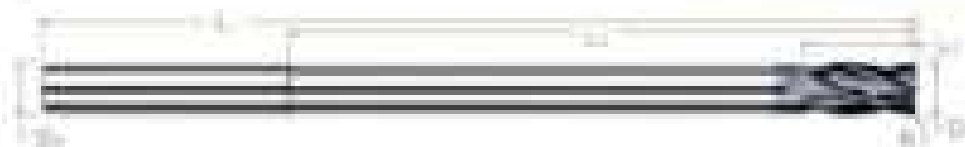
Corner Radius - Long Reach, Slab Flute (cont.)

continued from previous page

ITEM NO.	CORNER RADIUS	L	OVERALL LENGTH	FLUTES	GRADE G10	COAT	LENGTHS		ITEM NUMBER		ALTERNATE ITEM NUMBER	
							PKG. 1	PKG. 2	PKG. 1	PKG. 2	PKG. 1	PKG. 2
501010	.000	.125	1.000	5/8	G10	G	2000	4000	501010-01	5010		
501015	.000	.125	1.000	5/8	G10	G	5000	4000	501015-01	5010		
501020	.000	.125	1.000	5/8	G10	G	5000	4000	501020-01	5010	501010	4455
501030	.000	.125	1.000	5/8	G10	G	5000	4000	501030-01	5010		
501040	.000	.125	1.000	5/8	G10	G	5000	4000	501040-01	5010		
501050	.000	.125	1.000	5/8	G10	G	5000	4000	501050-01	5010	501010	5500
501060	.000	.125	1.000	5/8	G10	G	5000	4000	501060-01	5010		
501070	.000	.125	1.000	5/8	G10	G	5000	4000	501070-01	5010		
501080	.000	.125	1.000	5/8	G10	G	5000	4000	501080-01	5010		
501090	.000	.125	1.000	5/8	G10	G	5000	4000	501090-01	5010		
501100	.000	.125	1.000	5/8	G10	G	5000	4000	501100-01	5010		
501110	.000	.125	1.000	5/8	G10	G	5000	4000	501110-01	5010		
501120	.000	.125	1.000	5/8	G10	G	5000	4000	501120-01	5010		
501130	.000	.125	1.000	5/8	G10	G	5000	4000	501130-01	5010		
501140	.000	.125	1.000	5/8	G10	G	5000	4000	501140-01	5010		
501150	.000	.125	1.000	5/8	G10	G	5000	4000	501150-01	5010		
501160	.000	.125	1.000	5/8	G10	G	5000	4000	501160-01	5010		
501170	.000	.125	1.000	5/8	G10	G	5000	4000	501170-01	5010		
501180	.000	.125	1.000	5/8	G10	G	5000	4000	501180-01	5010		
501190	.000	.125	1.000	5/8	G10	G	5000	4000	501190-01	5010		
501200	.000	.125	1.000	5/8	G10	G	5000	4000	501200-01	5010		
501210	.000	.125	1.000	5/8	G10	G	5000	4000	501210-01	5010	501010	7000
501220	.000	.125	1.000	5/8	G10	G	5000	4000	501220-01	5010	501010	7500
501230	.000	.125	1.000	5/8	G10	G	5000	4000	501230-01	5010	501010	9000
501240	.000	.125	1.000	5/8	G10	G	5000	4000	501240-01	5010		
501250	.000	.125	1.000	5/8	G10	G	5000	4000	501250-01	5010	501010	7500
501260	.000	.125	1.000	5/8	G10	G	5000	4000	501260-01	5010		
501270	.000	.125	1.000	5/8	G10	G	5000	4000	501270-01	5010		
501280	.000	.125	1.000	5/8	G10	G	5000	4000	501280-01	5010		
501290	.000	.125	1.000	5/8	G10	G	5000	4000	501290-01	5010		
501300	.000	.125	1.000	5/8	G10	G	5000	4000	501300-01	5010		
501310	.000	.125	1.000	5/8	G10	G	5000	4000	501310-01	5010		
501320	.000	.125	1.000	5/8	G10	G	5000	4000	501320-01	5010		
501330	.000	.125	1.000	5/8	G10	G	5000	4000	501330-01	5010		

## MINIATURE END MILLS

Corner Radius – Extra Long Length



- Up to 8" overall length
- Larger diameter corner and end chamfer options
- Ground teeth
- 2 Flutes
- Flange cutting
- Interchangeable
- CNC ground to the 20th

Diameter (mm)	Diameter (in)	Length of Cut (mm)	Overall Length (mm)	Flange Diameter (mm)	Overall Length (in)	Corner Radius		End Chamfer	
						R (mm)	R (in)	C (mm)	C (in)
0.100	0.0039	30	100.0	0.1	0	0.025	0.0010	0.0000	0.0000
0.125	0.0049	40	125.0	0.125	0	0.032	0.0013	0.0000	0.0000
0.150	0.0059	50	150.0	0.15	0	0.039	0.0016	0.0000	0.0000
0.200	0.0079	70	200.0	0.2	0	0.051	0.0020	0.0000	0.0000
0.250	0.0099	90	250.0	0.25	0	0.063	0.0025	0.0000	0.0000
0.300	0.0119	110	300.0	0.3	0	0.076	0.0030	0.0000	0.0000

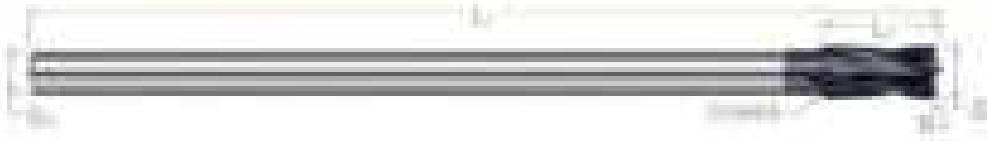


Access Simulation Files in DXF Format for Every Harvey Tool Product

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

## END MILLS

### Corner Radius - Reduced Shank



- Reduced diameter shank avoids any shank taper
- Built-in coolant channels for maximum rigidity
- Long length design for Area Study machining
- Corner radius for improved strength
- Length of cut = 1/3 of shank length
- Center cutting
- 4 Flutes
- Solid Carbide
- ISO grade of steel A65

Check at  
Any Depth



L2 (mm)	L2 (in)	D (mm)	D (in)	SHANK DIAMETER (mm)	SHANK DIAMETER (in)	R (mm)		R (in)	
						Min.	Max.	Min.	Max.
175	6.89	8.0	0.315	8.000	0.315	1.000	0.50	0.0080	0.0031
175	6.89	10.0	0.394	8.000	0.315	1.000	0.50	0.0080	0.0031
175	6.89	12.0	0.472	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	14.0	0.551	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	16.0	0.630	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	18.0	0.709	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	20.0	0.787	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	22.0	0.866	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	24.0	0.945	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	26.0	1.024	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	28.0	1.103	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	30.0	1.182	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	32.0	1.261	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	34.0	1.340	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	36.0	1.419	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	38.0	1.498	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	40.0	1.577	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	42.0	1.656	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	44.0	1.735	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	46.0	1.814	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	48.0	1.893	10.0	0.394	1.500	0.50	0.0080	0.0031
175	6.89	50.0	1.972	10.0	0.394	1.500	0.50	0.0080	0.0031

For Square Reduced Shank, please see page 44.

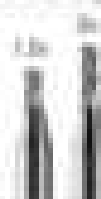
For Ball Reduced Shank, please see page 45.

## MINIATURE END MILLS

Corner Chamfer - Stock & Standard



Stock Head & Standard Length



- Standard end mill design (standard head and stock length) designed for maximum tool life
- 60° corner chamfer protects corners on the end mill and tool seats on all standard end mill shanks
- Faster cutting
- Better quality
- ISO2 ground to 0.0001

CORNER CHAMFER	STOCK HEAD	STOCK LENGTH	STOCK DIAMETER	STOCK LENGTH	STOCK HEAD		STOCK LENGTH	
					±H7	±H9	±H7	±H9
0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	
0.150	0.150	0.150	0.150	0.150	0.150	0.150	0.150	
0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	
0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200	
0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	
0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300	
0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350	
0.400	0.400	0.400	0.400	0.400	0.400	0.400	0.400	
0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	
0.600	0.600	0.600	0.600	0.600	0.600	0.600	0.600	
0.750	0.750	0.750	0.750	0.750	0.750	0.750	0.750	
1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	
1.250	1.250	1.250	1.250	1.250	1.250	1.250	1.250	
1.500	1.500	1.500	1.500	1.500	1.500	1.500	1.500	
2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	
2.500	2.500	2.500	2.500	2.500	2.500	2.500	2.500	
3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	
4.000	4.000	4.000	4.000	4.000	4.000	4.000	4.000	
5.000	5.000	5.000	5.000	5.000	5.000	5.000	5.000	
6.000	6.000	6.000	6.000	6.000	6.000	6.000	6.000	
8.000	8.000	8.000	8.000	8.000	8.000	8.000	8.000	
10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	
12.500	12.500	12.500	12.500	12.500	12.500	12.500	12.500	
15.000	15.000	15.000	15.000	15.000	15.000	15.000	15.000	
20.000	20.000	20.000	20.000	20.000	20.000	20.000	20.000	
25.000	25.000	25.000	25.000	25.000	25.000	25.000	25.000	
30.000	30.000	30.000	30.000	30.000	30.000	30.000	30.000	
40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	
50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	
60.000	60.000	60.000	60.000	60.000	60.000	60.000	60.000	
80.000	80.000	80.000	80.000	80.000	80.000	80.000	80.000	
100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	

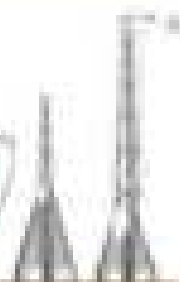
# MINIATURE END MILLS

Exposed - Square



- Length of cut up to 20x end diameter
- Long length design for deep cavity machining
- 2 Flutes
- Center cutting
- Solid carbide
- CNC ground to fine finish

Available in **Micro** Lengths For Size:



MILL DIA (IN)	LENGTH (IN)	LENGTH (MM)	DIA (IN)	DIA (MM)	ITEM NO.		ITEM NO.		ITEM NO.	
					PK10	PK50	PK10	PK50	PK10	PK50
.015"	0.015	0.015	.015	0.375	99114	4420	99114-10	4420		
	0.015	0.015	.015	0.375	99114	7144	99114-10	7144		
	0.015	0.015	.015	0.375	99114	1740	99114-10	1740		
	0.015	0.015	0.015	0	99114	1910	99114-10	1910		
	0.015	0.015	.015	0.375	99114	1740	99114-10	1740		
	0.015	0.015	0.015	0	99114	1910	99114-10	1910		
	0.015	0.015	.015	0.375	99114	1740	99114-10	1740		
	0.015	0.015	0.015	0	99114	1910	99114-10	1910		
	0.015	0.015	.015	0.375	99114	1740	99114-10	1740		
	0.015	0.015	0.015	0	99114	1910	99114-10	1910		
	0.015	0.015	0.015	0	99114	1910	99114-10	1910		
	0.015	0.015	.015	0.375	99114	1740	99114-10	1740		
.020"	0.020	0.020	.020	0.500	99115	4420	99115-10	4420		
	0.020	0.020	.020	0.500	99115	7144	99115-10	7144		
	0.020	0.020	.020	0.500	99115	1740	99115-10	1740	99115-10	4420
	0.020	0.020	0.020	0	99115	1910	99115-10	1910	99115-10	4420
	0.020	0.020	.020	0.500	99115	1740	99115-10	1740		
	0.020	0.020	0.020	0	99115	1910	99115-10	1910		
	0.020	0.020	.020	0.500	99115	1740	99115-10	1740		
	0.020	0.020	0.020	0	99115	1910	99115-10	1910		
	0.020	0.020	.020	0.500	99115	1740	99115-10	1740		
	0.020	0.020	0.020	0	99115	1910	99115-10	1910		
	0.020	0.020	0.020	0	99115	1910	99115-10	1910		
	0.020	0.020	.020	0.500	99115	1740	99115-10	1740		
.025"	0.025	0.025	.025	0.625	99116	4420	99116-10	4420		
	0.025	0.025	.025	0.625	99116	7144	99116-10	7144		
	0.025	0.025	.025	0.625	99116	1740	99116-10	1740		
	0.025	0.025	0.025	0	99116	1910	99116-10	1910		
	0.025	0.025	.025	0.625	99116	1740	99116-10	1740		
	0.025	0.025	0.025	0	99116	1910	99116-10	1910		
	0.025	0.025	.025	0.625	99116	1740	99116-10	1740		
	0.025	0.025	0.025	0	99116	1910	99116-10	1910		
	0.025	0.025	.025	0.625	99116	1740	99116-10	1740		
	0.025	0.025	0.025	0	99116	1910	99116-10	1910		
	0.025	0.025	0.025	0	99116	1910	99116-10	1910		
	0.025	0.025	.025	0.625	99116	1740	99116-10	1740		

continued on next page

## MINIATURE END MILLS

Tapered - Square end

Continued from previous page

MOULDED PER DIA.	O.D. TOP FLANGE	LENGTH OF CUT	DIA. OF SHANK	OVERALL LENGTH	WEIGHT		K10000 GRADE		TOL. FINISH	
					GR.	FIN.	1.5	0.5	1.5	0.5
1/8"	1/8"	1/8" 1/2"	1/8"	5/8"	0.100	0.10	0.0001-0.0002	0.001		
	1/8"	1/8" 3/8"	3/8"	1.110	0.100	0.10	0.0001-0.0002	0.001		
	1/8"	1/8" 1/2"	1/2"	5/8"	0.100	0.10	0.0001-0.0002	0.001		
1/4"	1/4" 1/8"	1/4" 1/2"	1/4"	1.110	0.200	0.20	0.0001-0.0002	0.001		
	1/4" 1/8"	1/4" 3/8"	3/8"	0.910	0.200	0.20	0.0001-0.0002	0.001		
	1/4"	1/4" 1/2"	1/2"	1.110	0.200	0.20	0.0001-0.0002	0.001		
	1/4"	1/4" 3/8"	3/8"	5/8"	0.200	0.20	0.0001-0.0002	0.001		
	1/4"	1/4" 1/2"	1/2"	1.110	0.200	0.20	0.0001-0.0002	0.001		
	1/4"	1/4" 3/8"	3/8"	5/8"	0.200	0.20	0.0001-0.0002	0.001		
	1/4"	1/4" 1/2"	1/2"	1.110	0.200	0.20	0.0001-0.0002	0.001		
	1/4"	1/4" 3/8"	3/8"	5/8"	0.200	0.20	0.0001-0.0002	0.001		
	1/4"	1/4" 1/2"	1/2"	1.110	0.200	0.20	0.0001-0.0002	0.001		
	1/4"	1/4" 3/8"	3/8"	5/8"	0.200	0.20	0.0001-0.0002	0.001		
	1/4"	1/4" 1/2"	1/2"	1.110	0.200	0.20	0.0001-0.0002	0.001		
	1/4"	1/4" 3/8"	3/8"	5/8"	0.200	0.20	0.0001-0.0002	0.001		
	3/8"	1/4" 1/8"	3/8" 1/2"	3/8"	1.110	0.300	0.30	0.0001-0.0002	0.001	
1/4" 1/8"		3/8" 3/8"	3/8"	0.910	0.300	0.30	0.0001-0.0002	0.001		
3/8"		3/8" 1/2"	1/2"	1.110	0.300	0.30	0.0001-0.0002	0.001		
3/8"		3/8" 3/8"	3/8"	5/8"	0.300	0.30	0.0001-0.0002	0.001		
3/8"		3/8" 1/2"	1/2"	1.110	0.300	0.30	0.0001-0.0002	0.001		
3/8"		3/8" 3/8"	3/8"	5/8"	0.300	0.30	0.0001-0.0002	0.001		
3/8"		3/8" 1/2"	1/2"	1.110	0.300	0.30	0.0001-0.0002	0.001		
3/8"		3/8" 3/8"	3/8"	5/8"	0.300	0.30	0.0001-0.0002	0.001		
3/8"		3/8" 1/2"	1/2"	1.110	0.300	0.30	0.0001-0.0002	0.001		
3/8"		3/8" 3/8"	3/8"	5/8"	0.300	0.30	0.0001-0.0002	0.001		
3/8"		3/8" 1/2"	1/2"	1.110	0.300	0.30	0.0001-0.0002	0.001		
1/2"	1/4" 1/8"	1/2" 1/2"	1/2"	1.110	0.400	0.40	0.0001-0.0002	0.001		
	1/4" 1/8"	1/2" 3/8"	3/8"	0.910	0.400	0.40	0.0001-0.0002	0.001		
	1/2" 1/8"	1/2" 1/2"	1/2"	1.110	0.400	0.40	0.0001-0.0002	0.001		
	1/2" 1/8"	1/2" 3/8"	3/8"	0.910	0.400	0.40	0.0001-0.0002	0.001		
	1/2"	1/2" 1/2"	1/2"	1.110	0.400	0.40	0.0001-0.0002	0.001		
	1/2"	1/2" 3/8"	3/8"	0.910	0.400	0.40	0.0001-0.0002	0.001		
	1/2"	1/2" 1/2"	1/2"	1.110	0.400	0.40	0.0001-0.0002	0.001		
	1/2"	1/2" 3/8"	3/8"	0.910	0.400	0.40	0.0001-0.0002	0.001		
	1/2"	1/2" 1/2"	1/2"	1.110	0.400	0.40	0.0001-0.0002	0.001		
	1/2"	1/2" 3/8"	3/8"	0.910	0.400	0.40	0.0001-0.0002	0.001		
	1/2"	1/2" 1/2"	1/2"	1.110	0.400	0.40	0.0001-0.0002	0.001		

Continued on next page

# MINIATURE END MILLS

Tapered - Square (cont.)

continued from previous page

MILL PART NO.	CUTTER NUMBER	LENGTH OF CUT	SHAFT DIAMETER	OVERALL LENGTH	DIMENSIONS		MIL. RANGE		MIL. RANGE	
					F.A.	W.D.	F.A.	W.D.	F.A.	W.D.
E	101	122.000	.14	1.100	.0002	0.000	.000000	.000000		
	102	160.000	0.15	1	0.0002	0.000	.000000	.000000		
	1030000	144.000	0.14	1.100	.0002	0.000	.000000	.000000		
	1030100	160.000	0.15	1	0.0002	0.000	.000000	.000000		
	103	170.000	0.16	1	0.0002	0.000	.000000	.000000		
	104	194.000	0.17	1	0.0002	0.000	.000000	.000000		
	105	200.000	0.18	1	0.0002	0.000	.000000	.000000		
	106	200.000	0.18	1	0.0002	0.000	.000000	.000000		
	1060000	200.000	0.18	1	0.0002	0.000	.000000	.000000		
	1060100	200.000	0.18	1	0.0002	0.000	.000000	.000000		
	1060200	200.000	0.18	1	0.0002	0.000	.000000	.000000		
	1060300	200.000	0.18	1	0.0002	0.000	.000000	.000000		
E	1070000	194.000	0.17	1.100	.0002	0.000	.000000	.000000		
	107	200.000	0.18	1	0.0002	0.000	.000000	.000000		
	108	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	109	200.000	0.18	1	0.0002	0.000	.000000	.000000		
	110	200.000	0.18	1	0.0002	0.000	.000000	.000000		
	111	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	112	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	113	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
F	1140000	194.000	0.17	1.100	.0002	0.000	.000000	.000000		
	114	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	115	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	116	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	117	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	118	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	119	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	120	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	121	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	122	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	123	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	124	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
G	1250000	194.000	0.17	1.100	.0002	0.000	.000000	.000000		
	125	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	126	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	127	200.000	0.18	1.100	.0002	0.000	.000000	.000000		
	128	200.000	0.18	1.100	.0002	0.000	.000000	.000000		

continued on next page



## MINIATURE END MILLS

Tapered - Square end

continued from previous page

ANGLE PER SIDE	CUTTER DIAMETER	LENGTH OF CUT	SHANK DIAMETER	SHANK LENGTH	TAPERED END		SQUARE END		TOL. GRADES	
					FRA.	MM	FRA.	MM	F15	FH10
10°	0.015	0.015	0.015	0.100	0.015	0.100	0.015	0.100		
	0.020	0.020	0.020	0.100	0.020	0.100	0.020	0.100		
	0.025	0.025	0.025	0.100	0.025	0.100	0.025	0.100		
	0.030	0.030	0.030	0.100	0.030	0.100	0.030	0.100		
	0.035	0.035	0.035	0.100	0.035	0.100	0.035	0.100		
	0.040	0.040	0.040	0.100	0.040	0.100	0.040	0.100		
	0.045	0.045	0.045	0.100	0.045	0.100	0.045	0.100		
	0.050	0.050	0.050	0.100	0.050	0.100	0.050	0.100		
	0.055	0.055	0.055	0.100	0.055	0.100	0.055	0.100		
	0.060	0.060	0.060	0.100	0.060	0.100	0.060	0.100		
	0.065	0.065	0.065	0.100	0.065	0.100	0.065	0.100		
	0.070	0.070	0.070	0.100	0.070	0.100	0.070	0.100		
	0.075	0.075	0.075	0.100	0.075	0.100	0.075	0.100		
	0.080	0.080	0.080	0.100	0.080	0.100	0.080	0.100		
	0.085	0.085	0.085	0.100	0.085	0.100	0.085	0.100		
	0.090	0.090	0.090	0.100	0.090	0.100	0.090	0.100		
	0.095	0.095	0.095	0.100	0.095	0.100	0.095	0.100		
	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100		
	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100		
	15°	0.015	0.015	0.015	0.100	0.015	0.100	0.015	0.100	
0.020		0.020	0.020	0.100	0.020	0.100	0.020	0.100		
0.025		0.025	0.025	0.100	0.025	0.100	0.025	0.100		
0.030		0.030	0.030	0.100	0.030	0.100	0.030	0.100		
0.035		0.035	0.035	0.100	0.035	0.100	0.035	0.100		
0.040		0.040	0.040	0.100	0.040	0.100	0.040	0.100		
0.045		0.045	0.045	0.100	0.045	0.100	0.045	0.100		
0.050		0.050	0.050	0.100	0.050	0.100	0.050	0.100		
0.055		0.055	0.055	0.100	0.055	0.100	0.055	0.100		
0.060		0.060	0.060	0.100	0.060	0.100	0.060	0.100		
0.065		0.065	0.065	0.100	0.065	0.100	0.065	0.100		
0.070		0.070	0.070	0.100	0.070	0.100	0.070	0.100		
0.075		0.075	0.075	0.100	0.075	0.100	0.075	0.100		
0.080		0.080	0.080	0.100	0.080	0.100	0.080	0.100		
0.085	0.085	0.085	0.100	0.085	0.100	0.085	0.100			
0.090	0.090	0.090	0.100	0.090	0.100	0.090	0.100			
20°	0.015	0.015	0.015	0.100	0.015	0.100	0.015	0.100		
	0.020	0.020	0.020	0.100	0.020	0.100	0.020	0.100		
	0.025	0.025	0.025	0.100	0.025	0.100	0.025	0.100		
	0.030	0.030	0.030	0.100	0.030	0.100	0.030	0.100		
	0.035	0.035	0.035	0.100	0.035	0.100	0.035	0.100		
	0.040	0.040	0.040	0.100	0.040	0.100	0.040	0.100		
	0.045	0.045	0.045	0.100	0.045	0.100	0.045	0.100		
	0.050	0.050	0.050	0.100	0.050	0.100	0.050	0.100		

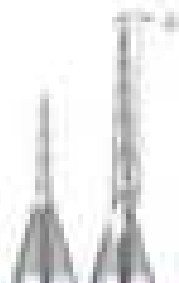
For larger angles, please see Chatter Cutters on page 287.

# MINIATURE END MILLS

Exposed - Ball



- Stocked in 0.01 to 0.02" lengths
- Long length design for final cavity machining
- 2 Flutes - Central cutting
- Hard coating - TiCN ground in the USA



MILL DIA	LENGTH IN MILLIMETERS	LENGTH OF FLUTE IN MILLIMETERS	CHAMFER IN MILLIMETERS	CHAMFER ANGLE	COATING		MATERIAL	
					COATING	PRECISION	ALLOY	FINISH
0.015"	0.100	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.150	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.200	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.250	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.300	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.350	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.400	0.050	0.000	0°	0.000	0.000	0.000	0.000
0.020"	0.100	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.150	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.200	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.250	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.300	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.350	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.400	0.050	0.000	0°	0.000	0.000	0.000	0.000
0.025"	0.100	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.150	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.200	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.250	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.300	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.350	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.400	0.050	0.000	0°	0.000	0.000	0.000	0.000
0.030"	0.100	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.150	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.200	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.250	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.300	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.350	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.400	0.050	0.000	0°	0.000	0.000	0.000	0.000
0.035"	0.100	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.150	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.200	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.250	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.300	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.350	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.400	0.050	0.000	0°	0.000	0.000	0.000	0.000
0.040"	0.100	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.150	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.200	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.250	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.300	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.350	0.050	0.000	0°	0.000	0.000	0.000	0.000
	0.400	0.050	0.000	0°	0.000	0.000	0.000	0.000

continued on next page

## MINIATURE END MILLS

Taproot - Ballnose

continued from previous page

MILL PART NO.	LENGTH IN. (MM)	LENGTH OF CUT IN. (MM)	SPACE BETWEEN FLUTES	FLUTE LENGTH	WEIGHTS		MATERIAL	
					WT.	MM	15	18-18
E <sup>1</sup>	ETC1004	.100 (.004)	.08	.010	0.000	0.00	SAE52100	41.00
	001	.000 (.004)	.000	0	0.000	0.00	SAE52100	41.00
	002	.000 (.004)	.010	0	0.000	0.00	SAE52100	41.00
	003	.000 (.004)	.020	0	0.000	0.00	SAE52100	41.00
E <sup>2</sup>	ETC1008	.100 (.008)	.08	.010	0.000	0.00	SAE52100	44.00
	001	.000 (.008)	.000	.010	0.000	0.00	SAE52100	44.00
	002	.000 (.008)	.010	0	0.000	0.00	SAE52100	44.00
	003	.000 (.008)	.020	0	0.000	0.00	SAE52100	44.00
	004	.000 (.008)	.030	0	0.000	0.00	SAE52100	44.00
	005	.000 (.008)	.040	0	0.000	0.00	SAE52100	44.00
	006	.000 (.008)	.050	0	0.000	0.00	SAE52100	44.00
	007	.000 (.008)	.060	0	0.000	0.00	SAE52100	44.00
	008	.000 (.008)	.070	0	0.000	0.00	SAE52100	44.00
	009	.000 (.008)	.080	0	0.000	0.00	SAE52100	44.00
E <sup>3</sup>	ETC1012	.100 (.012)	.08	.010	0.000	0.00	SAE52100	47.00
	001	.000 (.012)	.000	0	0.000	0.00	SAE52100	47.00
	002	.000 (.012)	.010	0	0.000	0.00	SAE52100	47.00
	003	.000 (.012)	.020	0	0.000	0.00	SAE52100	47.00
E <sup>4</sup>	ETC1016	.100 (.016)	.08	.010	0.000	0.00	SAE52100	50.00
	001	.000 (.016)	.000	0	0.000	0.00	SAE52100	50.00
	002	.000 (.016)	.010	0	0.000	0.00	SAE52100	50.00
	003	.000 (.016)	.020	0	0.000	0.00	SAE52100	50.00
	004	.000 (.016)	.030	0	0.000	0.00	SAE52100	50.00
E <sup>5</sup>	ETC1020	.100 (.020)	.08	.010	0.000	0.00	SAE52100	53.00
	001	.000 (.020)	.000	0	0.000	0.00	SAE52100	53.00
	002	.000 (.020)	.010	0	0.000	0.00	SAE52100	53.00
	003	.000 (.020)	.020	0	0.000	0.00	SAE52100	53.00
	004	.000 (.020)	.030	0	0.000	0.00	SAE52100	53.00
	005	.000 (.020)	.040	0	0.000	0.00	SAE52100	53.00
	006	.000 (.020)	.050	0	0.000	0.00	SAE52100	53.00
	007	.000 (.020)	.060	0	0.000	0.00	SAE52100	53.00
	008	.000 (.020)	.070	0	0.000	0.00	SAE52100	53.00
	009	.000 (.020)	.080	0	0.000	0.00	SAE52100	53.00
E <sup>6</sup>	ETC1024	.100 (.024)	.08	.010	0.000	0.00	SAE52100	56.00
	001	.000 (.024)	.000	0	0.000	0.00	SAE52100	56.00
	002	.000 (.024)	.010	0	0.000	0.00	SAE52100	56.00
	003	.000 (.024)	.020	0	0.000	0.00	SAE52100	56.00
	004	.000 (.024)	.030	0	0.000	0.00	SAE52100	56.00
	005	.000 (.024)	.040	0	0.000	0.00	SAE52100	56.00
	006	.000 (.024)	.050	0	0.000	0.00	SAE52100	56.00
	007	.000 (.024)	.060	0	0.000	0.00	SAE52100	56.00
	008	.000 (.024)	.070	0	0.000	0.00	SAE52100	56.00
	009	.000 (.024)	.080	0	0.000	0.00	SAE52100	56.00
E <sup>7</sup>	ETC1028	.100 (.028)	.08	.010	0.000	0.00	SAE52100	59.00
	001	.000 (.028)	.000	0	0.000	0.00	SAE52100	59.00
	002	.000 (.028)	.010	0	0.000	0.00	SAE52100	59.00
	003	.000 (.028)	.020	0	0.000	0.00	SAE52100	59.00
	004	.000 (.028)	.030	0	0.000	0.00	SAE52100	59.00
	005	.000 (.028)	.040	0	0.000	0.00	SAE52100	59.00
	006	.000 (.028)	.050	0	0.000	0.00	SAE52100	59.00
	007	.000 (.028)	.060	0	0.000	0.00	SAE52100	59.00
	008	.000 (.028)	.070	0	0.000	0.00	SAE52100	59.00
	009	.000 (.028)	.080	0	0.000	0.00	SAE52100	59.00
E <sup>8</sup>	ETC1032	.100 (.032)	.08	.010	0.000	0.00	SAE52100	62.00
	001	.000 (.032)	.000	0	0.000	0.00	SAE52100	62.00
	002	.000 (.032)	.010	0	0.000	0.00	SAE52100	62.00
	003	.000 (.032)	.020	0	0.000	0.00	SAE52100	62.00

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— Ryan S. —

Ryan S.

Shop Owner, Avonia, PA



## MATERIAL-SPECIFIC END MILLS

### FERROUS MATERIALS

**End Mills for Hardened Steels (HSS)** .....  100

**Recommended Materials:**  
 hardened steels up to 60 HRC and high temperature alloys

**End Mills for High Temp Alloys (HSS) (HSS)** .....  100

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

**End Mills for Medium Alloy Steels (HSS) (HSS)** .....  100

**Recommended Materials:**  
 mostly non-austenitic medium alloy steels, stainless steels, and tool steels

**End Mills for Free-Machining Steels (HSS)** .....  100

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

### NON-FERROUS MATERIALS

**End Mills for Aluminum Alloys (HSS) (HSS)** .....  100

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

**End Mills for Non-Ferrous Materials (HSS)** .....  100

**Recommended Materials:**  
 graphite, beryllium, green castles, green castles

**End Mills for Plastics (HSS) (HSS)** .....  100

**Recommended Materials:**  
 most cast and wrought plastics

**End Mills for Composites (HSS)** .....  100

**Recommended Materials:**  
 various composites: fiber-reinforced plastics, epoxy composites

**End Mills for Wood** .....  100

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





## END MILLS FOR HARDENED STEELS

Square - For Steels Up to 55 Rc parts

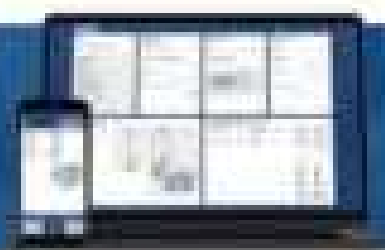
Continued from previous page

CUTTER ID NUMBER			LENGTH OF CUT	LENGTH OF ANGLE	INTERNAL CORNER	SPRINK NO. OF CUTS	
TYPE OF CUT	ANGLE OF CUT	ANGLE CORNER	L 1/4", 3/8", 1/2", 3/4", 1"	3/8", 1/2", 3/4", 1"	R	1/4"	3/8"
941 1000	90°	90°	941 1/4"	1/4"	0.125	94100010	11.00
942 1000	90°	90°	942 3/8"	3/8"	0.125	94200030	11.00
943 1000	90°	90°	943 1/2"	1/2"	0.125	94300010	11.00
944 1000	90°	90°	944 3/4"	3/4"	0.125	94400030	11.00
945 1000	90°	90°	945 1"	1"	0.125	94500010	11.00
946 1000	90°	90°	946 1/4"	1/4"	0.125	94600010	11.00
947 1000	90°	90°	947 3/8"	3/8"	0.125	94700030	11.00
948 1000	90°	90°	948 1/2"	1/2"	0.125	94800010	11.00
949 1000	90°	90°	949 3/4"	3/4"	0.125	94900030	11.00
950 1000	90°	90°	950 1"	1"	0.125	95000010	11.00
951 1000	90°	90°	951 1/4"	1/4"	0.125	95100010	11.00
952 1000	90°	90°	952 3/8"	3/8"	0.125	95200030	11.00
953 1000	90°	90°	953 1/2"	1/2"	0.125	95300010	11.00
954 1000	90°	90°	954 3/4"	3/4"	0.125	95400030	11.00
955 1000	90°	90°	955 1"	1"	0.125	95500010	11.00
956 1000	90°	90°	956 1/4"	1/4"	0.125	95600010	11.00
957 1000	90°	90°	957 3/8"	3/8"	0.125	95700030	11.00
958 1000	90°	90°	958 1/2"	1/2"	0.125	95800010	11.00
959 1000	90°	90°	959 3/4"	3/4"	0.125	95900030	11.00
960 1000	90°	90°	960 1"	1"	0.125	96000010	11.00
961 1000	90°	90°	961 1/4"	1/4"	0.125	96100010	11.00
962 1000	90°	90°	962 3/8"	3/8"	0.125	96200030	11.00
963 1000	90°	90°	963 1/2"	1/2"	0.125	96300010	11.00
964 1000	90°	90°	964 3/4"	3/4"	0.125	96400030	11.00
965 1000	90°	90°	965 1"	1"	0.125	96500010	11.00
966 1000	90°	90°	966 1/4"	1/4"	0.125	96600010	11.00
967 1000	90°	90°	967 3/8"	3/8"	0.125	96700030	11.00
968 1000	90°	90°	968 1/2"	1/2"	0.125	96800010	11.00
969 1000	90°	90°	969 3/4"	3/4"	0.125	96900030	11.00
970 1000	90°	90°	970 1"	1"	0.125	97000010	11.00
971 1000	90°	90°	971 1/4"	1/4"	0.125	97100010	11.00
972 1000	90°	90°	972 3/8"	3/8"	0.125	97200030	11.00
973 1000	90°	90°	973 1/2"	1/2"	0.125	97300010	11.00
974 1000	90°	90°	974 3/4"	3/4"	0.125	97400030	11.00
975 1000	90°	90°	975 1"	1"	0.125	97500010	11.00
976 1000	90°	90°	976 1/4"	1/4"	0.125	97600010	11.00
977 1000	90°	90°	977 3/8"	3/8"	0.125	97700030	11.00
978 1000	90°	90°	978 1/2"	1/2"	0.125	97800010	11.00
979 1000	90°	90°	979 3/4"	3/4"	0.125	97900030	11.00
980 1000	90°	90°	980 1"	1"	0.125	98000010	11.00

PLEASE SEE SPEEDS & FEEDS ON PAGE 112

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## END MILLS FOR HATCHING STEELS

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



5 Flute, Variable  
 Helix Design

- Designed to mill hardened tool, die, and mold steels up to 55Rc
- Best suited for stainless steel (Austenitic, Martensitic, and Duplex high temperature alloy)
- 5 Flute, variable helix design (variable RFL) for increased cutting and cooling
- Stub flute for maximum rigidity
- Latent generation RFL for faster cutting rates, reduced heatwork and tool wear
- Increased stock clearance to maintain strength and stiffness - RFL stock available for high precision tool finishes
- Double fluting - Solid carbide - ISO ground to the 12th

DIA (mm)	LENGTH (mm)	LENGTH (mm)	WEIGHT (g)	WEIGHT (g)	RFL Stock GRADE	
					12C	11C
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100
100-1100	100	100	100	100	100	100

**PLEASE SEE SPEED & FEEDS ON PAGE 111**

## END MILLS FOR HARDENED STEELS

Mult - For Steels Up to 55 Rc



6 FLUTE, Variable  
Flute Design

- Designed to mill hardened tool, die, and mold steels up to 55 Rc
- Best solution for stainless steel, Inconel, titanium, and other high temperature alloys
- 6 Flute, variable flute design (VFD) for improved cutting and chiping
- Full width for maximum strength
- Latest generation ATW form leaving ultra superior finishes and tool life
- Coatings must change to match strength and stiffness - 60 degree chamfers for high pressure tool holder
- Great spring - 4 flute models - 1 MC ground in the USA

Series Diameter	Length Dicut	Width Dcutlet	Series Length	ATW End Mill	
				FL	PM25
D11000	L11000	Dc 1100	1100		
100 (1.00)	107 (1.07)	10	1100	1000 (10)	1100
125 (1.25)	125 (1.25)	12	1200	1000 (12)	1200
150	140 (1.40)	15	1300	1000 (15)	1300
175	157 (1.57)	17	1400	1000 (17)	1400
200	170 (1.70)	20	1500	1000 (20)	1500
250 (2.50)	217 (2.17)	25	1900	1000 (25)	1900
300 (3.00)	270 (2.70)	30	2300	1000 (30)	2300
350 (3.50)	320 (3.20)	35	2700	1000 (35)	2700
400 (4.00)	370 (3.70)	40	3100	1000 (40)	3100
450 (4.50)	420 (4.20)	45	3500	1000 (45)	3500
500 (5.00)	470 (4.70)	50	3900	1000 (50)	3900
550 (5.50)	520 (5.20)	55	4300	1000 (55)	4300
600 (6.00)	570 (5.70)	60	4700	1000 (60)	4700
650 (6.50)	620 (6.20)	65	5100	1000 (65)	5100
700 (7.00)	670 (6.70)	70	5500	1000 (70)	5500
750 (7.50)	720 (7.20)	75	5900	1000 (75)	5900
800 (8.00)	770 (7.70)	80	6300	1000 (80)	6300
850 (8.50)	820 (8.20)	85	6700	1000 (85)	6700
900 (9.00)	870 (8.70)	90	7100	1000 (90)	7100
950 (9.50)	920 (9.20)	95	7500	1000 (95)	7500
1000 (10.00)	970 (9.70)	100	7900	1000 (100)	7900
D12000	L12000	Dc 1200	1200		
1200 (12.00)	117 (11.70)	12	1200	1000 (12)	1200
1500 (15.00)	150 (1.50)	15	1500	1000 (15)	1500
2000 (20.00)	200 (2.00)	20	2000	1000 (20)	2000
2500 (25.00)	250 (2.50)	25	2500	1000 (25)	2500
3000 (30.00)	300 (3.00)	30	3000	1000 (30)	3000
3500 (35.00)	350 (3.50)	35	3500	1000 (35)	3500
4000 (40.00)	400 (4.00)	40	4000	1000 (40)	4000
4500 (45.00)	450 (4.50)	45	4500	1000 (45)	4500
5000 (50.00)	500 (5.00)	50	5000	1000 (50)	5000
5500 (55.00)	550 (5.50)	55	5500	1000 (55)	5500
6000 (60.00)	600 (6.00)	60	6000	1000 (60)	6000
6500 (65.00)	650 (6.50)	65	6500	1000 (65)	6500
7000 (70.00)	700 (7.00)	70	7000	1000 (70)	7000
7500 (75.00)	750 (7.50)	75	7500	1000 (75)	7500
8000 (80.00)	800 (8.00)	80	8000	1000 (80)	8000
8500 (85.00)	850 (8.50)	85	8500	1000 (85)	8500
9000 (90.00)	900 (9.00)	90	9000	1000 (90)	9000
9500 (95.00)	950 (9.50)	95	9500	1000 (95)	9500

PLEASE SEE SPEEDS & FEEDS ON PAGE 197



## END MILLS FOR HARDENED STEELS

Corner Radius - For Steels Up to 55 Rc



**3 Flute, Variable Helix Design**

- Designed to mill hardened tool, die, and mold steels up to 55 Rc
- Best solution for stainless steel, Inconel, titanium, and other high temperature alloys
- 3 Flute, variable helix design (VH) for improved chipping and chiping
- Corner radius for improved strength
- Laser generated MQL flow coating offers superior lubrication and heat resistance
- Increased flute depth for maximum strength and stiffness - 50% shank tolerance for high precision tool holders
- Super cutting - 4 lead angles - 120° ground to the LSA

MILL DIAMETER			COARSE PITCH (C)	LENGTH OF CUT	FINISH DIAMETER	OVERALL LENGTH	MQL FLUID SYSTEM	
1/8"	3/16"	1/4"	1/8"	1/2"	7/8"	1 1/2"	1/8"	1/4"
425 1/8	425 3/16	425 1/4	425	425 1/2	425 7/8	425 1 1/2	425 1/8	425 1/4
426 1/8	426 3/16	426 1/4	426	426 1/2	426 7/8	426 1 1/2	426 1/8	426 1/4
427 1/8	427 3/16	427 1/4	427	427 1/2	427 7/8	427 1 1/2	427 1/8	427 1/4
428 1/8	428 3/16	428 1/4	428	428 1/2	428 7/8	428 1 1/2	428 1/8	428 1/4
429 1/8	429 3/16	429 1/4	429	429 1/2	429 7/8	429 1 1/2	429 1/8	429 1/4
430 1/8	430 3/16	430 1/4	430	430 1/2	430 7/8	430 1 1/2	430 1/8	430 1/4
431 1/8	431 3/16	431 1/4	431	431 1/2	431 7/8	431 1 1/2	431 1/8	431 1/4
432 1/8	432 3/16	432 1/4	432	432 1/2	432 7/8	432 1 1/2	432 1/8	432 1/4
433 1/8	433 3/16	433 1/4	433	433 1/2	433 7/8	433 1 1/2	433 1/8	433 1/4
434 1/8	434 3/16	434 1/4	434	434 1/2	434 7/8	434 1 1/2	434 1/8	434 1/4
435 1/8	435 3/16	435 1/4	435	435 1/2	435 7/8	435 1 1/2	435 1/8	435 1/4
436 1/8	436 3/16	436 1/4	436	436 1/2	436 7/8	436 1 1/2	436 1/8	436 1/4
437 1/8	437 3/16	437 1/4	437	437 1/2	437 7/8	437 1 1/2	437 1/8	437 1/4
438 1/8	438 3/16	438 1/4	438	438 1/2	438 7/8	438 1 1/2	438 1/8	438 1/4
439 1/8	439 3/16	439 1/4	439	439 1/2	439 7/8	439 1 1/2	439 1/8	439 1/4
440 1/8	440 3/16	440 1/4	440	440 1/2	440 7/8	440 1 1/2	440 1/8	440 1/4
441 1/8	441 3/16	441 1/4	441	441 1/2	441 7/8	441 1 1/2	441 1/8	441 1/4
442 1/8	442 3/16	442 1/4	442	442 1/2	442 7/8	442 1 1/2	442 1/8	442 1/4
443 1/8	443 3/16	443 1/4	443	443 1/2	443 7/8	443 1 1/2	443 1/8	443 1/4
444 1/8	444 3/16	444 1/4	444	444 1/2	444 7/8	444 1 1/2	444 1/8	444 1/4
445 1/8	445 3/16	445 1/4	445	445 1/2	445 7/8	445 1 1/2	445 1/8	445 1/4
446 1/8	446 3/16	446 1/4	446	446 1/2	446 7/8	446 1 1/2	446 1/8	446 1/4
447 1/8	447 3/16	447 1/4	447	447 1/2	447 7/8	447 1 1/2	447 1/8	447 1/4
448 1/8	448 3/16	448 1/4	448	448 1/2	448 7/8	448 1 1/2	448 1/8	448 1/4
449 1/8	449 3/16	449 1/4	449	449 1/2	449 7/8	449 1 1/2	449 1/8	449 1/4
450 1/8	450 3/16	450 1/4	450	450 1/2	450 7/8	450 1 1/2	450 1/8	450 1/4
451 1/8	451 3/16	451 1/4	451	451 1/2	451 7/8	451 1 1/2	451 1/8	451 1/4
452 1/8	452 3/16	452 1/4	452	452 1/2	452 7/8	452 1 1/2	452 1/8	452 1/4
453 1/8	453 3/16	453 1/4	453	453 1/2	453 7/8	453 1 1/2	453 1/8	453 1/4
454 1/8	454 3/16	454 1/4	454	454 1/2	454 7/8	454 1 1/2	454 1/8	454 1/4
455 1/8	455 3/16	455 1/4	455	455 1/2	455 7/8	455 1 1/2	455 1/8	455 1/4
456 1/8	456 3/16	456 1/4	456	456 1/2	456 7/8	456 1 1/2	456 1/8	456 1/4
457 1/8	457 3/16	457 1/4	457	457 1/2	457 7/8	457 1 1/2	457 1/8	457 1/4
458 1/8	458 3/16	458 1/4	458	458 1/2	458 7/8	458 1 1/2	458 1/8	458 1/4
459 1/8	459 3/16	459 1/4	459	459 1/2	459 7/8	459 1 1/2	459 1/8	459 1/4
460 1/8	460 3/16	460 1/4	460	460 1/2	460 7/8	460 1 1/2	460 1/8	460 1/4

continued on next page.

## END MILLS FOR HARDENED STEELS

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

(continued from previous page)

CUTTER NOMENCLATURE			COARSE RASTUS	LENGTH OF CUT	TOOTH NOMENCLATURE	OVERALL LENGTH	STOCK NUMBER	
CUTTER NO.	CUTTER SIZE	CUTTER ANGLE	CUTTER NO.	CUTTER NO.	CUTTER NO.	CUTTER NO.	URL	PRICE
	1/2 in.	111	27-000	27-000	27-000	27-000	27000-10	7000
280	1/2 in.	111	280	280-000	280	280	28000-10	5000
281	1/2 in.	111	281	281-000	281	281	28100-10	7000
282-000	1/2 in.	111	282	282-000	282	282	28200-10	5000
283-000	1/2 in.	111	283	283-000	283	283	28300-10	5000
284-000	1/2 in.	111	284	284-000	284	284	28400-10	5000
285-000	1/2 in.	111	285	285-000	285	285	28500-10	5000
286-000	1/2 in.	111	286	286-000	286	286	28600-10	5000
287-000	1/2 in.	111	287	287-000	287	287	28700-10	5000
288-000	1/2 in.	111	288	288-000	288	288	28800-10	5000
289-000	1/2 in.	111	289	289-000	289	289	28900-10	5000
290-000	1/2 in.	111	290	290-000	290	290	29000-10	5000
291	1/2 in.	111	291	291-000	291	291	29100-10	5000
292	1/2 in.	111	292	292-000	292	292	29200-10	5000
293	1/2 in.	111	293	293-000	293	293	29300-10	5000
294	1/2 in.	111	294	294-000	294	294	29400-10	5000
295	1/2 in.	111	295	295-000	295	295	29500-10	5000
296	1/2 in.	111	296	296-000	296	296	29600-10	5000
297	1/2 in.	111	297	297-000	297	297	29700-10	5000
298	1/2 in.	111	298	298-000	298	298	29800-10	5000
299	1/2 in.	111	299	299-000	299	299	29900-10	5000
300	1/2 in.	111	300	300-000	300	300	30000-10	5000
301	1/2 in.	111	301	301-000	301	301	30100-10	5000
302	1/2 in.	111	302	302-000	302	302	30200-10	5000
303	1/2 in.	111	303	303-000	303	303	30300-10	5000
304	1/2 in.	111	304	304-000	304	304	30400-10	5000
305	1/2 in.	111	305	305-000	305	305	30500-10	5000
306	1/2 in.	111	306	306-000	306	306	30600-10	5000
307	1/2 in.	111	307	307-000	307	307	30700-10	5000
308	1/2 in.	111	308	308-000	308	308	30800-10	5000
309	1/2 in.	111	309	309-000	309	309	30900-10	5000
310	1/2 in.	111	310	310-000	310	310	31000-10	5000
311	1/2 in.	111	311	311-000	311	311	31100-10	5000
312	1/2 in.	111	312	312-000	312	312	31200-10	5000
313	1/2 in.	111	313	313-000	313	313	31300-10	5000
314	1/2 in.	111	314	314-000	314	314	31400-10	5000
315	1/2 in.	111	315	315-000	315	315	31500-10	5000
316	1/2 in.	111	316	316-000	316	316	31600-10	5000
317	1/2 in.	111	317	317-000	317	317	31700-10	5000
318	1/2 in.	111	318	318-000	318	318	31800-10	5000
319	1/2 in.	111	319	319-000	319	319	31900-10	5000
320	1/2 in.	111	320	320-000	320	320	32000-10	5000
321	1/2 in.	111	321	321-000	321	321	32100-10	5000
322	1/2 in.	111	322	322-000	322	322	32200-10	5000
323	1/2 in.	111	323	323-000	323	323	32300-10	5000
324	1/2 in.	111	324	324-000	324	324	32400-10	5000
325	1/2 in.	111	325	325-000	325	325	32500-10	5000
326	1/2 in.	111	326	326-000	326	326	32600-10	5000
327	1/2 in.	111	327	327-000	327	327	32700-10	5000
328	1/2 in.	111	328	328-000	328	328	32800-10	5000
329	1/2 in.	111	329	329-000	329	329	32900-10	5000
330	1/2 in.	111	330	330-000	330	330	33000-10	5000
331	1/2 in.	111	331	331-000	331	331	33100-10	5000
332	1/2 in.	111	332	332-000	332	332	33200-10	5000
333	1/2 in.	111	333	333-000	333	333	33300-10	5000
334	1/2 in.	111	334	334-000	334	334	33400-10	5000
335	1/2 in.	111	335	335-000	335	335	33500-10	5000
336	1/2 in.	111	336	336-000	336	336	33600-10	5000
337	1/2 in.	111	337	337-000	337	337	33700-10	5000
338	1/2 in.	111	338	338-000	338	338	33800-10	5000
339	1/2 in.	111	339	339-000	339	339	33900-10	5000
340	1/2 in.	111	340	340-000	340	340	34000-10	5000

(continued on next page)

## END MILLS FOR HARDENED STEELS

Corner Radius  $r$  For Steels Up to 55 Rc (mm)

(continued from previous page)

CUTTER DIAMETER			CUTTER HEAD LEN. mm	LENGTH OF CUT mm	SPINDLE SPEEDS rpm	FEED RATE mm/min	AVAILABLE LENGTHS	
1.00	1.50	2.00					L14	L16
HM 5056	1.00	0.05	055	100-150	210	0.10	200-210	210
HM 5056	1.50	0.05	060	100-150	110	0.10	200-210	210
HM 5056	2.00	0.05	065	100-150	120	0.10	200-210	210
HM 5056	2.50	0.05	070	100-150	130	0.10	200-210	210
HM 5056	3.00	0.05	075	100-150	140	0.10	200-210	210
HM 5056	4.00	0.05	080	100-150	150	0.10	200-210	210
HM 5056	5.00	0.05	090	100-150	160	0.10	200-210	210
HM 5056	6.00	0.05	100	100-150	170	0.10	200-210	210
	7.00	0.05	110	100-150	180	0.10	200-210	210
	8.00	0.05	120	100-150	190	0.10	200-210	210
	10.00	0.05	140	100-150	210	0.10	200-210	210
	12.00	0.05	160	100-150	230	0.10	200-210	210
	15.00	0.05	200	100-150	270	0.10	200-210	210
	20.00	0.05	260	100-150	340	0.10	200-210	210
	25.00	0.05	320	100-150	410	0.10	200-210	210
	30.00	0.05	380	100-150	480	0.10	200-210	210

### SPEEDS & FEEDS (End Mills for Hardened Steels - Series 8 - Corner Radius $r$ For Steels Up to 55 Rc)

**Important Note:** Always consult our technical literature and resources available at [www.cncforall.com](http://www.cncforall.com) for more detailed information and more cutting charts.   
 RPM=SPINDLE SPEED, FEED=FEED RATE,  $r$ =CORNER RADIUS,  $D$ =CUTTER DIAMETER,  $L$ =CUTTER HEAD LENGTH,  $C$ =CUTTING CHIP WIDTH,  $V_c$ =CUTTING SPEED,  $V_f$ =FEED PER TOOTH,  $V_m$ =METRIC FEED PER TOOTH.

Series	Cutter Dia.	Cutter Head Length	Chip Width For Each RPM & Feed Rate															Depth of Cut	Notes	
			0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.80	0.85	0.90	0.95			
Series 8 Standard	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	1.00	10-10
			0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.50
Series 8 Advanced	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	1.00	10-10
			0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.50



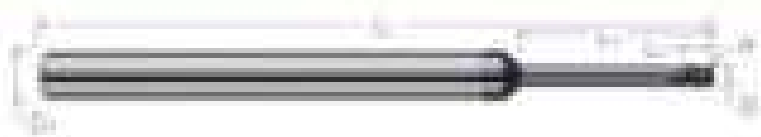
### Check Out Our New CNC Show!

Introducing Performance Technology National System from England. Our guests will show you specific cutting tool types, answering the questions that come with them. To help you accomplish more at the spindle.

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### END MILLS FOR HATHENED STEELS

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



5 Flute, Variable  
Flute Design

- Designed to mill hardened tool, die, and mold steels up to 55Rc
- Also suitable for stainless steel, Inconel®, titanium, and other high temperature alloys
- 5 Flute - variable flute design (variable .171) for improved cutting and chiping
- Stub Flute for maximum rigidity
- Lathe generated ATC taper seating offers superior stability and heat resistance
- Extended length diameter to maintain strength and stiffness - 10% shank increase for high precision tool holders
- Corrosion Inhibiting - Inert coating - 120° ground to the USA

Overall Length (L)	Shank Diameter (D_s)	Cutting Diameter (D_f)		Shank Length (L_s)	Overall Length (L)	ATC Seat (D_s)	
		Min.	Max.			Min.	Max.
200 (7.87)	800 (31.5)	807	814	175	212.5	800	815
250 (9.84)	800 (31.5)	807	814	175	262.5	800	815
300 (11.81)	800 (31.5)	807	814	175	312.5	800	815
350 (13.78)	800 (31.5)	807	814	175	362.5	800	815
400 (15.74)	800 (31.5)	807	814	175	412.5	800	815
450 (17.71)	800 (31.5)	807	814	175	462.5	800	815
500 (19.68)	800 (31.5)	807	814	175	512.5	800	815
550 (21.65)	800 (31.5)	807	814	175	562.5	800	815
600 (23.62)	800 (31.5)	807	814	175	612.5	800	815
650 (25.59)	800 (31.5)	807	814	175	662.5	800	815
700 (27.56)	800 (31.5)	807	814	175	712.5	800	815
750 (29.53)	800 (31.5)	807	814	175	762.5	800	815
800 (31.5)	800 (31.5)	807	814	175	812.5	800	815

Overall Length (L)	Shank Diameter (D_s)	Cutting Diameter (D_f)		Shank Length (L_s)	Overall Length (L)	ATC Seat (D_s)	
		Min.	Max.			Min.	Max.
100 (3.94)	200 (7.87)	207	214	75	127.5	200	215
150 (5.91)	200 (7.87)	207	214	75	177.5	200	215
200 (7.87)	200 (7.87)	207	214	75	227.5	200	215
250 (9.84)	200 (7.87)	207	214	75	277.5	200	215
300 (11.81)	200 (7.87)	207	214	75	327.5	200	215
350 (13.78)	200 (7.87)	207	214	75	377.5	200	215
400 (15.74)	200 (7.87)	207	214	75	427.5	200	215
450 (17.71)	200 (7.87)	207	214	75	477.5	200	215
500 (19.68)	200 (7.87)	207	214	75	527.5	200	215
550 (21.65)	200 (7.87)	207	214	75	577.5	200	215

#### SPEED & FEED (End Mills for Hardened Steels - Square & Corner Radius - For Steels Up to 55Rc - Long Reach, Stub Flute)

**Important Note:** Always consult your supplier and use formulas supplied in the Tool directory of the relevant catalog to determine correct tool speeds and feeds for your application. For longer lengths and rough finish, consult your tool supplier for tips.

Speed	Feeds	GPM	Cutting Speed (SFM) by Steel Grades														Depth of Cut		
			SAE 1045	SAE 1050	SAE 52100	SAE 4140	SAE 4142	SAE 4145	SAE 52100	SAE 4150	SAE 52100	SAE 4152	SAE 4155	SAE 52100	SAE 52100	Inches	MM		
5000	Standard	0.010	2400	2600	2800	2800	2800	3000	3000	3000	3200	3200	3200	3200	3200	3200	3200	0.010	0.254
	High	0.008	2600	2800	3000	3000	3000	3200	3200	3200	3400	3400	3400	3400	3400	3400	3400	0.008	0.203
4000	Standard	0.012	2600	2800	3000	3000	3000	3200	3200	3200	3400	3400	3400	3400	3400	3400	3400	0.012	0.305
	High	0.010	2800	3000	3200	3200	3200	3400	3400	3400	3600	3600	3600	3600	3600	3600	3600	0.010	0.254

## END MILLS FOR HARDENED STEELS

### Square - For Steels 45 - 60 Hrc



7 Flute, variable  
Flute Design

RECOMMENDED END MILLS

- Designed to mill hardened steels between 45Hrc and 60Hrc (including stainless, tool, and mold steels)
- 7 Flute, variable flute design (variable FFD) and geometrical geometry for improved machine removal rates
- Ideal geometric FFD from allowing efficient material removal and tool lifespan
- All sizes suitable for high-pressure Coolant-Through cutting (as well as other cutting)
- Ball finish - CNC ground to the flute

SK 7500 Sk 7500	SK 7500 Sk 7500	SK 7500 Sk 7500	SK 7500 Sk 7500	SK 7500 Sk 7500
SK 7500	SK 7500	SK 7500	SK 7500	SK 7500
SK 7500	SK 7500	SK 7500	SK 7500	SK 7500
SK 7500	SK 7500	SK 7500	SK 7500	SK 7500
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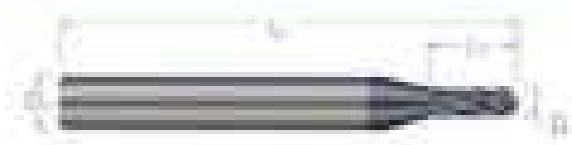
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SK 7500	SK 7500	SK 7500	SK 7500	SK 7500
SK 7500	SK 7500	SK 7500	SK 7500	SK 7500
SK 7500	SK 7500	SK 7500	SK 7500	SK 7500
SK 7500	SK 7500	SK 7500	SK 7500	SK 7500
SK 7500	SK 7500	SK 7500	SK 7500	SK 7500
SK 7500	SK 7500	SK 7500	SK 7500	SK 7500
SK 7500	SK 7500	SK 7500	SK 7500	SK 7500
SK 7500	SK 7500	SK 7500	SK 7500	SK 7500

PLEASE SEE SPECS & PRICES ON PAGE 119



## END MILLS FOR HARDENED STEELS

Ball - For Steels A5 - 63 Rc



6 Flute, Variable  
rake Design

- Designed to mill hardened steels between 45 Rc and 63 Rc (including stainless, tool, and mold steels)
- 6 Flute, variable rake design (patent # 7,771,497) and specialized geometry for improved material removal rate
- Latest generation 6 Flute design featuring ultra superior hardness and heat resistance
- 60 degree clearance for high precision tool holders
- Center cutting
- Hole drilling
- CNC ground to the 4th

Diameter Ø (mm)	Length L (mm)	Width to Center Ø (mm)	Overall Length L (mm)	Stock Length (mm)	
				STK	PMK
Ø12 (Ø12)	100 (100)	12	112	112	112
Ø16 (Ø16)	100 (100)	16	112	112	112
Ø20 (Ø20)	100 (100)	20	112	112	112
Ø25 (Ø25)	100 (100)	25	112	112	112
Ø32 (Ø32)	100 (100)	32	112	112	112
Ø40 (Ø40)	100 (100)	40	112	112	112
Ø50 (Ø50)	100 (100)	50	112	112	112
Ø63 (Ø63)	100 (100)	63	112	112	112

### SPRINGS & PISTONS | End Mills for Hardened Steels - Ball - For Steels 45 - 63 Rc

**Important Note:** Harvey Performance Tool does not warrant or guarantee the life span of an end mill. The above chart of stock dimensions is for reference only. Actual dimensions may vary. For more information on our products, please visit our website at [www.harveytool.com](http://www.harveytool.com).

Item	Part No.	QTY	Description	This chart lists items only by length. Please refer to the chart on the next page for stock length.												Stock Length mm	Stock Length mm
				100	125	150	175	200	225	250	275	300	325	350	375		
End Mill	Ø12 (Ø12)	1	6 Flute, Variable Rake Design	112	112	112	112	112	112	112	112	112	112	112	112	112	112
End Mill	Ø16 (Ø16)	1	6 Flute, Variable Rake Design	112	112	112	112	112	112	112	112	112	112	112	112	112	112
End Mill	Ø20 (Ø20)	1	6 Flute, Variable Rake Design	112	112	112	112	112	112	112	112	112	112	112	112	112	112
End Mill	Ø25 (Ø25)	1	6 Flute, Variable Rake Design	112	112	112	112	112	112	112	112	112	112	112	112	112	112
End Mill	Ø32 (Ø32)	1	6 Flute, Variable Rake Design	112	112	112	112	112	112	112	112	112	112	112	112	112	112
End Mill	Ø40 (Ø40)	1	6 Flute, Variable Rake Design	112	112	112	112	112	112	112	112	112	112	112	112	112	112
End Mill	Ø50 (Ø50)	1	6 Flute, Variable Rake Design	112	112	112	112	112	112	112	112	112	112	112	112	112	112
End Mill	Ø63 (Ø63)	1	6 Flute, Variable Rake Design	112	112	112	112	112	112	112	112	112	112	112	112	112	112



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## END MILLS FOR HARDENED STEELS

### Corner Radius - For Steels 45 - 68 Rc



### 7 Flute, Variable Helix Design

- Designed to cut hardened steels between 45 Rc and 68 Rc (including stainless, tool, and exotic steels)
- 7 flute, variable helix design (up to 30°) and optimized geometry for increased material removal rates.
- Latest generation HR steel coating offers superior hardness and tool resistance
- Coarse cutting for increased throughput      • HR coating optimized for high pressure fluid cutting
- Best cutting and overall cutting      • Feed surface      • DRG approved by the ISO.

CORNER RADIUS	CORNER RADIUS	LENGTH	LENGTH	CORNER RADIUS	ITEM NUMBER		
R (mm)	R (mm)	L (mm)	L (mm)	R (mm)	CO	CRG	
300	300	300	1200	1.0	0.25	80300300300100	73400
300	300	300	1200	1.5	0.25	80300300300105	73400
300	300	300	1200	2.0	0.25	80300300300110	73400
300	300	300	1200	3.0	0.25	80300300300115	73400
300	300	300	1200	4.0	0.25	80300300300120	73400
300	300	300	1200	5.0	0.25	80300300300125	73400
300	300	300	1200	6.0	0.25	80300300300130	73400
300	300	300	1200	8.0	0.25	80300300300140	73400
300	300	300	1200	10.0	0.25	80300300300150	73400
300	300	300	1200	15.0	0.25	80300300300160	73400
300	300	300	1200	20.0	0.25	80300300300170	73400
300	300	300	1200	30.0	0.25	80300300300180	73400
300	300	300	1200	40.0	0.25	80300300300190	73400
300	300	300	1200	50.0	0.25	80300300300200	73400
300	300	300	1200	75.0	0.25	80300300300210	73400
300	300	300	1200	100.0	0.25	80300300300220	73400
300	300	300	1200	150.0	0.25	80300300300230	73400
300	300	300	1200	200.0	0.25	80300300300240	73400
300	300	300	1200	300.0	0.25	80300300300250	73400
300	300	300	1200	400.0	0.25	80300300300260	73400
300	300	300	1200	500.0	0.25	80300300300270	73400
300	300	300	1200	750.0	0.25	80300300300280	73400
300	300	300	1200	1000.0	0.25	80300300300290	73400
ITEM NUMBER	CORNER RADIUS	LENGTH	LENGTH	CORNER RADIUS	CO	CRG	
80300300300010	300	300	1200	1.0	0.25	80300300300010	73400
80300300300015	300	300	1200	1.5	0.25	80300300300015	73400
80300300300020	300	300	1200	2.0	0.25	80300300300020	73400
80300300300025	300	300	1200	3.0	0.25	80300300300025	73400
80300300300030	300	300	1200	4.0	0.25	80300300300030	73400
80300300300035	300	300	1200	5.0	0.25	80300300300035	73400
80300300300040	300	300	1200	6.0	0.25	80300300300040	73400
80300300300045	300	300	1200	8.0	0.25	80300300300045	73400
80300300300050	300	300	1200	10.0	0.25	80300300300050	73400

(continued on next page)





**END MILLS FOR HATCHED STEELS**

Finishing - Ball nose

Continued from previous page

ITEM NUMBER			LENGTH OF CUT	OVERALL WIDTH		DEPTH OF CUT	OVERALL LENGTH		WITH HANDLE (F 1207)		WITH HANDLE (F 1220)	
ITEM CODE	ITEM NAME	ITEM NUMBER		INCH	MILLIMETER		INCH	MILLIMETER	LN	LN2	LN	LN2
100	100	100	100			100	100					
101	100	100	100	100	100	100	100					
102	100	100	100	100	100	100	100					
103	100	100	100	100	100	100	100					
104	100	100	100	100	100	100	100					
105	100	100	100	100	100	100	100					
106	100	100	100	100	100	100	100					
107	100	100	100	100	100	100	100					
	1000	100	1000	1000	100	1000	1000					
	1000	100	1000	1000	100	1000	1000					
108	100	100	100	100	100	100	100					
109	100	100	100	100	100	100	100					
110 1000	100	100	100	100	100	100	100					
111 1000	100	100	100	100	100	100	100					
112 1000	100	100	100	100	100	100	100			1000	1000	
113 1000	100	100	100	100	100	100	100			1000	1000	
114 1000	100	100	100	100	100	100	100					
115 1000	100	100	100	100	100	100	100					
116 1000	100	100	100	100	100	100	100					
117 1000	100	100	100	100	100	100	100					
118	100	100	100	100	100	100	100					
119	100	100	100	100	100	100	100					
120	100	100	100	100	100	100	100					
121	100	100	100	100	100	100	100					
122 1000	100	100	100	100	100	100	100					
123 1000	100	100	100	100	100	100	100					
124 1000	100	100	100	100	100	100	100			1000	1000	
125 1000	100	100	100	100	100	100	100			1000	1000	
126 1000	100	100	100	100	100	100	100					
127 1000	100	100	100	100	100	100	100					
128 1000	100	100	100	100	100	100	100					
129 1000	100	100	100	100	100	100	100					
130 1000	100	100	100	100	100	100	100					
131 1000	100	100	100	100	100	100	100					
132 1000	100	100	100	100	100	100	100					
133 1000	100	100	100	100	100	100	100					
134 1000	100	100	100	100	100	100	100			1000	1000	
135 1000	100	100	100	100	100	100	100			1000	1000	
136 1000	100	100	100	100	100	100	100					
137 1000	100	100	100	100	100	100	100					
138 1000	100	100	100	100	100	100	100					
139 1000	100	100	100	100	100	100	100					
140 1000	100	100	100	100	100	100	100					
141 1000	100	100	100	100	100	100	100					
142 1000	100	100	100	100	100	100	100					
143 1000	100	100	100	100	100	100	100					
144 1000	100	100	100	100	100	100	100					
145 1000	100	100	100	100	100	100	100					
146 1000	100	100	100	100	100	100	100					
147 1000	100	100	100	100	100	100	100					
148 1000	100	100	100	100	100	100	100					
149 1000	100	100	100	100	100	100	100					
150 1000	100	100	100	100	100	100	100					

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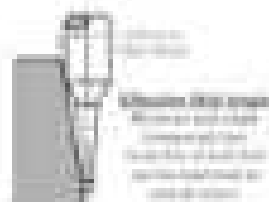


## END MILLS FOR HARDENED STEELS

### Finistors - Ball - Tapered Neck



- Designed to grind and finish hardened tool, die, and mold steels 48Hc to 62Hc
- Built tapered neck for increased rigidity and strength
- Ball radius gives for improved edge control
- Latest generation 40% NiCo coating offers superior fracture and wear resistance
- Reverse flutes and flare relief help cool chip and evacuate, and promote faster
- Increased flute diameter for maximum strength and stiffness
- 10° chamfered for fast precision tool holders
- 2 Flutes
- Double cutting
- ISO grade G10



ITEM NO.	OUTER DIAMETER	LENGTH OF CUT	TYPE	TAPERED NECK		SHOULDER RADIUS	BALL DIAMETER	FLUTE LENGTH	FINISH TOLERANCE	
				D <sub>1</sub> (mm)	L <sub>1</sub> (mm)				R <sub>1</sub>	R <sub>2</sub>
G10	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125
	60-1100	100	1	400	100	0.075	1.0	0-1.0	0.0125	0.0125

(continued on next page)

TYPE I



TYPE II





## END MILLS FOR HARDENED STEELS

Finishers - Ball - Tapered Nose (cont.)

continued from previous page

ITEM NO.	CUTTER DIAMETER	LENGTH OF CUT	TYPE	TAPERED NOSSE	OVERALL LENGTH	APPROX. MAX. RPM	CUTTER DIAMETER	LENGTH OF CUT	ITEM NAME	
									IN	MM
L-8	60-1100	.001	1	.000	.075	300	.001	0.10	601100-01	10.00
	60-1100	.001	1	.000	.080	300	.001	0.10	601100-02	10.75
	60-1100	.001	1	.075	.075	300	.001	0.10	601100-03	10.00
	60-1110	.001	1	.000	.100	300	.001	0.10	601110-01	10.00
	60-1110	.001	1	.000	.100	300	.001	0.0	601110-02	10.00
	60-1100	.001	1	.000	.100	300	.001	0.10	601100-04	10.00
	60-1100	.001	1	.000	.100	300	.001	0.0	601100-05	10.00
	60-1100	.001	1	.000	.100	300	.001	0.0	601100-06	10.00
	60-1100	.001	1	.000	.100	300	.001	0.0	601100-07	10.00
	60-1100	.001	1	.000	.100	300	.001	0.10	601100-08	10.00
	60-1100	.001	0	.000	.000	300	.001	0.0	601100-09	10.00
L-9	60-1100	.001	1	.110	.110	300	.001	0.10	601100-10	10.00
	60-1100	.001	1	.110	.100	300	.001	0.10	601100-11	10.00
	60-1100	.001	1	.075	.100	300	.001	0.10	601100-12	10.00
	60-1100	.001	1	.100	.100	300	.001	0.0	601100-13	10.00
	60-1110	.001	1	.075	.110	300	.001	0.10	601110-01	11.00
	60-1110	.001	0	.000	.000	300	.001	0.0	601110-02	11.00
	60-1100	.001	1	.100	.100	300	.001	0.0	601100-14	10.00
	60-1100	.001	0	.000	.000	300	.001	0.0	601100-15	10.00
	60-1100	.001	1	.000	.100	300	.001	0.10	601100-16	11.00
	60-1100	.001	0	.075	.075	300	.001	0.0	601100-17	10.00
	60-1100	.001	0	.000	.000	300	.001	0.0	601100-18	10.00
60-1100	.001	0	.000	.000	300	.001	0.0	601100-19	10.00	

ITEM NO. 601100-09



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# END MILLS FOR HARDENED STEELS

## Finistars – Corner Radius



- Designed to profile and finish hardened tool, die, and mold steels (HRC to 65HRC)
- Sharp outside grate for improved edge retention
- 1.5mm generous WFL for coating while ensuring hardness and heat resistance
- Finishing products that have large equal outer diameter and isotropic wear
- Increased shank diameter to maximize strength and stiffness
- 30 degree chamfer for high pressure tool holders - - Gender cutting
- 100% ground to the USA



Finistars  
Specialty  
Tool Grinding

OUTER DIAMETER	SHANK DIAMETER	LENGTH OF CUT	SHANK DIAMETER	SHANK DIAMETER	SHANK LENGTH	FINISH GRIND 1.5mm WFL		FINISH GRIND 1.0mm WFL	
D (mm)	Ø (mm)	L (mm)	D (mm)	D (mm)	L (mm)	FTN	MM T	FTN	MM T
0.1	0.1	0.1	0.1	0.1	0.1	999900	9999		
0.125	0.125	0.125	0.125	0.125	0.125	999900	9999		
0.150	0.150	0.150	0.150	0.150	0.150	999900	9999	999900	9999
0.200	0.200	0.200	0.200	0.200	0.200	999900	9999		
0.250	0.250	0.250	0.250	0.250	0.250	999900	9999		
0.300	0.300	0.300	0.300	0.300	0.300	999900	9999		
0.375	0.375	0.375	0.375	0.375	0.375	999900	9999	999900	9999
0.400	0.400	0.400	0.400	0.400	0.400	999900	9999		
0.500	0.500	0.500	0.500	0.500	0.500	999900	9999	999900	9999
0.600	0.600	0.600	0.600	0.600	0.600	999900	9999	999900	9999
0.750	0.750	0.750	0.750	0.750	0.750	999900	9999		
0.900	0.900	0.900	0.900	0.900	0.900	999900	9999		
1.000	1.000	1.000	1.000	1.000	1.000	999900	9999	999900	9999
1.250	1.250	1.250	1.250	1.250	1.250	999900	9999		
1.500	1.500	1.500	1.500	1.500	1.500	999900	9999		
1.750	1.750	1.750	1.750	1.750	1.750	999900	9999		
2.000	2.000	2.000	2.000	2.000	2.000	999900	9999		
2.500	2.500	2.500	2.500	2.500	2.500	999900	9999	999900	9999
3.000	3.000	3.000	3.000	3.000	3.000	999900	9999	999900	9999
3.500	3.500	3.500	3.500	3.500	3.500	999900	9999		
4.000	4.000	4.000	4.000	4.000	4.000	999900	9999		
4.500	4.500	4.500	4.500	4.500	4.500	999900	9999		
5.000	5.000	5.000	5.000	5.000	5.000	999900	9999		
5.500	5.500	5.500	5.500	5.500	5.500	999900	9999		
6.000	6.000	6.000	6.000	6.000	6.000	999900	9999		
6.500	6.500	6.500	6.500	6.500	6.500	999900	9999		
7.000	7.000	7.000	7.000	7.000	7.000	999900	9999		
7.500	7.500	7.500	7.500	7.500	7.500	999900	9999		
8.000	8.000	8.000	8.000	8.000	8.000	999900	9999		
8.500	8.500	8.500	8.500	8.500	8.500	999900	9999		
9.000	9.000	9.000	9.000	9.000	9.000	999900	9999		
9.500	9.500	9.500	9.500	9.500	9.500	999900	9999		
10.000	10.000	10.000	10.000	10.000	10.000	999900	9999		
12.000	12.000	12.000	12.000	12.000	12.000	999900	9999		
15.000	15.000	15.000	15.000	15.000	15.000	999900	9999		
20.000	20.000	20.000	20.000	20.000	20.000	999900	9999		
25.000	25.000	25.000	25.000	25.000	25.000	999900	9999		
30.000	30.000	30.000	30.000	30.000	30.000	999900	9999		
35.000	35.000	35.000	35.000	35.000	35.000	999900	9999		
40.000	40.000	40.000	40.000	40.000	40.000	999900	9999		
50.000	50.000	50.000	50.000	50.000	50.000	999900	9999		
60.000	60.000	60.000	60.000	60.000	60.000	999900	9999		
70.000	70.000	70.000	70.000	70.000	70.000	999900	9999		
80.000	80.000	80.000	80.000	80.000	80.000	999900	9999		
90.000	90.000	90.000	90.000	90.000	90.000	999900	9999		
100.000	100.000	100.000	100.000	100.000	100.000	999900	9999		

continued on next page





## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Square



- Optimized for titanium alloys, Inconel, nickel alloys, and other high-temperature materials with outstanding performance in stainless steels, aluminum steels, and tool steels.
- Variable helix design (up to 30°) reduces chatter and increases tool longevity and productivity.
- Large geometry BTN design allows efficient coolant delivery and chip evacuation.
- 30° chamfer reduces top edge stresses and improves chip formation for clean up to 40%.
- Coated cutting - P-Bond coating - P-Coat ground to the USA.

COUPLER DIAMETER	LENGTH OF CUT	FLUTE LENGTH	FLUTE ANGLE	FLUTE WIDTH	TYPICAL SPEED	SFM RANGE FEED RATE	
						MIN. FPM	MAX. FPM
1/16"	3/16"	3/32"	0°	1/16"	6000	14000-18	10-20
1/16"	3/16"	1/16"	0°	1/16"	12000	27000-18	20-40
1/16"	3/16"	3/64"	0°	1/16"	12000	27000-18	20-40
1/16"	3/16"	3/64"	0°	1/16"	6000	14000-18	20-40
1/8"	3/16"	3/32"	0°	1/8"	12000	27000-24	40-80
1/8"	3/16"	1/16"	0°	1/8"	24000	54000-24	80-160
1/8"	3/16"	3/64"	4°	1/8"	24000	54000-24	80-160
1/8"	3/16"	3/64"	0°	1/8"	12000	27000-24	80-160
1/8"	3/16"	3/64"	4°	1/8"	12000	27000-24	80-160
1/8"	3/16"	3/64"	0°	1/8"	6000	14000-24	160-320
1/8"	3/16"	3/64"	0°	1/8"	6000	14000-24	160-320
1/4"	3/16"	3/32"	0°	1/4"	12000	27000-30	320-640
1/4"	3/16"	1/16"	0°	1/4"	24000	54000-30	640-1280
1/4"	3/16"	1/16"	0°	1/4"	24000	54000-30	640-1280
1/4"	3/16"	3/64"	4°	1/4"	24000	54000-30	640-1280
1/4"	3/16"	3/64"	0°	1/4"	12000	27000-30	640-1280
1/4"	3/16"	3/64"	0°	1/4"	6000	14000-30	1280-2560
1/4"	3/16"	3/64"	4°	1/4"	6000	14000-30	1280-2560
1/2"	3/16"	3/32"	0°	1/2"	12000	27000-36	1280-2560
1/2"	3/16"	1/16"	0°	1/2"	24000	54000-36	2560-5120
1/2"	3/16"	1/16"	0°	1/2"	24000	54000-36	2560-5120
1/2"	3/16"	3/64"	4°	1/2"	24000	54000-36	2560-5120
1/2"	3/16"	3/64"	0°	1/2"	12000	27000-36	2560-5120
1/2"	3/16"	3/64"	0°	1/2"	6000	14000-36	5120-10240
1/2"	3/16"	3/64"	4°	1/2"	6000	14000-36	5120-10240

(continued on next page)



## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Square (cont.)

continued from previous page

SERIAL NO.	TOOTH GEOMETRY		LENGTH OF CUT	RPM	FEED RATE	CUTTING SPEED	APPLICABLE MATERIALS	
	TOOTH FLUTE	TOOTH WIDTH					GROUP 1	GROUP 2
100	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
101	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
102	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
103	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
104	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
105	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
106	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
107	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
108	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
109	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
110	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
111	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
112	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
113	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
114	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
115	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
116	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
117	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
118	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
119	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
120	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
121	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
122	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
123	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
124	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
125	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
126	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
127	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
128	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
129	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
130	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
131	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
132	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
133	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
134	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
135	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
136	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
137	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
138	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
139	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
140	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
141	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
142	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
143	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
144	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
145	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
146	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
147	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
148	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
149	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00
150	1/8-3/16	1/16	0.001-0.002	0	0.001	0.001	ALUMINUM	30.00

continued on next page





**VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS**

Figure 1000-1

continued from previous page

DUTY CODE			LENGTH OF CUT L (inches)	FLUTES	SHAFT DIAMETER D <sub>s</sub> (in)	OVERALL LENGTH L <sub>t</sub>	DIPPER-HEAD	
1-20	1-30	Overall diameter					PRG 2	PRG 3
60-1-10	100		100	4	1.0	11.10	9000-10	40.00
60-1-15	100		150	4	1.0	11.10	9000-10	49.00
60-1-20	100		200	4	1.0	11.10	9000-10	58.00
60-1-30	100		300	4	1.0	11.10	9000-10	87.00
60-1-40	100		400	4	1.0	11.10	9000-10	116.00
60-1-50	100		500	4	1.0	11.10	9000-10	145.00
60-1-75	100		750	4	1.0	11.10	9000-10	214.00
60-1-100	100		1000	4	1.0	11.10	9000-10	283.00
60-2-10	100		100	4	0.75	7.70	9000-10	32.00
60-2-15	100		150	4	0.75	7.70	9000-10	41.00
60-2-20	100		200	4	0.75	7.70	9000-10	50.00
60-2-30	100		300	4	0.75	7.70	9000-10	79.00
60-2-40	100		400	4	0.75	7.70	9000-10	108.00
60-2-50	100		500	4	0.75	7.70	9000-10	137.00
60-2-75	100		750	4	0.75	7.70	9000-10	206.00
60-2-100	100		1000	4	0.75	7.70	9000-10	275.00
60-3-10	100	100	1000-600	4	0.60	6.30	9000-10	40.00
70-1-10	110		100	4	0.75	7.70	9011-10	39.00
70-1-15	110		150	4	0.75	7.70	9011-10	48.00
70-1-20	110		200	4	0.75	7.70	9011-10	57.00
70-1-30	110		300	4	0.75	7.70	9011-10	86.00
70-1-40	110		400	4	0.75	7.70	9011-10	115.00
70-1-50	110		500	4	0.75	7.70	9011-10	144.00
70-1-75	110		750	4	0.75	7.70	9011-10	213.00
70-1-100	110		1000	4	0.75	7.70	9011-10	282.00
70-2-10	110	100	1000-600	4	0.60	6.30	9011-10	41.00
70-3-10	110		100	3	0.5	5.10	9033-10	44.00
70-3-15	110		150	3	0.5	5.10	9033-10	53.00
70-3-20	110		200	3	0.5	5.10	9033-10	62.00
70-3-30	110		300	3	0.5	5.10	9033-10	91.00
70-3-40	110		400	3	0.5	5.10	9033-10	120.00
70-3-50	110		500	3	0.5	5.10	9033-10	149.00
70-3-75	110		750	3	0.5	5.10	9033-10	218.00
70-3-100	110		1000	3	0.5	5.10	9033-10	287.00
70-4-10	110	100	1000-600	4	0.4	4.70	9055-10	44.00
70-4-15	110	100	1500-600	4	0.4	4.70	9055-10	53.00
70-4-20	110	100	2000-600	4	0.4	4.70	9055-10	62.00
70-4-30	110	100	3000-600	4	0.4	4.70	9055-10	91.00
70-4-40	110	100	4000-600	4	0.4	4.70	9055-10	120.00
70-4-50	110	100	5000-600	4	0.4	4.70	9055-10	149.00
70-4-75	110	100	7500-600	4	0.4	4.70	9055-10	218.00
70-4-100	110	100	10000-600	4	0.4	4.70	9055-10	287.00
70-5-10	110	100	1000-600	4	0.3	4.30	9077-10	44.00
70-5-15	110	100	1500-600	4	0.3	4.30	9077-10	53.00
70-5-20	110	100	2000-600	4	0.3	4.30	9077-10	62.00
70-5-30	110	100	3000-600	4	0.3	4.30	9077-10	91.00
70-5-40	110	100	4000-600	4	0.3	4.30	9077-10	120.00
70-5-50	110	100	5000-600	4	0.3	4.30	9077-10	149.00
70-5-75	110	100	7500-600	4	0.3	4.30	9077-10	218.00
70-5-100	110	100	10000-600	4	0.3	4.30	9077-10	287.00

**PLEASE SEE SPECS & FEEDS ON PAGE 100**

## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

### Square - Long Reach, Stub Flute



- Designed for stainless steels, Inconel, nickel alloys, and other high temperature materials with excellent geometry for difficult-to-machine steels, stainless steels, and cast alloys
- Long reach design for deep cavities - 6x reduced run distance to avoid loading
- Variable helix design (Laporté™ HP) reduces chatter and harmonics and increases material removal rate
- Laser generated ATC flutes coating stress resistant hardness and heat resistance
- 12 degree taper angle for high pressure cool liquids - 1/2 suitable for stream up to 1000
- Corner cutting - 1/2 hole option - 1/2 90° ground in the slot

D mm	D in.	Length mm	Length in.	Overall Length mm	Flutes	Taper in mm/ft	Taper in.	Average Length	
								mm	in.
1.5	.06	110	4.3	112.5	5	.14	0.12	105.0	4.13
2.0	.08	110	4.3	112.5	5	.17	0.12	105.0	4.13
2.5	.10	110	4.3	112.5	5	.18	0.12	105.0	4.13
3.0	.12	110	4.3	112.5	5	.19	0.12	105.0	4.13
4.0	.16	110	4.3	112.5	5	.23	0.12	105.0	4.13
5.0	.20	110	4.3	112.5	5	.24	0.12	105.0	4.13
6.0	.24	110	4.3	112.5	5	.25	0.12	105.0	4.13
8.0	.32	110	4.3	112.5	5	.28	0.12	105.0	4.13
10.0	.40	110	4.3	112.5	5	.31	0.12	105.0	4.13
12.0	.48	110	4.3	112.5	5	.33	0.12	105.0	4.13
15.0	.60	110	4.3	112.5	5	.35	0.12	105.0	4.13
18.0	.72	110	4.3	112.5	5	.37	0.12	105.0	4.13
20.0	.80	110	4.3	112.5	5	.38	0.12	105.0	4.13
25.0	1.00	110	4.3	112.5	5	.42	0.12	105.0	4.13
30.0	1.20	110	4.3	112.5	5	.45	0.12	105.0	4.13
35.0	1.40	110	4.3	112.5	5	.47	0.12	105.0	4.13
40.0	1.60	110	4.3	112.5	5	.49	0.12	105.0	4.13
45.0	1.80	110	4.3	112.5	5	.51	0.12	105.0	4.13
50.0	2.00	110	4.3	112.5	5	.53	0.12	105.0	4.13
60.0	2.40	110	4.3	112.5	5	.57	0.12	105.0	4.13
70.0	2.80	110	4.3	112.5	5	.60	0.12	105.0	4.13
80.0	3.20	110	4.3	112.5	5	.63	0.12	105.0	4.13
90.0	3.60	110	4.3	112.5	5	.65	0.12	105.0	4.13
100.0	4.00	110	4.3	112.5	5	.67	0.12	105.0	4.13
120.0	4.80	110	4.3	112.5	5	.71	0.12	105.0	4.13
150.0	6.00	110	4.3	112.5	5	.75	0.12	105.0	4.13
180.0	7.20	110	4.3	112.5	5	.79	0.12	105.0	4.13
200.0	8.00	110	4.3	112.5	5	.81	0.12	105.0	4.13
250.0	10.00	110	4.3	112.5	5	.85	0.12	105.0	4.13
300.0	12.00	110	4.3	112.5	5	.89	0.12	105.0	4.13
350.0	14.00	110	4.3	112.5	5	.91	0.12	105.0	4.13
400.0	16.00	110	4.3	112.5	5	.93	0.12	105.0	4.13
450.0	18.00	110	4.3	112.5	5	.95	0.12	105.0	4.13
500.0	20.00	110	4.3	112.5	5	.97	0.12	105.0	4.13
600.0	24.00	110	4.3	112.5	5	1.01	0.12	105.0	4.13
700.0	28.00	110	4.3	112.5	5	1.05	0.12	105.0	4.13
800.0	32.00	110	4.3	112.5	5	1.09	0.12	105.0	4.13
900.0	36.00	110	4.3	112.5	5	1.13	0.12	105.0	4.13
1000.0	40.00	110	4.3	112.5	5	1.17	0.12	105.0	4.13

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## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Reground – Long Reach, Start Flute (mm)

(continued from previous page)

CUTTER DIMENSIONS			MAXIMUM DEPTH OF CUT <i>L<sub>z</sub></i>	PIECE POINT <i>L<sub>p</sub></i>	NUMBER OF FLUTES	LENGTH OF SHARP LENGTH <i>L<sub>s</sub></i>	APPROXIMATE MATERIAL REMOVAL RATE	
MODEL	LENGTH OF SHARP LENGTH <i>L<sub>s</sub></i>	DIAMETER					FEED <i>f<sub>z</sub></i>	SPINDLE SPEED <i>S</i>
MSL275	275	100	125	200	4	175	2-12	50-200
MSL280	280	100	125	200	4	175	2-12	50-200
MSL285	285	100	125	200	4	175	2-12	50-200
MSL290	290	100	125	200	4	175	2-12	50-200
MSL295	295	100	125	200	4	175	2-12	50-200
MSL300	300	100	125	200	4	175	2-12	50-200
MSL310	310	100	125	200	4	175	2-12	50-200
MSL320	320	100	125	200	4	175	2-12	50-200
MSL330	330	100	125	200	4	175	2-12	50-200
MSL340	340	100	125	200	4	175	2-12	50-200
MSL350	350	100	125	200	4	175	2-12	50-200
MSL360	360	100	125	200	4	175	2-12	50-200
MSL370	370	100	125	200	4	175	2-12	50-200
MSL380	380	100	125	200	4	175	2-12	50-200
MSL390	390	100	125	200	4	175	2-12	50-200
MSL400	400	100	125	200	4	175	2-12	50-200
MSL410	410	100	125	200	4	175	2-12	50-200
MSL420	420	100	125	200	4	175	2-12	50-200
MSL430	430	100	125	200	4	175	2-12	50-200
MSL440	440	100	125	200	4	175	2-12	50-200
MSL450	450	100	125	200	4	175	2-12	50-200
MSL460	460	100	125	200	4	175	2-12	50-200
MSL470	470	100	125	200	4	175	2-12	50-200
MSL480	480	100	125	200	4	175	2-12	50-200
MSL490	490	100	125	200	4	175	2-12	50-200
MSL500	500	100	125	200	4	175	2-12	50-200
MSL510	510	100	125	200	4	175	2-12	50-200
MSL520	520	100	125	200	4	175	2-12	50-200
MSL530	530	100	125	200	4	175	2-12	50-200
MSL540	540	100	125	200	4	175	2-12	50-200
MSL550	550	100	125	200	4	175	2-12	50-200
MSL560	560	100	125	200	4	175	2-12	50-200
MSL570	570	100	125	200	4	175	2-12	50-200
MSL580	580	100	125	200	4	175	2-12	50-200
MSL590	590	100	125	200	4	175	2-12	50-200
MSL600	600	100	125	200	4	175	2-12	50-200

PLEASE SEE SPEEDS & FEEDS ON PAGE 108



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## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Square - Reduced Shank



- Optimized for titanium alloys, Inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine alloys, stainless steels, and cast steels
- Variable flute design (VFD) reduces chatter and harmonics and increases radial cutting rate
- Reduced strength shank allows easy changing length
- Latest generation of HSS coatings offers superior hardness and wear resistance
- All shanks increase for high precision tool holders
- Suitable for diameters up to 4.00"
- Stock cutting
- Dual coolant
- CNC ground in the USA

FLUTE DIAMETER	LENGTH OF CUT	FLUTES	SHANK DIAMETER	LENGTH ADJUST	VARIABLE FLUTE DESIGN	
					FLUTE 1	FLUTE 2
1/8" (0.315)	1/4" (0.635)	4	0.250	0.125	0.00000	0.00000
1/4" (0.635)	3/8" (0.952)	4	0.500	0.250	0.00000	0.00000
3/8" (0.952)	1/2" (1.270)	4	0.750	0.375	0.00000	0.00000
1/2" (1.270)	5/8" (1.587)	4	1.000	0.500	0.00000	0.00000
5/8" (1.587)	3/4" (1.905)	4	1.250	0.625	0.00000	0.00000
3/4" (1.905)	7/8" (2.222)	4	1.500	0.750	0.00000	0.00000
1" (2.540)	1" (2.540)	4	1.750	0.875	0.00000	0.00000

## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

### MILL



- Optimized for finishing alloys, steels, cast alloys, and other high temperature materials with outstanding performance in difficult-to-machine steels, titanium alloys, and cast alloys
- Variable helix design (VHDL™) reduces chatter and improves tool longevity while increasing productivity
- Lowest generating MQL flow coating offers superior finishing and tool protection
- All sizes featuring top precision tool holders • Suitable for speeds up to 40,000
- Coated turning • Drill inserts • CBN ground drills (CNC)

CUTTING PARAMETERS			LENGTH OF CUT L (mm)	FLUTE	RPM @ MAX FEED	FEED RATE F (mm/min)	STOCK REMOVAL	
TYPE	FINISH	MAX. DEPTH OF CUT A (mm)					TYPE 1	TYPE 2
100	0.05	0.15	25.00	0	4000	18.00	0.05	0.10
125	0.05	0.15	31.75	0	3200	17.00	0.05	0.10
150	0.05	0.15	38.50	0	2800	16.00	0.05	0.10
175	0.05	0.15	45.25	0	2400	15.00	0.05	0.10
200	0.05	0.15	52.00	0	2000	14.00	0.05	0.10
225	0.05	0.15	58.75	0	1800	13.00	0.05	0.10
250	0.05	0.15	65.50	0	1600	12.00	0.05	0.10
275	0.05	0.15	72.25	0	1400	11.00	0.05	0.10
300	0.05	0.15	79.00	0	1200	10.00	0.05	0.10
325	0.05	0.15	85.75	0	1100	9.00	0.05	0.10
350	0.05	0.15	92.50	0	1000	8.00	0.05	0.10
375	0.05	0.15	99.25	0	900	7.00	0.05	0.10
400	0.05	0.15	106.00	0	800	6.00	0.05	0.10
425	0.05	0.15	112.75	0	750	5.50	0.05	0.10
450	0.05	0.15	119.50	0	700	5.00	0.05	0.10
475	0.05	0.15	126.25	0	650	4.50	0.05	0.10
500	0.05	0.15	133.00	0	600	4.00	0.05	0.10
525	0.05	0.15	139.75	0	550	3.50	0.05	0.10
550	0.05	0.15	146.50	0	500	3.00	0.05	0.10
575	0.05	0.15	153.25	0	450	2.50	0.05	0.10
600	0.05	0.15	160.00	0	400	2.00	0.05	0.10
625	0.05	0.15	166.75	0	350	1.50	0.05	0.10
650	0.05	0.15	173.50	0	300	1.00	0.05	0.10
675	0.05	0.15	180.25	0	250	0.50	0.05	0.10
700	0.05	0.15	187.00	0	200	0.20	0.05	0.10
725	0.05	0.15	193.75	0	150	0.10	0.05	0.10
750	0.05	0.15	200.50	0	100	0.05	0.05	0.10
775	0.05	0.15	207.25	0	50	0.02	0.05	0.10
800	0.05	0.15	214.00	0	20	0.01	0.05	0.10

continued on next page



## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Ball nose

Continued from previous page

CUTTER ID NUMBER			LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	CUTTING LENGTH	
1-1/2" Dia.	1-1/4" Dia.	Overall Length					1-1/2" Dia.	1-1/4" Dia.
200	200	200	1.00 (1.00)	3	1.00	1.00	0.000 (0.00)	0.00
201	201	201	1.50 (1.50)	3	1.50	1.50	0.000 (0.00)	0.00
202	202	202	2.00 (2.00)	4	2.00	2.00	0.000 (0.00)	0.00
203	203	203	2.50 (2.50)	3	2.50	2.50	0.000 (0.00)	0.00
	1.000	1.000	2.00 (2.00)	3	2.000	2.000	0.000 (0.00)	0.00
	1.500	1.500	2.50 (2.50)	3	2.500	2.500	0.000 (0.00)	0.00
204-200	204	204	3.00 (3.00)	3	3.00	3.00	0.000 (0.00)	0.00
204-201	204	204	3.50 (3.50)	3	3.50	3.50	0.000 (0.00)	0.00
204-202	204	204	4.00 (4.00)	4	4.00	4.00	0.000 (0.00)	0.00
204-203	204	204	4.50 (4.50)	3	4.50	4.50	0.000 (0.00)	0.00
204-204	204	204	5.00 (5.00)	3	5.00	5.00	0.000 (0.00)	0.00
	3.000	3.000	2.50 (2.50)	3	3.000	3.000	0.000 (0.00)	0.00
	3.500	3.500	3.00 (3.00)	3	4.000	4.000	0.000 (0.00)	0.00
	4.000	4.000	3.50 (3.50)	3	4.000	4.000	0.000 (0.00)	0.00
205	205	205	1.00 (1.00)	3	1.00	1.00	0.000 (0.00)	0.00
206	206	206	1.50 (1.50)	3	1.50	1.50	0.000 (0.00)	0.00
207	207	207	2.00 (2.00)	3	2.00	2.00	0.000 (0.00)	0.00
208	208	208	2.50 (2.50)	3	2.50	2.50	0.000 (0.00)	0.00
209	209	209	3.00 (3.00)	3	3.00	3.00	0.000 (0.00)	0.00
210-200	210	210	3.50 (3.50)	3	3.50	3.50	0.000 (0.00)	0.00
210-201	210	210	4.00 (4.00)	3	4.00	4.00	0.000 (0.00)	0.00
210-202	210	210	4.50 (4.50)	4	4.50	4.50	0.000 (0.00)	0.00
210-203	210	210	5.00 (5.00)	3	5.00	5.00	0.000 (0.00)	0.00
210-204	210	210	5.50 (5.50)	3	5.50	5.50	0.000 (0.00)	0.00
	3.000	3.000	2.50 (2.50)	3	3.000	3.000	0.000 (0.00)	0.00
	3.500	3.500	3.00 (3.00)	3	4.000	4.000	0.000 (0.00)	0.00
211	211	211	1.00 (1.00)	3	1.00	1.00	0.000 (0.00)	0.00
212	212	212	1.50 (1.50)	3	1.50	1.50	0.000 (0.00)	0.00
213	213	213	2.00 (2.00)	3	2.00	2.00	0.000 (0.00)	0.00
214-200	214	214	2.50 (2.50)	3	2.50	2.50	0.000 (0.00)	0.00
214-201	214	214	3.00 (3.00)	3	3.00	3.00	0.000 (0.00)	0.00
214-202	214	214	3.50 (3.50)	4	3.50	3.50	0.000 (0.00)	0.00
214-203	214	214	4.00 (4.00)	3	4.00	4.00	0.000 (0.00)	0.00
214-204	214	214	4.50 (4.50)	3	4.50	4.50	0.000 (0.00)	0.00
	3.000	3.000	2.50 (2.50)	3	3.000	3.000	0.000 (0.00)	0.00
	3.500	3.500	3.00 (3.00)	3	4.000	4.000	0.000 (0.00)	0.00
215	215	215	1.00 (1.00)	3	1.00	1.00	0.000 (0.00)	0.00
216	216	216	1.50 (1.50)	3	1.50	1.50	0.000 (0.00)	0.00
217	217	217	2.00 (2.00)	3	2.00	2.00	0.000 (0.00)	0.00
218-200	218	218	2.50 (2.50)	3	2.50	2.50	0.000 (0.00)	0.00
218-201	218	218	3.00 (3.00)	3	3.00	3.00	0.000 (0.00)	0.00
218-202	218	218	3.50 (3.50)	4	3.50	3.50	0.000 (0.00)	0.00
218-203	218	218	4.00 (4.00)	3	4.00	4.00	0.000 (0.00)	0.00
218-204	218	218	4.50 (4.50)	3	4.50	4.50	0.000 (0.00)	0.00
	3.000	3.000	2.50 (2.50)	3	3.000	3.000	0.000 (0.00)	0.00
	3.500	3.500	3.00 (3.00)	3	4.000	4.000	0.000 (0.00)	0.00
219	219	219	1.00 (1.00)	3	1.00	1.00	0.000 (0.00)	0.00
220	220	220	1.50 (1.50)	3	1.50	1.50	0.000 (0.00)	0.00
221	221	221	2.00 (2.00)	3	2.00	2.00	0.000 (0.00)	0.00
222-200	222	222	2.50 (2.50)	3	2.50	2.50	0.000 (0.00)	0.00
222-201	222	222	3.00 (3.00)	3	3.00	3.00	0.000 (0.00)	0.00
222-202	222	222	3.50 (3.50)	4	3.50	3.50	0.000 (0.00)	0.00
222-203	222	222	4.00 (4.00)	3	4.00	4.00	0.000 (0.00)	0.00
222-204	222	222	4.50 (4.50)	3	4.50	4.50	0.000 (0.00)	0.00
	3.000	3.000	2.50 (2.50)	3	3.000	3.000	0.000 (0.00)	0.00
	3.500	3.500	3.00 (3.00)	3	4.000	4.000	0.000 (0.00)	0.00

Continued on next page



## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Ball Index

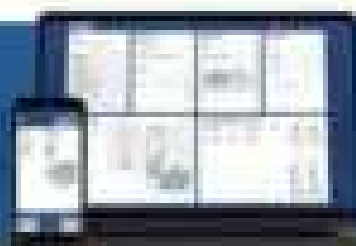
continued from previous page

COYER BRAND BY			Length Overall L <sub>1</sub> (mm) L <sub>2</sub> (mm)	FLUTE	Length to Start of Flute L <sub>3</sub> (mm)	CORONA CORONAL	STANDARD CORONAL	
Part No.	Part No.	Part No.					Part No.	
90 1000	100	900 11.00	0	0.00	0	900000	910	
10 1000	100	400 10.00	1	0.00	0	900000	910	
10 1000	100	700 10.00	2	0.00	0	900000	910	
10 1000	100	800 11.00	0	0.00	0	900000	910	
10 1000	100	470 10.00	0	0.00	0	900000	910	
10 1000	100	700 10.00	0	0.00	0	900000	910	
10 1000	100	700 10.00	0	0.00	0	900000	910	
10 1000	100	700 10.00	0	0.00	0	900000	910	
10 1000	100	700 11.00	1	0.00	0	900000	910	
10 1000	100	700 10.00	2	0.00	0	900000	910	
10 1000	100	700 10.00	0	0.00	0	900000	910	
10 1000	100	1000 10.00	0	0.00	0	900000	910	
	1000	100000 10.00	0	0.00	10.00	900000	910	
	1000	100000 10.00	0	0.00	10.00	900000	910	
90 1100	100	900 11.00	1	1.00	0.00	900000	910	
90 1100	100	700 11.00	2	1.00	0.00	900000	910	
90 1100	100	700 10.00	0	1.00	0.00	900000	910	
90 1100	100	1000 10.00	0	1.00	0	900000	910	
90 1100	100	1000 10.00	0	1.00	0	900000	910	
90 1100	100	470 11.00	0	0.00	0.00	900000	910	
90 1100	100	1000 10.00	1	0.00	0.00	900000	910	
90 1100	100	700 11.00	2	0.00	0	900000	910	
90 1100	100	1000 10.00	0	0.00	0	900000	910	

PLEASE SEE SPEEDS & FEEDS ON PAGE 100

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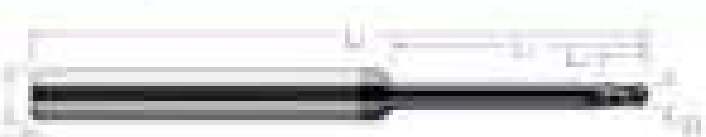
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## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

### Ball - 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 cast steels.
- Long reach design for deep cavities.
- Reduced neck diameter to avoid loading.
- Variable flute design (OptiFlute™ MT) reduces chatter and minimizes tool deflection and thermal expansion.
- Unique geometry (ACT) flute coating offers superior toughness and wear resistance.
- Available for diameters up to 1.500.
- Full depth chamfer for high precision tool inserts.
- Double coating: + TiAlN surface - TiAlN ground in the ball.



D TYPE Diameter mm	Length mm	Overall Length mm	Overall Reach mm	Flutes	Neck Diameter mm	Overall Length mm	Suggested Speeds	
							ft/min	m/min
1/16	100	100	100	4	1/16	100	3000-10000	60-200
1/16	125	125	125	4	1/16	125	3000-10000	75-250
1/16	150	150	150	4	1/16	150	3000-10000	90-300
1/8	100	100	100	4	1/8	100	3000-10000	60-200
1/8	125	125	125	4	1/8	125	3000-10000	75-250
1/8	150	150	150	4	1/8	150	3000-10000	90-300
3/16	100	100	100	4	3/16	100	3000-10000	90-300
3/16	125	125	125	4	3/16	125	3000-10000	112-375
3/16	150	150	150	4	3/16	150	3000-10000	135-450
1/4	100	100	100	4	1/4	100	3000-10000	120-400
1/4	125	125	125	4	1/4	125	3000-10000	150-500
1/4	150	150	150	4	1/4	150	3000-10000	180-600
5/16	100	100	100	4	5/16	100	3000-10000	150-500
5/16	125	125	125	4	5/16	125	3000-10000	187-625
5/16	150	150	150	4	5/16	150	3000-10000	225-750
3/8	100	100	100	4	3/8	100	3000-10000	180-600
3/8	125	125	125	4	3/8	125	3000-10000	225-750
3/8	150	150	150	4	3/8	150	3000-10000	270-900
1/2	100	100	100	4	1/2	100	3000-10000	240-800
1/2	125	125	125	4	1/2	125	3000-10000	300-1000
1/2	150	150	150	4	1/2	150	3000-10000	360-1200
5/8	100	100	100	4	5/8	100	3000-10000	300-1000
5/8	125	125	125	4	5/8	125	3000-10000	375-1250
5/8	150	150	150	4	5/8	150	3000-10000	450-1500
3/4	100	100	100	4	3/4	100	3000-10000	360-1200
3/4	125	125	125	4	3/4	125	3000-10000	450-1500
3/4	150	150	150	4	3/4	150	3000-10000	540-1800
7/8	100	100	100	4	7/8	100	3000-10000	420-1400
7/8	125	125	125	4	7/8	125	3000-10000	525-1750
7/8	150	150	150	4	7/8	150	3000-10000	630-2100
1	100	100	100	4	1	100	3000-10000	480-1600
1	125	125	125	4	1	125	3000-10000	600-2000
1	150	150	150	4	1	150	3000-10000	720-2400
1.125	100	100	100	4	1.125	100	3000-10000	540-1800
1.125	125	125	125	4	1.125	125	3000-10000	675-2250
1.125	150	150	150	4	1.125	150	3000-10000	810-2700

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## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Ball - Long Reach, Stub Flute (cont.)

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COOPER ID NUMBER			LENGTH OF CUT		OVERALL SIZE		FLUTES	SHANK DIAMETER	OVERALL LENGTH	SPRUE CODE NUMBER	
COOPER PART NUMBER	COOPER PART NUMBER	COOPER PART NUMBER	L IN (mm)	L IN (mm)	L IN (mm)	D IN (mm)				L IN (mm)	PH
10000	10000	10000	1.0000	1.0000	1.0000	1.0000	2	0.500	10.000	10000-10	10000
10000	10000	10000	1.0000	1.0000	1.0000	1.0000	3	0.500	10.000	10000-10	10000
10000	10000	10000	1.0000	1.0000	1.0000	1.0000	4	0.500	10.000	10000-10	10000
10000	10000	10000	1.0000	1.0000	1.0000	1.0000	5	0.500	10.000	10000-10	10000
100	100	100	.1000	.1000	.1000	.1000	2	.125	1.000	10000-10	10000
100	100	100	.1000	.1000	.1000	.1000	3	.125	1.000	10000-10	10000
100	100	100	.1000	.1000	.1000	.1000	4	.125	1.000	10000-10	10000
100	100	100	.1000	.1000	.1000	.1000	5	.125	1.000	10000-10	10000
100000	100000	100000	.1000	.1000	.1000	.1000	2	.125	1.000	100000-10	100000
100000	100000	100000	.1000	.1000	.1000	.1000	3	.125	1.000	100000-10	100000
100000	100000	100000	.1000	.1000	.1000	.1000	4	.125	1.000	100000-10	100000
100000	100000	100000	.1000	.1000	.1000	.1000	5	.125	1.000	100000-10	100000
1000000	1000000	1000000	.1000	.1000	.1000	.1000	2	.125	1.000	1000000-10	1000000
1000000	1000000	1000000	.1000	.1000	.1000	.1000	3	.125	1.000	1000000-10	1000000
1000000	1000000	1000000	.1000	.1000	.1000	.1000	4	.125	1.000	1000000-10	1000000
1000000	1000000	1000000	.1000	.1000	.1000	.1000	5	.125	1.000	1000000-10	1000000
10000000	10000000	10000000	.1000	.1000	.1000	.1000	2	.125	1.000	10000000-10	10000000
10000000	10000000	10000000	.1000	.1000	.1000	.1000	3	.125	1.000	10000000-10	10000000
10000000	10000000	10000000	.1000	.1000	.1000	.1000	4	.125	1.000	10000000-10	10000000
10000000	10000000	10000000	.1000	.1000	.1000	.1000	5	.125	1.000	10000000-10	10000000
100000000	100000000	100000000	.1000	.1000	.1000	.1000	2	.125	1.000	100000000-10	100000000
100000000	100000000	100000000	.1000	.1000	.1000	.1000	3	.125	1.000	100000000-10	100000000
100000000	100000000	100000000	.1000	.1000	.1000	.1000	4	.125	1.000	100000000-10	100000000
100000000	100000000	100000000	.1000	.1000	.1000	.1000	5	.125	1.000	100000000-10	100000000
1000000000	1000000000	1000000000	.1000	.1000	.1000	.1000	2	.125	1.000	1000000000-10	1000000000
1000000000	1000000000	1000000000	.1000	.1000	.1000	.1000	3	.125	1.000	1000000000-10	1000000000
1000000000	1000000000	1000000000	.1000	.1000	.1000	.1000	4	.125	1.000	1000000000-10	1000000000
1000000000	1000000000	1000000000	.1000	.1000	.1000	.1000	5	.125	1.000	1000000000-10	1000000000
10000000000	10000000000	10000000000	.1000	.1000	.1000	.1000	2	.125	1.000	10000000000-10	10000000000
10000000000	10000000000	10000000000	.1000	.1000	.1000	.1000	3	.125	1.000	10000000000-10	10000000000
10000000000	10000000000	10000000000	.1000	.1000	.1000	.1000	4	.125	1.000	10000000000-10	10000000000
10000000000	10000000000	10000000000	.1000	.1000	.1000	.1000	5	.125	1.000	10000000000-10	10000000000
100000000000	100000000000	100000000000	.1000	.1000	.1000	.1000	2	.125	1.000	100000000000-10	100000000000
100000000000	100000000000	100000000000	.1000	.1000	.1000	.1000	3	.125	1.000	100000000000-10	100000000000
100000000000	100000000000	100000000000	.1000	.1000	.1000	.1000	4	.125	1.000	100000000000-10	100000000000
100000000000	100000000000	100000000000	.1000	.1000	.1000	.1000	5	.125	1.000	100000000000-10	100000000000
1000000000000	1000000000000	1000000000000	.1000	.1000	.1000	.1000	2	.125	1.000	1000000000000-10	1000000000000
1000000000000	1000000000000	1000000000000	.1000	.1000	.1000	.1000	3	.125	1.000	1000000000000-10	1000000000000
1000000000000	1000000000000	1000000000000	.1000	.1000	.1000	.1000	4	.125	1.000	1000000000000-10	1000000000000
1000000000000	1000000000000	1000000000000	.1000	.1000	.1000	.1000	5	.125	1.000	1000000000000-10	1000000000000

continued on next page



## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Corner Radius



- Optimized for Inconel alloys, Incoel, steel alloys, and other high temperature materials with excellent performance in difficult-to-machine steels, titanium alloys, and tool steels
- Variable helix design (varies - 30%) reduces chatter and improves chip management and chip evacuation
- (M2) general grade M7N form cutting effect against built-up and tool wear
- 50 sheets intended for high pressure tool holders
- Suitable for speeds up to 60%.
- Coated cutting - 1 flute version - 1 (M) ground to the 120°

DAYS DIA/IN	DAYS DIA/IN	DAYS DIA/IN	DAYS DIA/IN	DAYS DIA/IN	DAYS DIA/IN	DAYS DIA/IN	DAYS DIA/IN	
							DAYS DIA/IN	DAYS DIA/IN
0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
0.03125	0.03125	0.03125	0.03125	0.03125	0.03125	0.03125	0.03125	0.03125
0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375
0.04375	0.04375	0.04375	0.04375	0.04375	0.04375	0.04375	0.04375	0.04375
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.05625	0.05625	0.05625	0.05625	0.05625	0.05625	0.05625	0.05625	0.05625
0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625
0.06875	0.06875	0.06875	0.06875	0.06875	0.06875	0.06875	0.06875	0.06875
0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075	0.075
0.08125	0.08125	0.08125	0.08125	0.08125	0.08125	0.08125	0.08125	0.08125
0.0875	0.0875	0.0875	0.0875	0.0875	0.0875	0.0875	0.0875	0.0875
0.09375	0.09375	0.09375	0.09375	0.09375	0.09375	0.09375	0.09375	0.09375
0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
0.10625	0.10625	0.10625	0.10625	0.10625	0.10625	0.10625	0.10625	0.10625
0.1125	0.1125	0.1125	0.1125	0.1125	0.1125	0.1125	0.1125	0.1125
0.11875	0.11875	0.11875	0.11875	0.11875	0.11875	0.11875	0.11875	0.11875
0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.125
0.13125	0.13125	0.13125	0.13125	0.13125	0.13125	0.13125	0.13125	0.13125
0.1375	0.1375	0.1375	0.1375	0.1375	0.1375	0.1375	0.1375	0.1375
0.14375	0.14375	0.14375	0.14375	0.14375	0.14375	0.14375	0.14375	0.14375
0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
0.15625	0.15625	0.15625	0.15625	0.15625	0.15625	0.15625	0.15625	0.15625
0.1625	0.1625	0.1625	0.1625	0.1625	0.1625	0.1625	0.1625	0.1625
0.16875	0.16875	0.16875	0.16875	0.16875	0.16875	0.16875	0.16875	0.16875
0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175	0.175
0.18125	0.18125	0.18125	0.18125	0.18125	0.18125	0.18125	0.18125	0.18125
0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
0.19375	0.19375	0.19375	0.19375	0.19375	0.19375	0.19375	0.19375	0.19375
0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
0.20625	0.20625	0.20625	0.20625	0.20625	0.20625	0.20625	0.20625	0.20625
0.2125	0.2125	0.2125	0.2125	0.2125	0.2125	0.2125	0.2125	0.2125
0.21875	0.21875	0.21875	0.21875	0.21875	0.21875	0.21875	0.21875	0.21875
0.225	0.225	0.225	0.225	0.225	0.225	0.225	0.225	0.225
0.23125	0.23125	0.23125	0.23125	0.23125	0.23125	0.23125	0.23125	0.23125
0.2375	0.2375	0.2375	0.2375	0.2375	0.2375	0.2375	0.2375	0.2375
0.24375	0.24375	0.24375	0.24375	0.24375	0.24375	0.24375	0.24375	0.24375
0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
0.25625	0.25625	0.25625	0.25625	0.25625	0.25625	0.25625	0.25625	0.25625
0.2625	0.2625	0.2625	0.2625	0.2625	0.2625	0.2625	0.2625	0.2625
0.26875	0.26875	0.26875	0.26875	0.26875	0.26875	0.26875	0.26875	0.26875
0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
0.28125	0.28125	0.28125	0.28125	0.28125	0.28125	0.28125	0.28125	0.28125
0.2875	0.2875	0.2875	0.2875	0.2875	0.2875	0.2875	0.2875	0.2875
0.29375	0.29375	0.29375	0.29375	0.29375	0.29375	0.29375	0.29375	0.29375
0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3

continued on next page















## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Corner Radius (mm)

(continued from previous page)

CUTTING PARAMETERS			CURRENT RAD. (R)	LENGTH OF TOOL	Feeds	SPINDL. RPM/REV	TOTAL LENGTH	MATERIAL CAPACITY	
								PSI/A	PCU/D
D	FLUTE	DEPTH	R	L	F	S	T	A	P
2.00 (1/2)	0.00	0.00	0.00	1.00 (1.00)	4	1.00	0	6910 (4.10)	33.00
2.00 (1/2)	0.10	0.00	0.00	1.00 (1.00)	4	1.00	0.10	6910 (4.10)	33.00
2.00 (1/2)	0.20	0.00	0.00	1.00 (1.00)	4	1.00	0.20	6910 (4.10)	33.00
2.00 (1/2)	0.30	0.00	0.00	1.00 (1.00)	4	1.00	0.30	6910 (4.10)	33.00
2.00 (1/2)	0.40	0.00	0.00	1.00 (1.00)	4	1.00	0.40	6910 (4.10)	33.00
2.00 (1/2)	0.50	0.00	0.00	1.00 (1.00)	4	1.00	0.50	6910 (4.10)	33.00
2.00 (1/2)	0.60	0.00	0.00	1.00 (1.00)	4	1.00	0.60	6910 (4.10)	33.00
2.00 (1/2)	0.70	0.00	0.00	1.00 (1.00)	4	1.00	0.70	6910 (4.10)	33.00
2.00 (1/2)	0.80	0.00	0.00	1.00 (1.00)	4	1.00	0.80	6910 (4.10)	33.00
2.00 (1/2)	0.90	0.00	0.00	1.00 (1.00)	4	1.00	0.90	6910 (4.10)	33.00
2.00 (1/2)	1.00	0.00	0.00	1.00 (1.00)	4	1.00	1.00	6910 (4.10)	33.00
2.00 (1/2)	1.10	0.00	0.00	1.00 (1.00)	4	1.00	1.10	6910 (4.10)	33.00
2.00 (1/2)	1.20	0.00	0.00	1.00 (1.00)	4	1.00	1.20	6910 (4.10)	33.00
2.00 (1/2)	1.30	0.00	0.00	1.00 (1.00)	4	1.00	1.30	6910 (4.10)	33.00
2.00 (1/2)	1.40	0.00	0.00	1.00 (1.00)	4	1.00	1.40	6910 (4.10)	33.00
2.00 (1/2)	1.50	0.00	0.00	1.00 (1.00)	4	1.00	1.50	6910 (4.10)	33.00
2.00 (1/2)	1.60	0.00	0.00	1.00 (1.00)	4	1.00	1.60	6910 (4.10)	33.00
2.00 (1/2)	1.70	0.00	0.00	1.00 (1.00)	4	1.00	1.70	6910 (4.10)	33.00
2.00 (1/2)	1.80	0.00	0.00	1.00 (1.00)	4	1.00	1.80	6910 (4.10)	33.00
2.00 (1/2)	1.90	0.00	0.00	1.00 (1.00)	4	1.00	1.90	6910 (4.10)	33.00
2.00 (1/2)	2.00	0.00	0.00	1.00 (1.00)	4	1.00	2.00	6910 (4.10)	33.00
2.00 (1/2)	2.10	0.00	0.00	1.00 (1.00)	4	1.00	2.10	6910 (4.10)	33.00

Metric Conversion Chart

### SPEED & FEED (Variable Mills for High Temp Alloys)

Speed and feed values are advised values based on 1/2" dia. diameter 60000 RPM tool length of 100 mm and only for a 20000 RPM tool. For a different tool diameter or tool length, the speed and feed values should be adjusted accordingly. The values shown in this table are for reference only and should not be used as a substitute for actual performance data. The values shown in this table are for reference only and should not be used as a substitute for actual performance data. The values shown in this table are for reference only and should not be used as a substitute for actual performance data.

Material	Machining Method	Tool	High Speed Steel (HSS) / Tool Length													
			100	150	200	250	300	350	400	450	500	550	600			
AISI 4140	End Mill	S2	Spindle	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
			Feed	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
			Chips	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
AISI 303	End Mill	S2	Spindle	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
			Feed	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
			Chips	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
AISI 316	End Mill	S2	Spindle	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
			Feed	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
			Chips	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Values are based on a 1/2" dia. diameter tool. Values shown in this table are for reference only and should not be used as a substitute for actual performance data. The values shown in this table are for reference only and should not be used as a substitute for actual performance data.







## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Corner Radius - Long Reach, 5/16" Flute (cont.)

(continued from previous page)

D <sub>1</sub> - 1/16"	D <sub>2</sub> - 1/16"	D <sub>3</sub> - 1/16"	D <sub>4</sub> - 1/16"	D <sub>5</sub> - 1/16"	FLUTES	D <sub>1</sub> - 1/16"	L <sub>1</sub>	DIMENSIONAL CODES	
								TYPE 1	TYPE 2
100-100	100	100	100	100-100	4	10	100	100-100	100
100-115	115	100	100	100-115	4	10	115	100-115	115
100-130	130	100	100	100-130	4	10	130	100-130	130
100-145	145	100	100	100-145	4	10	145	100-145	145
100-160	160	100	100	100-160	4	10	160	100-160	160
100-175	175	100	100	100-175	4	10	175	100-175	175
100-190	190	100	100	100-190	4	10	190	100-190	190
100-205	205	100	100	100-205	4	10	205	100-205	205
100-220	220	100	100	100-220	4	10	220	100-220	220
100-235	235	100	100	100-235	4	10	235	100-235	235
100-250	250	100	100	100-250	4	10	250	100-250	250
100-265	265	100	100	100-265	4	10	265	100-265	265
100-280	280	100	100	100-280	4	10	280	100-280	280
100-295	295	100	100	100-295	4	10	295	100-295	295
100-310	310	100	100	100-310	4	10	310	100-310	310
100-325	325	100	100	100-325	4	10	325	100-325	325
100-340	340	100	100	100-340	4	10	340	100-340	340
100-355	355	100	100	100-355	4	10	355	100-355	355
100-370	370	100	100	100-370	4	10	370	100-370	370
100-385	385	100	100	100-385	4	10	385	100-385	385
100-400	400	100	100	100-400	4	10	400	100-400	400
100-415	415	100	100	100-415	4	10	415	100-415	415
100-430	430	100	100	100-430	4	10	430	100-430	430
100-445	445	100	100	100-445	4	10	445	100-445	445
100-460	460	100	100	100-460	4	10	460	100-460	460
100-475	475	100	100	100-475	4	10	475	100-475	475
100-490	490	100	100	100-490	4	10	490	100-490	490
100-505	505	100	100	100-505	4	10	505	100-505	505
100-520	520	100	100	100-520	4	10	520	100-520	520
100-535	535	100	100	100-535	4	10	535	100-535	535
100-550	550	100	100	100-550	4	10	550	100-550	550
100-565	565	100	100	100-565	4	10	565	100-565	565
100-580	580	100	100	100-580	4	10	580	100-580	580
100-595	595	100	100	100-595	4	10	595	100-595	595
100-610	610	100	100	100-610	4	10	610	100-610	610
100-625	625	100	100	100-625	4	10	625	100-625	625
100-640	640	100	100	100-640	4	10	640	100-640	640
100-655	655	100	100	100-655	4	10	655	100-655	655
100-670	670	100	100	100-670	4	10	670	100-670	670
100-685	685	100	100	100-685	4	10	685	100-685	685
100-700	700	100	100	100-700	4	10	700	100-700	700
100-715	715	100	100	100-715	4	10	715	100-715	715
100-730	730	100	100	100-730	4	10	730	100-730	730
100-745	745	100	100	100-745	4	10	745	100-745	745
100-760	760	100	100	100-760	4	10	760	100-760	760
100-775	775	100	100	100-775	4	10	775	100-775	775
100-790	790	100	100	100-790	4	10	790	100-790	790
100-805	805	100	100	100-805	4	10	805	100-805	805
100-820	820	100	100	100-820	4	10	820	100-820	820
100-835	835	100	100	100-835	4	10	835	100-835	835
100-850	850	100	100	100-850	4	10	850	100-850	850
100-865	865	100	100	100-865	4	10	865	100-865	865
100-880	880	100	100	100-880	4	10	880	100-880	880
100-895	895	100	100	100-895	4	10	895	100-895	895
100-910	910	100	100	100-910	4	10	910	100-910	910
100-925	925	100	100	100-925	4	10	925	100-925	925
100-940	940	100	100	100-940	4	10	940	100-940	940
100-955	955	100	100	100-955	4	10	955	100-955	955
100-970	970	100	100	100-970	4	10	970	100-970	970
100-985	985	100	100	100-985	4	10	985	100-985	985
100-1000	1000	100	100	100-1000	4	10	1000	100-1000	1000

PLEASE SEE SPEEDS & FEEDS ON PAGE 140



## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Finishers - Square



up to 7  
Flutes

- Optimized for maximum stress, thrust, and axial rigidity removal and efficiency with outstanding performance in difficult-to-machine steels, stainless steels, and tool steels
- Variable flute design (up to 7 flutes) reduces chatter and harmonics improving finish
- Large neck and generous relief for improved tool life
- Latest generation ALN film coating offers superior hardness and heat resistance
- All diameters available for high precision ball turning
- Ball turning (not corner cutting) - ball outside - DAD ground to the size

COATING	DIN	ISO	MATERIAL	LENGTH OF CUT L (mm)	FLUTES	SHANK DIAMETER D <sub>1</sub> (mm)	OVERALL LENGTH L <sub>1</sub>	SPIN SPEED RPM (m/min)	
								MAX. P	MAX. S
ALN	1180	S12	AISI 304	2000	4	3.00	30.00	2000-30	3000
				3000	4	4.00	30.00	2000-30	3000
				4000	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 316	2000	4	3.00	30.00	2000-30	3000
				3000	4	4.00	30.00	2000-30	3000
				4000	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 4140	2000	4	3.00	30.00	2000-30	3000
				3000	4	4.00	30.00	2000-30	3000
				4000	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 52100	2000	4	3.00	30.00	2000-30	3000
				3000	4	4.00	30.00	2000-30	3000
				4000	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 304	1000	4	3.00	30.00	2000-30	3000
				2000	4	4.00	30.00	2000-30	3000
				3000	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 316	1000	4	3.00	30.00	2000-30	3000
				2000	4	4.00	30.00	2000-30	3000
				3000	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 4140	1000	4	3.00	30.00	2000-30	3000
				2000	4	4.00	30.00	2000-30	3000
				3000	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 52100	1000	4	3.00	30.00	2000-30	3000
				2000	4	4.00	30.00	2000-30	3000
				3000	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 304	500	4	3.00	30.00	2000-30	3000
				1000	4	4.00	30.00	2000-30	3000
				1500	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 316	500	4	3.00	30.00	2000-30	3000
				1000	4	4.00	30.00	2000-30	3000
				1500	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 4140	500	4	3.00	30.00	2000-30	3000
				1000	4	4.00	30.00	2000-30	3000
				1500	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 52100	500	4	3.00	30.00	2000-30	3000
				1000	4	4.00	30.00	2000-30	3000
				1500	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 304	250	4	3.00	30.00	2000-30	3000
				500	4	4.00	30.00	2000-30	3000
				750	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 316	250	4	3.00	30.00	2000-30	3000
				500	4	4.00	30.00	2000-30	3000
				750	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 4140	250	4	3.00	30.00	2000-30	3000
				500	4	4.00	30.00	2000-30	3000
				750	4	5.00	30.00	2000-30	3100
ALN	1180	S12	AISI 52100	250	4	3.00	30.00	2000-30	3000
				500	4	4.00	30.00	2000-30	3000
				750	4	5.00	30.00	2000-30	3100

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## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Features – Superior (cont.)

continued from previous page

CUTTER ID (mm/IN)		LENGTH (mm/IN)	HELIX	SHANK Ø (mm/IN)	LENGTH (mm/IN)	TOTAL LENGTH (mm/IN)	
TYPE	CLIP					CLIP Ø (mm/IN)	CLIP L (mm/IN)
3034	1/2	6.35 (1/4)	0	2.00	30.48	36.83 (1.45)	28.95
3034	7/16	6.35 (1/4)	0	2.00	30.48	36.83 (1.45)	34.40
3034	3/8	12.70 (1/2)	0	4.00	30.48	43.23 (1.70)	44.40
3034	1/2	19.05 (3/4)	0	4.00	30.48	49.63 (1.95)	50.95
303	1/8	6.35 (1/4)	0	1.50	30.48	32.03 (1.26)	30.55
303	3/16	6.35 (1/4)	0	1.50	30.48	32.03 (1.26)	31.70
303	1/4	6.35 (1/4)	0	1.50	30.48	32.03 (1.26)	33.25
303	5/16	6.35 (1/4)	0	1.50	30.48	32.03 (1.26)	34.80
303	3/8	12.70 (1/2)	0	1.50	30.48	32.03 (1.26)	36.35
303	1/2	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	37.90
303	5/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	39.45
303	3/4	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	41.00
303	7/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	42.55
303	1	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	44.10
303	1 1/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	45.65
303	1 1/4	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	47.20
303	1 3/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	48.75
303	1 1/2	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	50.30
303	1 5/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	51.85
303	1 3/4	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	53.40
303	1 7/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	54.95
303	2	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	56.50
303	2 1/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	58.05
303	2 1/4	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	59.60
303	2 3/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	61.15
303	2 1/2	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	62.70
303	2 5/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	64.25
303	2 3/4	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	65.80
303	2 7/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	67.35
303	3	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	68.90
303	3 1/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	70.45
303	3 1/4	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	72.00
303	3 3/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	73.55
303	3 1/2	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	75.10
303	3 5/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	76.65
303	3 3/4	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	78.20
303	3 7/8	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	79.75
303	4	19.05 (3/4)	0	1.50	30.48	32.03 (1.26)	81.30

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## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Finishes - Square (cont.)

Continued from previous page

M1000 & P1000   Finishes for High Temp Alloys																				
Material	Endmill Size	Type	The Leader Now! 80% to 90% Faster											Lead of End						
			1/8"	3/16"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"	1 1/4"	1 1/2"	1 3/4"	2"					
Inconel 600	1/8"	S	Waldron M1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
			Waldron P1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
			Waldron M1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
			Waldron P1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
			Waldron M1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
			Waldron P1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
			Waldron M1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
			Waldron P1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
			Waldron M1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
			Waldron P1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
			Waldron M1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
			Waldron P1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
	Waldron M1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
	Waldron P1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
	Waldron M1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
	Waldron P1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
	Waldron M1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
	Waldron P1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
	Waldron M1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
	Waldron P1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
	Waldron M1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
	Waldron P1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		





## VARIABLE HOLEX END MILLS FOR HIGH TEMP ALLOYS

Finishers - Square - Long Reach out

continued from previous page

SIZES & WEIGHTS			LENGTH OF CUT	WEIGHT POUNDS	FINISH	SHAPE OF SHANK	WEIGHT LENGTH	HARVEY TOOL #	
1/2" (12.7)	3/4" (19.0)	1" (25.4)	L <sub>1</sub> 1/2" (12.7)	L <sub>2</sub> 1/2" (12.7)	Finish	L <sub>1</sub>	L <sub>2</sub>	TYPE 1	TYPE 2
600	600	600	240	660 (30)	F	120	240	60000-1	60000-2
600	600	600	270	756 (34)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	756 (34)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	756 (34)	F	135	270	60000-1	60000-2
600	600	600	300	900 (41)	F	150	300	60000-1	60000-2
600 (120)	600	600	300	900 (41)	F	150	300	60000-1	60000-2
600 (120)	600	600	300	900 (41)	F	150	300	60000-1	60000-2
TOTAL			240	660 (30)	F	120	240	60000-1	60000-2
D.1 (1/2")			D.1 (1/2")		D.1 (1/2")		TYPE 1		TYPE 2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	756 (34)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	756 (34)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2
600 (120)	600	600	270	660 (30)	F	135	270	60000-1	60000-2

**PLEASE SEE SPEEDS & FEEDS ON PAGE 192**



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## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Finishes - Square - Long Reach (mm)

SPEEDS & FEEDS (Finishes - Long Reach for High Temp Alloys)															
Material	Diameter (mm)	Length (mm)	Type	Long Reach (mm) from 100 to 1000										Stock at End	
				100	200	300	400	500	600	700	800	900	1000	Radius	Angle
Inconel 625 Inconel 718 C26, C27, C28, C29	16-20 20-25	40	Variable Helix	2000	1500	1200	1000	900	800	750	700	650	600	1.50	30°
			Variable Helix	2000	1500	1200	1000	900	800	750	700	650	600	1.50	30°
			Variable Helix	2000	1500	1200	1000	900	800	750	700	650	600	1.50	30°
			Variable Helix	2000	1500	1200	1000	900	800	750	700	650	600	1.50	30°
			Variable Helix	2000	1500	1200	1000	900	800	750	700	650	600	1.50	30°
	Titanium Ti-6Al-4V	16-20 20-25	40	Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°
				Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°
				Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°
				Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°
				Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°
		16-20 20-25	60	Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°
				Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°
				Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°
				Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°
				Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°
Titanium Ti-6Al-4V	16-20 20-25	80	Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°	
			Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°	
			Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°	
			Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°	
			Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°	
	16-20 20-25	100	Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°	
			Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°	
			Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°	
			Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°	
			Variable Helix	2000	1500	1200	1000	900	800	750	700	650	1.50	30°	

## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

### Finishers - Corner Radius



- Optimized for titanium alloys, Inconel, nickel alloys, and other high-temperature materials with outstanding performance in difficult-to-machine alloys, stainless steels, and tool steels
- Available from design (999100 - 1177) - standard design and performance engineering stock
- Great geometry for faster cutting speeds, superior finishes and tool resistance
- For details, please refer high precision catalogues
- Best cutting fluid water cooling
- Solid carbide
- CNC ground to the 10th

MILL SIZE Diameter	D mm	Length L mm	CORNER RADIUS R mm	LENGTH OF CUT L <sub>C</sub> mm	FLUTES	LENGTH OF FLUTE mm	SHOULDER WIDTH mm	STANDARD	
								Stock	Price
20 (1.75)	20.00	110	0.05	100.00	6	19	1.13	FINISHER	14.00
20 (1.75)	20.00	150	0.05	140.00	6	19	1.13	FINISHER	16.00
20	20.00	200	0.05	190.00	6	19	1.13	FINISHER	18.00
20	20.00	250	0.05	240.00	6	19	1.13	FINISHER	20.00
20	20.00	300	0.05	290.00	6	19	1.13	FINISHER	22.00
20 (1.75)	20.00	110	0.05	100.00	6	19	1.13	FINISHER	14.00
20 (1.75)	20.00	150	0.05	140.00	6	19	1.13	FINISHER	16.00
20 (1.75)	20.00	200	0.05	190.00	6	19	1.13	FINISHER	18.00
20 (1.75)	20.00	250	0.05	240.00	6	19	1.13	FINISHER	20.00
20 (1.75)	20.00	300	0.05	290.00	6	19	1.13	FINISHER	22.00
25	25.00	110	0.05	100.00	6	23	1.38	FINISHER	14.00
25	25.00	150	0.05	140.00	6	23	1.38	FINISHER	16.00
25 (2.00)	25.00	110	0.05	100.00	6	23	1.38	FINISHER	14.00
25 (2.00)	25.00	150	0.05	140.00	6	23	1.38	FINISHER	16.00
25 (2.00)	25.00	200	0.05	190.00	6	23	1.38	FINISHER	18.00
25 (2.00)	25.00	250	0.05	240.00	6	23	1.38	FINISHER	20.00
25 (2.00)	25.00	300	0.05	290.00	6	23	1.38	FINISHER	22.00
30	30.00	110	0.05	100.00	7	23	1.52	FINISHER	16.00
30 (2.50)	30.00	110	0.05	100.00	7	23	1.52	FINISHER	16.00
30 (2.50)	30.00	150	0.05	140.00	7	23	1.52	FINISHER	18.00
30 (2.50)	30.00	200	0.05	190.00	7	23	1.52	FINISHER	20.00
30 (2.50)	30.00	250	0.05	240.00	7	23	1.52	FINISHER	22.00
30 (2.50)	30.00	300	0.05	290.00	7	23	1.52	FINISHER	24.00
35	35.00	110	0.05	100.00	7	23	1.52	FINISHER	16.00
35 (3.15)	35.00	110	0.05	100.00	7	23	1.52	FINISHER	16.00
35 (3.15)	35.00	150	0.05	140.00	7	23	1.52	FINISHER	18.00
35 (3.15)	35.00	200	0.05	190.00	7	23	1.52	FINISHER	20.00
35 (3.15)	35.00	250	0.05	240.00	7	23	1.52	FINISHER	22.00
35 (3.15)	35.00	300	0.05	290.00	7	23	1.52	FINISHER	24.00
40	40.00	110	0.05	100.00	7	23	1.52	FINISHER	16.00
40 (4.00)	40.00	110	0.05	100.00	7	23	1.52	FINISHER	16.00
40 (4.00)	40.00	150	0.05	140.00	7	23	1.52	FINISHER	18.00
40 (4.00)	40.00	200	0.05	190.00	7	23	1.52	FINISHER	20.00
40 (4.00)	40.00	250	0.05	240.00	7	23	1.52	FINISHER	22.00
40 (4.00)	40.00	300	0.05	290.00	7	23	1.52	FINISHER	24.00
50	50.00	110	0.05	100.00	7	23	1.52	FINISHER	16.00
50 (5.00)	50.00	110	0.05	100.00	7	23	1.52	FINISHER	16.00
50 (5.00)	50.00	150	0.05	140.00	7	23	1.52	FINISHER	18.00
50 (5.00)	50.00	200	0.05	190.00	7	23	1.52	FINISHER	20.00
50 (5.00)	50.00	250	0.05	240.00	7	23	1.52	FINISHER	22.00
50 (5.00)	50.00	300	0.05	290.00	7	23	1.52	FINISHER	24.00
60	60.00	110	0.05	100.00	7	23	1.52	FINISHER	16.00
60 (6.35)	60.00	110	0.05	100.00	7	23	1.52	FINISHER	16.00
60 (6.35)	60.00	150	0.05	140.00	7	23	1.52	FINISHER	18.00
60 (6.35)	60.00	200	0.05	190.00	7	23	1.52	FINISHER	20.00
60 (6.35)	60.00	250	0.05	240.00	7	23	1.52	FINISHER	22.00
60 (6.35)	60.00	300	0.05	290.00	7	23	1.52	FINISHER	24.00
80	80.00	110	0.05	100.00	7	23	1.52	FINISHER	16.00
80 (8.00)	80.00	110	0.05	100.00	7	23	1.52	FINISHER	16.00
80 (8.00)	80.00	150	0.05	140.00	7	23	1.52	FINISHER	18.00
80 (8.00)	80.00	200	0.05	190.00	7	23	1.52	FINISHER	20.00
80 (8.00)	80.00	250	0.05	240.00	7	23	1.52	FINISHER	22.00
80 (8.00)	80.00	300	0.05	290.00	7	23	1.52	FINISHER	24.00

continued on next page

## VARIABLE HELIX END MILLS FOR HIGH TEMP ALLOYS

Finishers - Corner Radii (mm)

continued from previous page

ITEM NUMBER	DIN CODE	LENGTH mm	DIA. mm	LENGTH OF CUT mm	FLUTES	SHANK DIA. mm	TOTAL LENGTH	CUTTING SPEED	
								M/min	M/min
120-115	910	100	600	127-1100	3	50	100	30000-50	34.35
120-116	910	100	600	127-1100	4	50	100	25100-50	34.35
120-117	910	100	600	127-1100	5	50	100	21000-50	34.35
120-118	910	100	600	127-1100	6	50	100	18000-50	34.35
120-119	910	100	600	127-1100	7	50	100	15000-50	34.35
120-120	910	100	600	127-1100	8	50	100	13000-50	34.35
120-121	910	100	600	127-1100	9	50	100	11000-50	34.35
120-122	910	100	600	127-1100	10	50	100	10000-50	34.35
120-123	910	100	600	127-1100	11	50	100	9000-50	34.35
120-124	910	100	600	127-1100	12	50	100	8000-50	34.35
120-125	910	100	600	127-1100	13	50	100	7000-50	34.35
120-126	910	100	600	127-1100	14	50	100	6000-50	34.35
120-127	910	100	600	127-1100	15	50	100	5000-50	34.35
120-128	910	100	600	127-1100	16	50	100	4000-50	34.35
120-129	910	100	600	127-1100	17	50	100	3000-50	34.35
120-130	910	100	600	127-1100	18	50	100	2000-50	34.35
120-131	910	100	600	127-1100	19	50	100	1500-50	34.35
120-132	910	100	600	127-1100	20	50	100	1000-50	34.35
120-133	910	100	600	127-1100	21	50	100	800-50	34.35
120-134	910	100	600	127-1100	22	50	100	700-50	34.35
120-135	910	100	600	127-1100	23	50	100	600-50	34.35
120-136	910	100	600	127-1100	24	50	100	500-50	34.35
120-137	910	100	600	127-1100	25	50	100	400-50	34.35
120-138	910	100	600	127-1100	26	50	100	300-50	34.35
120-139	910	100	600	127-1100	27	50	100	200-50	34.35
120-140	910	100	600	127-1100	28	50	100	150-50	34.35
120-141	910	100	600	127-1100	29	50	100	100-50	34.35
120-142	910	100	600	127-1100	30	50	100	80-50	34.35
120-143	910	100	600	127-1100	31	50	100	70-50	34.35
120-144	910	100	600	127-1100	32	50	100	60-50	34.35
120-145	910	100	600	127-1100	33	50	100	50-50	34.35
120-146	910	100	600	127-1100	34	50	100	40-50	34.35
120-147	910	100	600	127-1100	35	50	100	30-50	34.35
120-148	910	100	600	127-1100	36	50	100	20-50	34.35
120-149	910	100	600	127-1100	37	50	100	15-50	34.35
120-150	910	100	600	127-1100	38	50	100	10-50	34.35
120-151	910	100	600	127-1100	39	50	100	8-50	34.35
120-152	910	100	600	127-1100	40	50	100	7-50	34.35

PLEASE SEE SPEEDS & FEEDS ON PAGE 190

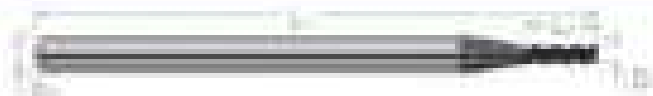


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# WINNABLE HOLE END MILLS FOR MEDIUM ALLOY STEELS

Square



- Designed for highly machinable medium alloy steels, stainless steels, and cast steels
- Winning hole design (uphol) - 37% reduces chatter and burrs/tear and increases material removal rates
- BTA coolant for improved lubricity and heat resistance - 45 degree tolerance for high precision tool making
- Double coating - TiAlN outside - TiCN ground in the USA

CUTTER IDENTIFIER		LENGTH OF CUT L mm inch	FLUTE	DIA. OF SHANK D <sub>1</sub> mm	SHOULDER WIDTH L <sub>1</sub>	WINNABLE HOLE	
Part No.	Material					Min. D <sub>2</sub>	Max. D <sub>2</sub>
W1	W100	200	2	10	100	Winnable	100
W2	W100	200	2	10	110	Winnable	100
W3 1/2" Dia	W100	200	2	10	110	Winnable	100
W4 1/2" Dia	W100	200	2	10	120	Winnable	100
W5 1/2" Dia	W100	200	2	10	210	Winnable	100
W6	W100	200	2	10	200	Winnable	100
W7	W100	200	2	10	110	Winnable	100
W8	W100	200	2	10	110	Winnable	100
W9	W100	200	2	10	210	Winnable	100
W10	W100	200	2	10	110	Winnable	100
W11	W100	200	2	10	110	Winnable	100
W12	W100	200	2	10	210	Winnable	100
W13	W100	200	2	10	110	Winnable	100
W14	W100	200	2	10	110	Winnable	100
W15 1/2" Dia	W100	200	2	10	110	Winnable	100
W16 1/2" Dia	W100	200	2	10	110	Winnable	100
W17 1/2" Dia	W100	200	2	10	210	Winnable	100
W18 1/2" Dia	W100	200	2	10	210	Winnable	100
W19	W100	200	2	10	110	Winnable	100
W20	W100	200	2	10	200	Winnable	100
W21	W100	200	2	10	110	Winnable	100
W22	W100	200	2	10	110	Winnable	100
W23	W100	200	2	10	210	Winnable	100
W24	W100	200	2	10	110	Winnable	100
W25	W100	200	2	10	110	Winnable	100
W26	W100	200	2	10	210	Winnable	100
W27 1/2" Dia	W100	200	2	10	210	Winnable	100
W28	W100	200	2	10	110	Winnable	100
W29	W100	200	2	10	210	Winnable	100
W30	W100	200	2	10	110	Winnable	100
W31	W100	200	2	10	110	Winnable	100
W32	W100	200	2	10	210	Winnable	100
W33	W100	200	2	10	110	Winnable	100
W34	W100	200	2	10	110	Winnable	100
W35 1/2" Dia	W100	200	2	10	110	Winnable	100
W36 1/2" Dia	W100	200	2	10	110	Winnable	100
W37	W100	200	2	10	210	Winnable	100
W38	W100	200	2	10	110	Winnable	100
W39	W100	200	2	10	110	Winnable	100
W40	W100	200	2	10	210	Winnable	100
W41	W100	200	2	10	110	Winnable	100
W42 1/2" Dia	W100	200	2	10	110	Winnable	100
W43 1/2" Dia	W100	200	2	10	110	Winnable	100

Continued on next page



**WORNABLE HOLD END MILLS FOR MEDIUM ALLOY STEELS**  
 Square – Long Reach, Stuff Flute



- Optimized for longly multipass medium alloy steels, stainless steels, and tool steels
- Long reach design for deep drilling
- Reduced tool chatter by stuff-fluting
- Specific flute design (up to 17°) enables drilling and tapping and increases overall cutting speed
- ATR design for maximum hole-boring and feed production
- All diameters optimized for high precision hole-boring
- Square cutting
- Square cutting
- 0.002 ground to the USA

Product Line Information

MILLER NUMBER			LENGTH OF CUT	TOTAL REACH	FLUTES	DEPTH OF HEAT TREAT	TYPICAL LENGTH	NEW LENGTH	
D	L1	Active Length	L1 (mm) L1 (in)	L2 (mm) L2 (in)		D (mm)	L	Code A	Code B
900 1000	100	100	100	170	2	100	0 100	900 1000	0 100
900 1200	120	120	120	190	2	120	0 120	900 1200	0 120
900 1400	140	140	140	210	2	140	0 140	900 1400	0 140
900 1600	160	160	160	230	2	160	0 160	900 1600	0 160
900 1800	180	180	180	250	2	180	0 180	900 1800	0 180
900 2000	200	200	200	270	2	200	0 200	900 2000	0 200
900 2200	220	220	220	290	2	220	0 220	900 2200	0 220
900 2400	240	240	240	310	2	240	0 240	900 2400	0 240
900 2600	260	260	260	330	2	260	0 260	900 2600	0 260
900 2800	280	280	280	350	2	280	0 280	900 2800	0 280
900 3000	300	300	300	370	2	300	0 300	900 3000	0 300
900 3200	320	320	320	390	2	320	0 320	900 3200	0 320
900 3400	340	340	340	410	2	340	0 340	900 3400	0 340
900 3600	360	360	360	430	2	360	0 360	900 3600	0 360
900 3800	380	380	380	450	2	380	0 380	900 3800	0 380
900 4000	400	400	400	470	2	400	0 400	900 4000	0 400
900 4200	420	420	420	490	2	420	0 420	900 4200	0 420
900 4400	440	440	440	510	2	440	0 440	900 4400	0 440
900 4600	460	460	460	530	2	460	0 460	900 4600	0 460
900 4800	480	480	480	550	2	480	0 480	900 4800	0 480
900 5000	500	500	500	570	2	500	0 500	900 5000	0 500
900 5200	520	520	520	590	2	520	0 520	900 5200	0 520
900 5400	540	540	540	610	2	540	0 540	900 5400	0 540
900 5600	560	560	560	630	2	560	0 560	900 5600	0 560
900 5800	580	580	580	650	2	580	0 580	900 5800	0 580
900 6000	600	600	600	670	2	600	0 600	900 6000	0 600
900 6200	620	620	620	690	2	620	0 620	900 6200	0 620
900 6400	640	640	640	710	2	640	0 640	900 6400	0 640
900 6600	660	660	660	730	2	660	0 660	900 6600	0 660
900 6800	680	680	680	750	2	680	0 680	900 6800	0 680
900 7000	700	700	700	770	2	700	0 700	900 7000	0 700
900 7200	720	720	720	790	2	720	0 720	900 7200	0 720
900 7400	740	740	740	810	2	740	0 740	900 7400	0 740
900 7600	760	760	760	830	2	760	0 760	900 7600	0 760
900 7800	780	780	780	850	2	780	0 780	900 7800	0 780
900 8000	800	800	800	870	2	800	0 800	900 8000	0 800
900 8200	820	820	820	890	2	820	0 820	900 8200	0 820
900 8400	840	840	840	910	2	840	0 840	900 8400	0 840
900 8600	860	860	860	930	2	860	0 860	900 8600	0 860
900 8800	880	880	880	950	2	880	0 880	900 8800	0 880
900 9000	900	900	900	970	2	900	0 900	900 9000	0 900
900 9200	920	920	920	990	2	920	0 920	900 9200	0 920
900 9400	940	940	940	1010	2	940	0 940	900 9400	0 940
900 9600	960	960	960	1030	2	960	0 960	900 9600	0 960
900 9800	980	980	980	1050	2	980	0 980	900 9800	0 980
900 10000	1000	1000	1000	1070	2	1000	0 1000	900 10000	0 1000

continued on next page

# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Square - Long Reach, Stub Flute (mm)

(continued from previous page)

ITEM NO.	ITEM NAME	ITEM NUMBER	LENGTH OF CUT	SYNCH DEPTH	TOOTH COUNT	TOOTH FLUTES	SYNCH LEADER	STK CHG	
			L	L				TYPE	PRICE
950		100	100	200	0	1.0	0.10	0000100	10.00
955		100	75	150	0	1.0	0.10	0000075	10.00
950 P/200		100	100	200	0	1.0	0.10	0000100	10.00
955 P/200		100	75	150	0	1.0	0.10	0000075	10.00
	0.0625	100	100/000	150/000	0	0.50	0.0625	0000100	07.00
	0.0625	100	100/000	200/000	0	0.50	0.0625	0000100	10.00
950 P/100		100	L	L		0.50	L	TYPE	PRICE
950 P/100	0.100	100	100	100	0	1.0	0.10	0000100	10.00
955 P/100	0.075	100	100	100	0	1.0	0.075	0000100	9.00
950 P/100	0.0625	100	100	100	0	1.0	0.0625	0000100	10.00
955 P/100	0.0625	100	100	100	0	1.0	0.0625	0000100	10.00
950 P/100	0.0500	100	100	100	0	1.0	0	0000100	10.00
955 P/100	0.0500	100	100	100	0	0.50	0	0000100	10.00
950 P/100	0.0400	100	100	100	0	1.0	0	0000100	10.00

PLEASE SEE SPECS & NOTES ON PAGE 174



Access Simulation Files in DXF Format  
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## VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Ball nose 1

Continued from previous page

Diameter of Shank			Length of Cut		Flutes	Spindle Diameter	Spindle Load (kg)	Cutting Speed	
Diameter of Shank	Length of Shank	Diameter of Shank	Length of Shank	V (m/min)				F (mm/rev)	META 1
Diameter of Shank	Length of Shank	10mm	100mm	10mm	0	10mm	10,000	2000/10	30.00
		15mm	100mm	15mm	0	15	15,000	2700/15	35.00
		20mm	100mm	20mm	0	20	20,000	3700/20	40.00
		25mm	100mm	25mm	0	25	25,000	5000/25	45.00
		30mm	100mm	30mm	0	30	30,000	6300/30	50.00
		35mm	100mm	35mm	0	35	35,000	7600/35	55.00
		40mm	100mm	40mm	0	40	40,000	8900/40	60.00
		45mm	100mm	45mm	0	45	45,000	10,200/45	65.00
		50mm	100mm	50mm	0	50	50,000	11,500/50	70.00
		60mm	100mm	60mm	0	60	60,000	13,800/60	80.00
		80mm	100mm	80mm	0	80	80,000	18,200/80	100.00
		100mm	100mm	100mm	0	100	100,000	22,600/100	120.00
		150mm	100mm	150mm	0	150	150,000	34,500/150	180.00
		200mm	100mm	200mm	0	200	200,000	46,400/200	240.00
		250mm	100mm	250mm	0	250	250,000	58,300/250	300.00

### APPROX. & PRICE (Variable Helix End Mill Medium Alloy Steels)

**Important Note:** Approximate cutting conditions are provided for reference only. Actual cutting conditions will vary depending on the workpiece material, tool geometry, and machine tool. The approximate cutting speeds and feed rates are based on the cutting conditions of the workpiece material and tool geometry. The approximate cutting speeds and feed rates are based on the cutting conditions of the workpiece material and tool geometry.

Material	Diameter of Shank	Length of Shank	Approximate Cutting Speed (m/min) by Spindle Diameter											
			10			15			20			25		
			1000	1500	2000	1000	1500	2000	1000	1500	2000	1000	1500	2000
Carbon Steels AISI 1045, AISI 1040, AISI 1035, AISI 1020, AISI 1010, AISI 1005, AISI 1000, AISI 1005, AISI 1010, AISI 1015, AISI 1020, AISI 1025, AISI 1030, AISI 1035, AISI 1040, AISI 1045, AISI 1050, AISI 1055, AISI 1060, AISI 1065, AISI 1070, AISI 1075, AISI 1080, AISI 1085, AISI 1090, AISI 1095	10	100	1000	1500	2000	1000	1500	2000	1000	1500	2000	1000	1500	2000
Stainless Steels AISI 304, AISI 304L, AISI 316, AISI 316L, AISI 321, AISI 321L, AISI 347, AISI 347L, AISI 409, AISI 409L, AISI 430, AISI 430L, AISI 434, AISI 434L, AISI 630, AISI 630L, AISI 904L, AISI 904, AISI 904L, AISI 904	10	100	1000	1500	2000	1000	1500	2000	1000	1500	2000	1000	1500	2000
Titanium Steels Ti-6Al-4V, Ti-6Al-2Sn-2Zr-1Mo-1Ni, Ti-6Al-4V-0.02C, Ti-6Al-4V-0.02N, Ti-6Al-4V-0.02C-0.02N	10	100	1000	1500	2000	1000	1500	2000	1000	1500	2000	1000	1500	2000

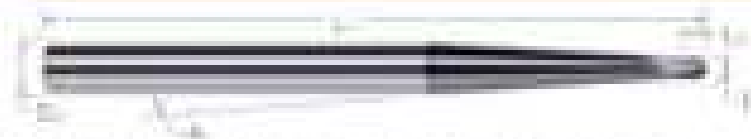
\* The approximate cutting speeds and feed rates are based on the cutting conditions of the workpiece material and tool geometry. The approximate cutting speeds and feed rates are based on the cutting conditions of the workpiece material and tool geometry.





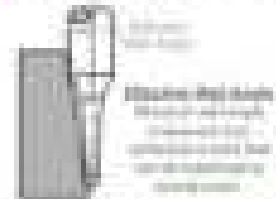
## HIGH HOLD END MILLS FOR MEDIUM ALLOY STEELS

Ball - Tapered Bead (Mold Cutters)



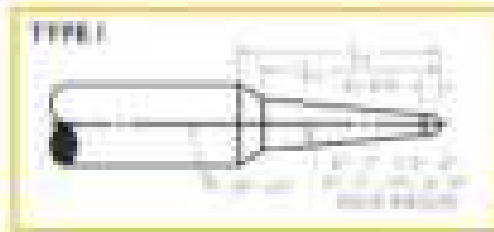
Excellent in Hardly  
Mechanically Mold Steels,  
Stainless Steels, & Tool Steels

- Very short length of ball (tapered) tapered neck for maximum rigidity
- Ideal for surface finishing of hard and die steels
- 80° built-in increased cutting performance
- 60° chamfer designed for high precision tool making
- Latent generation ATN leads coating (titanium nitride) and heat treatment
- 2 flutes to center - 4 flutes to periphery - 100% ground in the ball



ITEM NO.	SYSTEM OF COATING	LENGTH OF SHANK (mm)	LENGTH OF SHANK (mm)	LENGTH OF SHANK (mm)	LENGTH OF SHANK (mm)	LENGTH OF SHANK (mm)	LENGTH OF SHANK (mm)	LENGTH OF SHANK (mm)	LENGTH OF SHANK (mm)	APPROX. WEIGHT (g)	
										TYPE I	TYPE II
E1	ATN	100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
E2	ATN	100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
E3	ATN	100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100
		100-1100	100	100	100	100	100	100	100	100	100

continued on next page





# HIGH HOLD END MILLS FOR MEDIUM ALLOY STEELS

Ball - Tapered Beach (Mold Cutters) (cont.)

continued from previous page

BALL SIZE	CUTTER DIAMETER	LENGTH OF CUT	FEED	TANGENT RADIUS	TOTAL RADIUS	EFFECTIVE HOLDING BALL	BALL DIAMETER	TOTAL LENGTH	CUTTING LENGTH		
									1ST	2ND	
1/8"	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0	0.0000	0.000	
	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0.000	0.0000	0.000	
	1/8"	1/8"	0	1/8"	1/8"	0.0"	1/8"	0	0.0000	0.000	
	1/8"	1/8"	0	1/8"	1/8"	0.0"	1/8"	0	0.0000	0.000	
	1/8"	1/8"	0	1/8"	1/8"	0.0"	1/8"	0.000	0.0000	0.000	
	1/8" (1.000)	1/8"	1	1/8"	1/8"	0.0"	1/8"	0	0.0000	0.000	
	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0	0.0000	0.000	
	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0.000	0.0000	0.000	
	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0.000	0.0000	0.000	
	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0.000	0.0000	0.000	
	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0.000	0.0000	0.000	
	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0.000	0.0000	0.000	
	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0.000	0.0000	0.000	
	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0.000	0.0000	0.000	
	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0.000	0.0000	0.000	
	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0.000	0.0000	0.000	
	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0.000	0.0000	0.000	
	1/8" (1.000)	1/8"	0	1/8"	1/8"	0.0"	1/8"	0.000	0.0000	0.000	
	1/4"	1/4" (1.000)	1/4"	1	1/4"	1/4"	0.0"	1/4"	0	0.0000	0.000
		1/4" (1.000)	1/4"	0	1/4"	1/4"	0.0"	1/4"	0	0.0000	0.000
1/4"		1/4"	0	1/4"	1/4"	0.0"	1/4"	0	0.0000	0.000	
1/4" (1.000)		1/4"	1	1/4"	1/4"	0.0"	1/4"	0	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0.000	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0.000	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0.000	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0.000	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0.000	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0.000	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0.000	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0.000	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0.000	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0.000	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0.000	0.0000	0.000	
1/4" (1.000)		1/4"	0	1/4"	1/4"	0.0"	1/4"	0.000	0.0000	0.000	
1/2"		1/2" (1.000)	1/2"	1	1/2"	1/2"	0.0"	1/2"	0	0.0000	0.000
		1/2" (1.000)	1/2"	1	1/2"	1/2"	0.0"	1/2"	0	0.0000	0.000
	1/2" (1.000)	1/2"	0	1/2"	1/2"	0.0"	1/2"	0.000	0.0000	0.000	
1/2"	1/2" (1.000)	1/2"	1	1/2"	1/2"	0.0"	1/2"	0	0.0000	0.000	
	1/2" (1.000)	1/2"	1	1/2"	1/2"	0.0"	1/2"	0	0.0000	0.000	
	1/2" (1.000)	1/2"	0	1/2"	1/2"	0.0"	1/2"	0.000	0.0000	0.000	

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## VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

### Corner Radius



• Optimized for loading in automatic production using steady, diamond coated, and TiAlN coated

• Variable helix design (up to 12°) reduces chatter and burr-free and increases material removal rates

• B2N coated for improved lubricity and heat resistance

• 60° chamfer designed for high precision tool holders

• Great cutting

• Short cycle time

• ISO grade 10-12 1.4838

COATED PLAMITE	D mm	L mm	CORNER RADIUS R mm	CORNER ANGLE α °	FLUTES	SHANK DIAMETER D <sub>1</sub> mm	LENGTH L <sub>1</sub> mm	NEW RANGE	
								ISO 13324	ISO 13325
	12.00	120.00	0.025	60°	2	12.00	120.00	2000-12	8000
	12.00	120.00	0.050	60°	2	12.00	120.00	2000-12	8000
100	12.00	120.00	0.025	60°	2	12.00	120.00	2000-12	8000
100	12.00	120.00	0.050	60°	2	12.00	120.00	2000-12	8000
100	12.00	120.00	0.025	60°	3	12.00	120.00	2000-12	8000
100	12.00	120.00	0.050	60°	3	12.00	120.00	2000-12	8000
100	12.00	120.00	0.025	60°	4	12.00	120.00	2000-12	8000
100	12.00	120.00	0.050	60°	4	12.00	120.00	2000-12	8000
100	12.00	120.00	0.025	60°	5	12.00	120.00	2000-12	8000
100	12.00	120.00	0.050	60°	5	12.00	120.00	2000-12	8000
100	12.00	120.00	0.025	60°	6	12.00	120.00	2000-12	8000
100	12.00	120.00	0.050	60°	6	12.00	120.00	2000-12	8000
100	12.00	120.00	0.025	60°	8	12.00	120.00	2000-12	8000
100	12.00	120.00	0.050	60°	8	12.00	120.00	2000-12	8000
100	12.00	120.00	0.025	60°	10	12.00	120.00	2000-12	8000
100	12.00	120.00	0.050	60°	10	12.00	120.00	2000-12	8000
100	12.00	120.00	0.025	60°	12	12.00	120.00	2000-12	8000
100	12.00	120.00	0.050	60°	12	12.00	120.00	2000-12	8000
100	12.00	120.00	0.025	60°	14	12.00	120.00	2000-12	8000
100	12.00	120.00	0.050	60°	14	12.00	120.00	2000-12	8000
100	12.00	120.00	0.025	60°	16	12.00	120.00	2000-12	8000
100	12.00	120.00	0.050	60°	16	12.00	120.00	2000-12	8000
100	12.00	120.00	0.025	60°	18	12.00	120.00	2000-12	8000
100	12.00	120.00	0.050	60°	18	12.00	120.00	2000-12	8000
100	12.00	120.00	0.025	60°	20	12.00	120.00	2000-12	8000
100	12.00	120.00	0.050	60°	20	12.00	120.00	2000-12	8000

(continued on next page)





### VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Corner Radius (mm)

(continued from previous page)

ITEM #	ITEM NAME	ITEM PART	ITEM MATERIAL	ITEM FINISH	ITEM LENGTH (mm)	ITEM WIDTH (mm)	ITEM HEIGHT (mm)	ITEM WEIGHT	
								ITEM GROSS (kg)	ITEM NET (kg)
	0.1mm	0.1mm	20 mm	0.1mm	0.1mm	0.1mm	0.1mm	0.1mm	0.1mm
100	100	100	100	100	100	100	100	100	100
101	101	101	101	101	101	101	101	101	101
102	102	102	102	102	102	102	102	102	102
103	103	103	103	103	103	103	103	103	103
104	104	104	104	104	104	104	104	104	104
105	105	105	105	105	105	105	105	105	105
106	106	106	106	106	106	106	106	106	106
107	107	107	107	107	107	107	107	107	107
108	108	108	108	108	108	108	108	108	108
109	109	109	109	109	109	109	109	109	109
110	110	110	110	110	110	110	110	110	110
111	111	111	111	111	111	111	111	111	111
112	112	112	112	112	112	112	112	112	112
113	113	113	113	113	113	113	113	113	113
114	114	114	114	114	114	114	114	114	114
115	115	115	115	115	115	115	115	115	115
116	116	116	116	116	116	116	116	116	116
117	117	117	117	117	117	117	117	117	117
118	118	118	118	118	118	118	118	118	118
119	119	119	119	119	119	119	119	119	119
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149	149	149	149	149	149	149	149	149	149
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(continued on next page)

## MINOR ROLL END MILLS FOR MEDIUM ALLOY STEELS

Corner Roller (cont.)

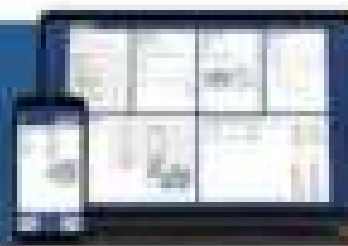
continued from previous page

CUTTER ID NUMBER		CUTTER LENGTH	CUTTER OD DIA.	FLUTE COUNT	WHEEL ID NUMBER	CUTTER LENGTH	SPRINGS	
D	WHEEL LENGTH	S	L		G	L	TENS.	COMP.
W019302	150	018	050 (1.96)	0	018	0	W019302	0000
W019303	150	018	050 (1.96)	4	018	0	W019303	0000
W019304	150	018	050 (1.96)	0	018	0	W019304	0000
W019305	150	018	050 (1.96)	0	018	0	W019305	0000
W019306	150	018	050 (1.96)	0	018	0	W019306	0000
W019307	150	018	050 (1.96)	0	018	0	W019307	0000
W019308	150	018	050 (1.96)	4	018	0	W019308	0000
W019309	150	018	050 (1.96)	0	018	0	W019309	0000
W019310	150	018	050 (1.96)	0	018	0	W019310	0000
W019311	150	018	050 (1.96)	0	018	0	W019311	0000
W019312	150	018	050 (1.96)	4	018	0	W019312	0000
W019313	150	018	050 (1.96)	0	018	0	W019313	0000
W019314	150	018	050 (1.96)	0	018	0	W019314	0000
W019315	150	018	050 (1.96)	4	018	0	W019315	0000
W019316	150	018	050 (1.96)	0	018	0	W019316	0000
W019317	150	018	050 (1.96)	0	018	0	W019317	0000
W019318	150	018	050 (1.96)	4	018	0	W019318	0000
W019319	150	018	050 (1.96)	0	018	0	W019319	0000
W019320	150	018	050 (1.96)	0	018	0	W019320	0000
W019321	150	018	050 (1.96)	4	018	0	W019321	0000
W019322	150	018	050 (1.96)	0	018	0	W019322	0000
W019323	150	018	050 (1.96)	0	018	0	W019323	0000
W019324	150	018	050 (1.96)	4	018	0	W019324	0000
W019325	150	018	050 (1.96)	0	018	0	W019325	0000
W019326	150	018	050 (1.96)	4	018	0	W019326	0000
W019327	150	018	050 (1.96)	0	018	0	W019327	0000
W019328	150	018	050 (1.96)	4	018	0	W019328	0000
W019329	150	018	050 (1.96)	0	018	0	W019329	0000
W019330	150	018	050 (1.96)	4	018	0	W019330	0000

PLEASE SEE SPEEDS & FEEDS ON PAGE 178

REACHING  
A NEW LEVEL

FREE 3D models,  
CAD files available



Customizable Grinding Parameters  
For Optimized Machining

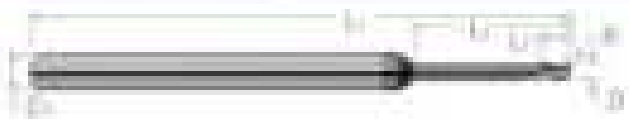


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## VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

### Corner Radius - Long Reach, 5/16 Flute



- Designed for steady performance medium alloy steels, stainless steels, and cast steels
- Long reach design for deep cavities
- Improved hole straightness in hard turning
- Variable helix design improves 40% radius control and laminated part warpage relative to standard mills
- Coarse cortex for improved strength - L-40V coated for improved stability and finish performance
- Full shank coverage for high precision tool holders - 4 Corner cutting - 4 Flute design - 30° PVD ground in the end

CUTTER DIMENSIONS			CUTTER RADIUS	LENGTH OF CUT	DIAMETER RANGE	FLUTE	SHANK DIAMETER	CORNER LENGTH	MFG. PART#	
D			R	L	Min	Max	Min	L1	1/2" DIA.	3/4" DIA.
5/16 DIA.	0.3150	0.1170	0.0078	0.0000	0.0900	0.3150	0.2500	0.2500	8959-09	8959-10
3/8 DIA.	0.3750	0.1170	0.0078	0.0000	0.1100	0.3750	0.2500	0.2500	8959-09	8959-10
1/2 DIA.	0.5000	0.1170	0.0078	0.0000	0.1500	0.5000	0.2500	0.2500	8959-09	8959-10
1/2 DIA.	0.5000	0.1340	0.0078	0.0000	0.1700	0.5000	0.2500	0.2500	8959-09	8959-10
1/2 DIA.	0.5000	0.1510	0.0078	0.0000	0.1900	0.5000	0.2500	0.2500	8959-09	8959-10
1/2 DIA.	0.5000	0.1680	0.0078	0.0000	0.2100	0.5000	0.2500	0.2500	8959-09	8959-10
1/2 DIA.	0.5000	0.1850	0.0078	0.0000	0.2300	0.5000	0.2500	0.2500	8959-09	8959-10
1/2 DIA.	0.5000	0.2020	0.0078	0.0000	0.2500	0.5000	0.2500	0.2500	8959-09	8959-10
1/2 DIA.	0.5000	0.2190	0.0078	0.0000	0.2700	0.5000	0.2500	0.2500	8959-09	8959-10
3/4 DIA.	0.7500	0.1170	0.0078	0.0000	0.1100	0.7500	0.2500	0.2500	8959-09	8959-10
3/4 DIA.	0.7500	0.1340	0.0078	0.0000	0.1300	0.7500	0.2500	0.2500	8959-09	8959-10
3/4 DIA.	0.7500	0.1510	0.0078	0.0000	0.1500	0.7500	0.2500	0.2500	8959-09	8959-10
3/4 DIA.	0.7500	0.1680	0.0078	0.0000	0.1700	0.7500	0.2500	0.2500	8959-09	8959-10
3/4 DIA.	0.7500	0.1850	0.0078	0.0000	0.1900	0.7500	0.2500	0.2500	8959-09	8959-10
3/4 DIA.	0.7500	0.2020	0.0078	0.0000	0.2100	0.7500	0.2500	0.2500	8959-09	8959-10
3/4 DIA.	0.7500	0.2190	0.0078	0.0000	0.2300	0.7500	0.2500	0.2500	8959-09	8959-10
1 DIA.	1.0000	0.1170	0.0078	0.0000	0.1500	1.0000	0.2500	0.2500	8959-09	8959-10
1 DIA.	1.0000	0.1340	0.0078	0.0000	0.1700	1.0000	0.2500	0.2500	8959-09	8959-10
1 DIA.	1.0000	0.1510	0.0078	0.0000	0.1900	1.0000	0.2500	0.2500	8959-09	8959-10
1 DIA.	1.0000	0.1680	0.0078	0.0000	0.2100	1.0000	0.2500	0.2500	8959-09	8959-10
1 DIA.	1.0000	0.1850	0.0078	0.0000	0.2300	1.0000	0.2500	0.2500	8959-09	8959-10
1 DIA.	1.0000	0.2020	0.0078	0.0000	0.2500	1.0000	0.2500	0.2500	8959-09	8959-10
1 DIA.	1.0000	0.2190	0.0078	0.0000	0.2700	1.0000	0.2500	0.2500	8959-09	8959-10
1 1/4 DIA.	1.5000	0.1170	0.0078	0.0000	0.1500	1.5000	0.2500	0.2500	8959-09	8959-10
1 1/4 DIA.	1.5000	0.1340	0.0078	0.0000	0.1700	1.5000	0.2500	0.2500	8959-09	8959-10
1 1/4 DIA.	1.5000	0.1510	0.0078	0.0000	0.1900	1.5000	0.2500	0.2500	8959-09	8959-10
1 1/4 DIA.	1.5000	0.1680	0.0078	0.0000	0.2100	1.5000	0.2500	0.2500	8959-09	8959-10
1 1/4 DIA.	1.5000	0.1850	0.0078	0.0000	0.2300	1.5000	0.2500	0.2500	8959-09	8959-10
1 1/4 DIA.	1.5000	0.2020	0.0078	0.0000	0.2500	1.5000	0.2500	0.2500	8959-09	8959-10
1 1/4 DIA.	1.5000	0.2190	0.0078	0.0000	0.2700	1.5000	0.2500	0.2500	8959-09	8959-10

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## VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

Features - Square (cont.)

(continued from previous page)

CUTTER ID NUMBER		LENGTH OF CUT	FEEDS	DIA. OF SHANK	LENGTH OF FLUTE	SIZES AVAILABLE		
COARSE FLUTE	FINE FLUTE					TYPE A	TYPE B	
600	1100	375 (15)	0	1.5	3.15		600 (15)	20.00
600	1100	375 (15)	0	1.5	3.15		600 (15)	20.00
600	1100	375 (15)	0	1.5	3.15		600 (15)	20.00
	1.5mm	150 (6)	0	6.35	63.5		5774 (15)	51.00
	1.5mm	150 (6)	0	6.35	63.5		5810 (15)	32.00
	1.5mm	150 (6)	0	6.35	63.5		5811 (15)	21.00
	1.5mm	150 (6)	0	6.35	63.5		5775 (15)	41.00
600 (15mm)	1100	113 (4.5)	0	1.5	3.15		600 (15)	20.00
600 (30mm)	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600 (45mm)	1100	339 (13.5)	0	1.5	3.15		600 (15)	20.00
600 (60mm)	1100	452 (18)	0	1.5	3.15		600 (15)	20.00
600 (75mm)	1100	565 (22.5)	0	1.5	3.15		600 (15)	20.00
600 (90mm)	1100	678 (27)	0	1.5	3.15		600 (15)	20.00
600 (105mm)	1100	791 (31.5)	0	1.5	3.15		600 (15)	20.00
600 (120mm)	1100	904 (36)	0	1.5	3.15		600 (15)	20.00
600 (135mm)	1100	1017 (40.5)	0	1.5	3.15		600 (15)	20.00
	1.5mm	150 (6)	0	6.35	63.5		5774 (15)	41.00
	1.5mm	150 (6)	0	6.35	63.5		5810 (15)	31.00
	1.5mm	150 (6)	0	6.35	63.5		5811 (15)	21.00
600	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600 (15mm)	1100	113 (4.5)	0	1.5	3.15		600 (15)	20.00
600 (30mm)	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600 (45mm)	1100	339 (13.5)	0	1.5	3.15		600 (15)	20.00
600 (60mm)	1100	452 (18)	0	1.5	3.15		600 (15)	20.00
600 (75mm)	1100	565 (22.5)	0	1.5	3.15		600 (15)	20.00
600 (90mm)	1100	678 (27)	0	1.5	3.15		600 (15)	20.00
600 (105mm)	1100	791 (31.5)	0	1.5	3.15		600 (15)	20.00
600 (120mm)	1100	904 (36)	0	1.5	3.15		600 (15)	20.00
600 (135mm)	1100	1017 (40.5)	0	1.5	3.15		600 (15)	20.00
	1.5mm	150 (6)	0	6.35	63.5		5774 (15)	41.00
	1.5mm	150 (6)	0	6.35	63.5		5810 (15)	31.00
600	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600 (15mm)	1100	113 (4.5)	0	1.5	3.15		600 (15)	20.00
600 (30mm)	1100	226 (9)	0	1.5	3.15		600 (15)	20.00
600 (45mm)	1100	339 (13.5)	0	1.5	3.15		600 (15)	20.00
600 (60mm)	1100	452 (18)	0	1.5	3.15		600 (15)	20.00
600 (75mm)	1100	565 (22.5)	0	1.5	3.15		600 (15)	20.00
600 (90mm)	1100	678 (27)	0	1.5	3.15		600 (15)	20.00
600 (105mm)	1100	791 (31.5)	0	1.5	3.15		600 (15)	20.00
600 (120mm)	1100	904 (36)	0	1.5	3.15		600 (15)	20.00
600 (135mm)	1100	1017 (40.5)	0	1.5	3.15		600 (15)	20.00
	1.5mm	150 (6)	0	6.35	63.5		5774 (15)	41.00
	1.5mm	150 (6)	0	6.35	63.5		5810 (15)	31.00
	1.5mm	150 (6)	0	6.35	63.5		5811 (15)	21.00

(continued on next page)



# WINNABLE HOLD END MILLS FOR MEDIUM ALLOY STEELS

Finishers - Square (cont.)

(continued from previous page)

CUTTER PART NO.	HOLE DIAMETER	LENGTH OF CUT	FLUTES	LENGTH OF SHANK	DRILL LENGTH	MATERIAL REMOVED	
						SPR. 2	SPR. 3
900-100	.100	.400 (1.250)	0	.100	1.000	9000100	44.00
900-120	.120	.470 (1.400)	0	.120	1.100	9000120	51.00
900-140	.140	.500 (1.500)	0	.140	1.000	9000140	61.00
900-160	.160	.550 (1.600)	0	.160	1.000	9000160	74.00
900-180	.180	.600 (1.700)	0	.180	1.000	9000180	89.00
900-200	.200	.650 (1.800)	0	.200	1.000	9000200	106.00
900-220	.220	.700 (1.900)	0	.220	1.000	9000220	125.00
900-240	.240	.750 (2.000)	0	.240	1.000	9000240	146.00
900-260	.260	.800 (2.100)	0	.260	1.000	9000260	169.00
900-280	.280	.850 (2.200)	0	.280	1.000	9000280	194.00
900-300	.300	.900 (2.300)	0	.300	1.000	9000300	221.00
900-320	.320	.950 (2.400)	0	.320	1.000	9000320	250.00
900-340	.340	1.000 (2.500)	0	.340	1.000	9000340	281.00
900-360	.360	1.050 (2.600)	0	.360	1.000	9000360	314.00
900-380	.380	1.100 (2.700)	0	.380	1.000	9000380	349.00
900-400	.400	1.150 (2.800)	0	.400	1.000	9000400	386.00
900-420	.420	1.200 (2.900)	0	.420	1.000	9000420	425.00
900-440	.440	1.250 (3.000)	0	.440	1.000	9000440	466.00
900-460	.460	1.300 (3.100)	0	.460	1.000	9000460	509.00
900-480	.480	1.350 (3.200)	0	.480	1.000	9000480	554.00
900-500	.500	1.400 (3.300)	0	.500	1.000	9000500	601.00
900-520	.520	1.450 (3.400)	0	.520	1.000	9000520	650.00
900-540	.540	1.500 (3.500)	0	.540	1.000	9000540	701.00
900-560	.560	1.550 (3.600)	0	.560	1.000	9000560	754.00
900-580	.580	1.600 (3.700)	0	.580	1.000	9000580	809.00
900-600	.600	1.650 (3.800)	0	.600	1.000	9000600	866.00
900-620	.620	1.700 (3.900)	0	.620	1.000	9000620	925.00
900-640	.640	1.750 (4.000)	0	.640	1.000	9000640	986.00
900-660	.660	1.800 (4.100)	0	.660	1.000	9000660	1049.00
900-680	.680	1.850 (4.200)	0	.680	1.000	9000680	1114.00
900-700	.700	1.900 (4.300)	0	.700	1.000	9000700	1181.00
900-720	.720	1.950 (4.400)	0	.720	1.000	9000720	1250.00
900-740	.740	2.000 (4.500)	0	.740	1.000	9000740	1321.00
900-760	.760	2.050 (4.600)	0	.760	1.000	9000760	1394.00
900-780	.780	2.100 (4.700)	0	.780	1.000	9000780	1469.00
900-800	.800	2.150 (4.800)	0	.800	1.000	9000800	1546.00
900-820	.820	2.200 (4.900)	0	.820	1.000	9000820	1625.00
900-840	.840	2.250 (5.000)	0	.840	1.000	9000840	1706.00
900-860	.860	2.300 (5.100)	0	.860	1.000	9000860	1789.00
900-880	.880	2.350 (5.200)	0	.880	1.000	9000880	1874.00
900-900	.900	2.400 (5.300)	0	.900	1.000	9000900	1961.00
900-920	.920	2.450 (5.400)	0	.920	1.000	9000920	2050.00
900-940	.940	2.500 (5.500)	0	.940	1.000	9000940	2141.00
900-960	.960	2.550 (5.600)	0	.960	1.000	9000960	2234.00
900-980	.980	2.600 (5.700)	0	.980	1.000	9000980	2329.00
900-1000	1.000	2.650 (5.800)	0	1.000	1.000	9001000	2426.00

PLEASE SEE SPEEDS & FEEDS ON PAGE 166

# VARIABLE HELIX END MILLS FOR MEDIUM ALLOY STEELS

## Finishers

SPEEDS & FEEDS   High-Helix Finishers for Medium Alloy Steels															
Series	Workpiece Size (mm)	Type	Tool Name	Cutting Conditions (mm/min)										Tool Life (min)	
				V <sub>c</sub>	V <sub>f</sub>	V <sub>d</sub>	V <sub>a</sub>	V <sub>h</sub>	V <sub>l</sub>	V <sub>o</sub>	V <sub>p</sub>	V <sub>r</sub>	V <sub>s</sub>	Est.	Min.
<b>Series 1:</b> 100-120, 120-150, 150-200, 200-250, 250-300, 300-350, 350-400, 400-450, 450-500, 500-550, 550-600, 600-650, 650-700, 700-750, 750-800, 800-850, 850-900, 900-950, 950-1000	100-120	100	Variable Helix 3-Flute	2000	0.15	0.10	0.08	0.07	0.06	0.05	0.04	0.03	0.02	10000	10000
			Variable Helix 4-Flute	2200	0.16	0.11	0.09	0.08	0.07	0.06	0.05	0.04	0.03	12000	12000
			Variable Helix 5-Flute	2400	0.17	0.12	0.10	0.09	0.08	0.07	0.06	0.05	0.04	14000	14000
			Variable Helix 6-Flute	2600	0.18	0.13	0.11	0.10	0.09	0.08	0.07	0.06	0.05	16000	16000
			Variable Helix 7-Flute	2800	0.19	0.14	0.12	0.11	0.10	0.09	0.08	0.07	0.06	18000	18000
			Variable Helix 8-Flute	3000	0.20	0.15	0.13	0.12	0.11	0.10	0.09	0.08	0.07	20000	20000
			Variable Helix 9-Flute	3200	0.21	0.16	0.14	0.13	0.12	0.11	0.10	0.09	0.08	22000	22000
			Variable Helix 10-Flute	3400	0.22	0.17	0.15	0.14	0.13	0.12	0.11	0.10	0.09	24000	24000
			Variable Helix 11-Flute	3600	0.23	0.18	0.16	0.15	0.14	0.13	0.12	0.11	0.10	26000	26000
	150-200	150	Variable Helix 3-Flute	2500	0.18	0.12	0.10	0.09	0.08	0.07	0.06	0.05	0.04	12000	12000
			Variable Helix 4-Flute	2700	0.19	0.13	0.11	0.10	0.09	0.08	0.07	0.06	0.05	14000	14000
			Variable Helix 5-Flute	2900	0.20	0.14	0.12	0.11	0.10	0.09	0.08	0.07	0.06	16000	16000
			Variable Helix 6-Flute	3100	0.21	0.15	0.13	0.12	0.11	0.10	0.09	0.08	0.07	18000	18000
			Variable Helix 7-Flute	3300	0.22	0.16	0.14	0.13	0.12	0.11	0.10	0.09	0.08	20000	20000
			Variable Helix 8-Flute	3500	0.23	0.17	0.15	0.14	0.13	0.12	0.11	0.10	0.09	22000	22000
			Variable Helix 9-Flute	3700	0.24	0.18	0.16	0.15	0.14	0.13	0.12	0.11	0.10	24000	24000
			Variable Helix 10-Flute	3900	0.25	0.19	0.17	0.16	0.15	0.14	0.13	0.12	0.11	26000	26000
			Variable Helix 11-Flute	4100	0.26	0.20	0.18	0.17	0.16	0.15	0.14	0.13	0.12	28000	28000
<b>Series 2:</b> 120-150, 150-200, 200-250, 250-300, 300-350, 350-400, 400-450, 450-500, 500-550, 550-600, 600-650, 650-700, 700-750, 750-800, 800-850, 850-900, 900-950, 950-1000	120-150	120	Variable Helix 3-Flute	1800	0.12	0.08	0.06	0.05	0.04	0.03	0.02	0.01	8000	8000	
			Variable Helix 4-Flute	2000	0.13	0.09	0.07	0.06	0.05	0.04	0.03	0.02	0.01	9000	9000
			Variable Helix 5-Flute	2200	0.14	0.10	0.08	0.07	0.06	0.05	0.04	0.03	0.02	10000	10000
			Variable Helix 6-Flute	2400	0.15	0.11	0.09	0.08	0.07	0.06	0.05	0.04	0.03	11000	11000
			Variable Helix 7-Flute	2600	0.16	0.12	0.10	0.09	0.08	0.07	0.06	0.05	0.04	12000	12000
			Variable Helix 8-Flute	2800	0.17	0.13	0.11	0.10	0.09	0.08	0.07	0.06	0.05	13000	13000
			Variable Helix 9-Flute	3000	0.18	0.14	0.12	0.11	0.10	0.09	0.08	0.07	0.06	14000	14000
			Variable Helix 10-Flute	3200	0.19	0.15	0.13	0.12	0.11	0.10	0.09	0.08	0.07	15000	15000
			Variable Helix 11-Flute	3400	0.20	0.16	0.14	0.13	0.12	0.11	0.10	0.09	0.08	16000	16000
	150-200	150	Variable Helix 3-Flute	2200	0.14	0.10	0.08	0.07	0.06	0.05	0.04	0.03	0.02	10000	10000
			Variable Helix 4-Flute	2400	0.15	0.11	0.09	0.08	0.07	0.06	0.05	0.04	0.03	11000	11000
			Variable Helix 5-Flute	2600	0.16	0.12	0.10	0.09	0.08	0.07	0.06	0.05	0.04	12000	12000
			Variable Helix 6-Flute	2800	0.17	0.13	0.11	0.10	0.09	0.08	0.07	0.06	0.05	13000	13000
			Variable Helix 7-Flute	3000	0.18	0.14	0.12	0.11	0.10	0.09	0.08	0.07	0.06	14000	14000
			Variable Helix 8-Flute	3200	0.19	0.15	0.13	0.12	0.11	0.10	0.09	0.08	0.07	15000	15000
			Variable Helix 9-Flute	3400	0.20	0.16	0.14	0.13	0.12	0.11	0.10	0.09	0.08	16000	16000
			Variable Helix 10-Flute	3600	0.21	0.17	0.15	0.14	0.13	0.12	0.11	0.10	0.09	17000	17000
			Variable Helix 11-Flute	3800	0.22	0.18	0.16	0.15	0.14	0.13	0.12	0.11	0.10	18000	18000



## VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

### Square - Long Reach, Stub Flute



- Optimized for free machining operation of carbon steels and stainless steels
- Long reach design for long reaches
- Reduced workpiece to workpiece
- Variable flute design (degrees - 30°) reduces chatter and burrs and increases productivity
- 4 Flutes for maximum rigidity and best response
- 40 degree chamfers for high precision tool holders
- Smooth cutting
- Good surface
- Good ground to the edge.

ITEM NO. 425000000	LENGTH mm	OVERALL LENGTH mm	FLUTES	SHAFT DIAMETER mm	OVERALL LENGTH mm	ITEM NUMBER	
						ITEM 1	ITEM 2
425000000	100	275	4	12	0.12	425000000	0.12
425000000	125	275	4	12	0.12	425000000	0.12
425000000	150	275	4	12	0.12	425000000	0.12
425000000	175	275	4	12	0.12	425000000	0.12
425000000	200	275	4	12	0.12	425000000	0.12
425000000	225	275	4	12	0.12	425000000	0.12
425000000	250	275	4	12	0.12	425000000	0.12
425000000	275	275	4	12	0.12	425000000	0.12
425000000	300	275	4	12	0.12	425000000	0.12
425000000	325	275	4	12	0.12	425000000	0.12
425000000	350	275	4	12	0.12	425000000	0.12
425000000	375	275	4	12	0.12	425000000	0.12
425000000	400	275	4	12	0.12	425000000	0.12
425000000	425	275	4	12	0.12	425000000	0.12
425000000	450	275	4	12	0.12	425000000	0.12
425000000	475	275	4	12	0.12	425000000	0.12
425000000	500	275	4	12	0.12	425000000	0.12
425000000	525	275	4	12	0.12	425000000	0.12
425000000	550	275	4	12	0.12	425000000	0.12
425000000	575	275	4	12	0.12	425000000	0.12
425000000	600	275	4	12	0.12	425000000	0.12
425000000	625	275	4	12	0.12	425000000	0.12
425000000	650	275	4	12	0.12	425000000	0.12
425000000	675	275	4	12	0.12	425000000	0.12
425000000	700	275	4	12	0.12	425000000	0.12
425000000	725	275	4	12	0.12	425000000	0.12
425000000	750	275	4	12	0.12	425000000	0.12
425000000	775	275	4	12	0.12	425000000	0.12
425000000	800	275	4	12	0.12	425000000	0.12
425000000	825	275	4	12	0.12	425000000	0.12
425000000	850	275	4	12	0.12	425000000	0.12
425000000	875	275	4	12	0.12	425000000	0.12
425000000	900	275	4	12	0.12	425000000	0.12
425000000	925	275	4	12	0.12	425000000	0.12
425000000	950	275	4	12	0.12	425000000	0.12
425000000	975	275	4	12	0.12	425000000	0.12
425000000	1000	275	4	12	0.12	425000000	0.12

(continued on next page)

## VARIABLE HOLE END MILLS FOR FREE MACHINING STEELS

Square - Long Reach, Slab Plate (cont.)

continued from previous page

ITEM NUMBER	LENGTH (L)	TOTAL LENGTH	Flutes	Length (L)	TOTAL LENGTH	MATERIAL	
						ITEM #	PRICE
100-100	100	100	2	100	100	100-100	100.00
100-100	100	100	2	100	100	100-100	100.00
100-100	100	100	2	100	100	100-100	100.00
100-100	100	100	2	100	100	100-100	100.00
100-100	100	100	2	100	100	100-100	100.00
100-100	100	100	2	100	100	100-100	100.00
100-100	100	100	2	100	100	100-100	100.00

### SPEEDS & FEEDS (Variable Hole - Long Reach, Slab Plate for Free Machining Steels)

Recommended Speeds & Feeds are based on cutting conditions based on material of the workpiece. The table provides data for 100-100 (100-100) for 100-100 (100-100) for 100-100 (100-100). Percentage increase/decrease of RPM and SFM for other materials (100-100) apply to 100-100 (100-100) and 100-100 (100-100) for 100-100 (100-100).

Material	Diameter (mm)	RPM	The Last Two (100-100) of Table Speeds															
			100	100	100	100	100	100	100	100	100	100	100	100	100	100		
Tool Steel 100-100 (100-100) 100-100 (100-100)	100-100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		
	100-100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		
	100-100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		
Aluminum 100-100 (100-100) 100-100 (100-100)	100-100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		
	100-100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		
	100-100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		

\* All data are approximate and for reference only. Actual results may vary. For more information, please contact your local distributor.

## VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

### MILL



- Optimized for free machining steels of carbon steel and stainless steel
- Variable helix design (30°/30°, 45°) reduces chatter and burring and increases life of end mill tool
- ATB coated for superior cutting performance
- All sizes optimized for high precision ball turning
- Center cutting
- Good coolant
- ISO grade H in the ISO

D1 (mm)	LENGTH OF CUT (mm)	FLUTES	INNER DIAMETER (mm)	CUTTING LENGTH (mm)	TYPE NUMBER	
					TYPE J	TYPE B
100 (100)	50 (100)	5	10	110	1000-100	1000
120 (120)	60 (120)	5	12	120	1000-120	1000
150 (150)	75 (150)	5	15	150	1000-150	1000
200 (200)	100 (200)	5	20	200	1000-200	1000
250 (250)	125 (250)	5	25	250	1000-250	1000
300 (300)	150 (300)	5	30	300	1000-300	1000
400 (400)	200 (400)	5	40	400	1000-400	1000
500 (500)	250 (500)	5	50	500	1000-500	1000
600 (600)	300 (600)	5	60	600	1000-600	1000
800 (800)	400 (800)	5	80	800	1000-800	1000
1000 (1000)	500 (1000)	5	100	1000	1000-1000	1000

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

**Important Note:** All data are based on a cutting speed and feed rate as indicated on this chart at a cutting length of 100 mm. For longer cutting lengths, recommended RPM must be increased 10-15% and feed is 10-15% the length factor (1000 mm length is 100% and 2000 mm length is about 150% increase). This information is for reference only. Please refer to our website for more information.

Material	Workpiece (mm)	RPM	Top Layer (mm) (RPM) by Cutting Diameter											
			100	120	150	200	250	300	400	500	600	800	1000	
Carbon Steels AISI 1045, S45C, C45, C45E, C45K, C45, C45E, C45K	100-150	100	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
	150-200	100	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
	200-300	100	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Stainless Steels AISI 304, 304L, 316, 316L, 316Ti, 316TiL, 316TiL, 316TiL	100-150	100	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
	150-200	100	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
	200-300	100	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
			Rough Machining						Finish Machining					
			Rough 1/10"						Finish 1/10"					
			Rough 1/20"						Finish 1/20"					
			Rough 1/30"						Finish 1/30"					

\* This chart is based on a cutting length of 100 mm. For longer cutting lengths, recommended RPM must be increased 10-15% and feed is 10-15% the length factor (1000 mm length is 100% and 2000 mm length is about 150% increase). This information is for reference only. Please refer to our website for more information.



## VARIABLE HELIX END MILLS FOR FREE MACHINING STEELS

Corner Radius (mm)

continued from previous page

DIETER SPINTECH			CORNER RADIUS	LENGTH OF FLUTE	FLUTES	SHANK Ø (mm)	OVERALL LENGTH	ITEM NUMBER	
Ø (mm)	Length (mm)	Overall diameter (mm)	R (mm)	L (mm)				TC100 g	PC100
20.000	100	20.000	0.500	50.000	5	20.000	200.000	20000100	0.000
20.000	150	20.000	0.500	75.000	5	20.000	300.000	20000150	0.000
20.000	200	20.000	0.500	100.000	5	20.000	400.000	20000200	0.000
20.000	250	20.000	0.500	125.000	5	20.000	500.000	20000250	0.000
20.000	300	20.000	0.500	150.000	5	20.000	600.000	20000300	0.000
20.000	350	20.000	0.500	175.000	5	20.000	700.000	20000350	0.000
20.000	400	20.000	0.500	200.000	5	20.000	800.000	20000400	0.000
20.000	450	20.000	0.500	225.000	5	20.000	900.000	20000450	0.000
20.000	500	20.000	0.500	250.000	5	20.000	1000.000	20000500	0.000
20.000	550	20.000	0.500	275.000	5	20.000	1100.000	20000550	0.000
20.000	600	20.000	0.500	300.000	5	20.000	1200.000	20000600	0.000
20.000	650	20.000	0.500	325.000	5	20.000	1300.000	20000650	0.000
20.000	700	20.000	0.500	350.000	5	20.000	1400.000	20000700	0.000
20.000	750	20.000	0.500	375.000	5	20.000	1500.000	20000750	0.000
20.000	800	20.000	0.500	400.000	5	20.000	1600.000	20000800	0.000
20.000	850	20.000	0.500	425.000	5	20.000	1700.000	20000850	0.000
20.000	900	20.000	0.500	450.000	5	20.000	1800.000	20000900	0.000
20.000	950	20.000	0.500	475.000	5	20.000	1900.000	20000950	0.000
20.000	1000	20.000	0.500	500.000	5	20.000	2000.000	20001000	0.000
25.000	100	25.000	0.500	50.000	5	25.000	200.000	25000100	0.000
25.000	150	25.000	0.500	75.000	5	25.000	300.000	25000150	0.000
25.000	200	25.000	0.500	100.000	5	25.000	400.000	25000200	0.000
25.000	250	25.000	0.500	125.000	5	25.000	500.000	25000250	0.000
25.000	300	25.000	0.500	150.000	5	25.000	600.000	25000300	0.000
25.000	350	25.000	0.500	175.000	5	25.000	700.000	25000350	0.000
25.000	400	25.000	0.500	200.000	5	25.000	800.000	25000400	0.000
25.000	450	25.000	0.500	225.000	5	25.000	900.000	25000450	0.000
25.000	500	25.000	0.500	250.000	5	25.000	1000.000	25000500	0.000
25.000	550	25.000	0.500	275.000	5	25.000	1100.000	25000550	0.000
25.000	600	25.000	0.500	300.000	5	25.000	1200.000	25000600	0.000
25.000	650	25.000	0.500	325.000	5	25.000	1300.000	25000650	0.000
25.000	700	25.000	0.500	350.000	5	25.000	1400.000	25000700	0.000
25.000	750	25.000	0.500	375.000	5	25.000	1500.000	25000750	0.000
25.000	800	25.000	0.500	400.000	5	25.000	1600.000	25000800	0.000
25.000	850	25.000	0.500	425.000	5	25.000	1700.000	25000850	0.000
25.000	900	25.000	0.500	450.000	5	25.000	1800.000	25000900	0.000
25.000	950	25.000	0.500	475.000	5	25.000	1900.000	25000950	0.000
25.000	1000	25.000	0.500	500.000	5	25.000	2000.000	25001000	0.000
30.000	100	30.000	0.500	50.000	5	30.000	200.000	30000100	0.000
30.000	150	30.000	0.500	75.000	5	30.000	300.000	30000150	0.000
30.000	200	30.000	0.500	100.000	5	30.000	400.000	30000200	0.000
30.000	250	30.000	0.500	125.000	5	30.000	500.000	30000250	0.000
30.000	300	30.000	0.500	150.000	5	30.000	600.000	30000300	0.000
30.000	350	30.000	0.500	175.000	5	30.000	700.000	30000350	0.000
30.000	400	30.000	0.500	200.000	5	30.000	800.000	30000400	0.000
30.000	450	30.000	0.500	225.000	5	30.000	900.000	30000450	0.000
30.000	500	30.000	0.500	250.000	5	30.000	1000.000	30000500	0.000
30.000	550	30.000	0.500	275.000	5	30.000	1100.000	30000550	0.000
30.000	600	30.000	0.500	300.000	5	30.000	1200.000	30000600	0.000
30.000	650	30.000	0.500	325.000	5	30.000	1300.000	30000650	0.000
30.000	700	30.000	0.500	350.000	5	30.000	1400.000	30000700	0.000
30.000	750	30.000	0.500	375.000	5	30.000	1500.000	30000750	0.000
30.000	800	30.000	0.500	400.000	5	30.000	1600.000	30000800	0.000
30.000	850	30.000	0.500	425.000	5	30.000	1700.000	30000850	0.000
30.000	900	30.000	0.500	450.000	5	30.000	1800.000	30000900	0.000
30.000	950	30.000	0.500	475.000	5	30.000	1900.000	30000950	0.000
30.000	1000	30.000	0.500	500.000	5	30.000	2000.000	30001000	0.000

PLEASE USE SPEEDS & FEEDS ON PAGE 100







## VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Chipbreaker Finaghters - Square



- Optimized for aluminum and titanium alloys with excellent performance in rough, finish, and broach steps
- Single flute geometry for improved chip management
- Variable helix design (up to 12° helix angle) and chipbreaker for excellent finish on turned parts
- All steel construction for high precision tool holding
- 2 Flutes
- Square cutting
- Solid carbide
- ISO2 ground to the USA

ISO CODE EN 837-100	ISO CODE EN 837-101	ALLOY	DIA. OF SHANK	OVERALL LENGTH	UNFINISHED		FINISHED	
					V.F.	M.F.M.	V.F.	M.F.M.
EN 837-100	EN 837-101		25 mm	120				
EN 837-100	EN 837-101	Al	18	120	0.002	0.002	0.0015	0.002
EN 837-100	EN 837-101	Al	18	120	0.002	0.002	0.0015	0.002
EN 837-100	EN 837-101	Al	18	120	0.002	0.002	0.0015	0.002
EN 837-100	EN 837-101		25 mm	120				
EN 837-100	EN 837-101	Al	18	120	0.002	0.002	0.0015	0.002
EN 837-100	EN 837-101	Al	18	120	0.002	0.002	0.0015	0.002
EN 837-100	EN 837-101	Al	18	120	0.002	0.002	0.0015	0.002



Download Speeds & Feeds Charts  
 For Every Harvey Tool End Mill

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

## VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

### Square



- Optimized for aluminum and aluminum alloys with excellent performance in various grades, different sizes
- Variable helix design (degrees: 12°) reduces chatter and built-up, and increases finished surface value
- 10 degree clearance for long precision tool holders + 1 Degree tapering
- Hard coating + DLC ground to the 200

END MILL SQUARE

ITEM	ITEM CODE	ITEM NAME	ITEM UNIT	ITEM QTY	ITEM DIMENSIONS	ITEM WEIGHT	ITEM PRICE		ITEM PRICE		ITEM PRICE		ITEM PRICE	
							ITEM PRICE	ITEM PRICE	ITEM PRICE	ITEM PRICE	ITEM PRICE	ITEM PRICE		
100	100	100	100	100	100	100	100	100	100	100	100	100	100	

continued on next page



# VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Significant sizes:

*(continued from previous page)*

CUTTING SPEED (MPM)	FEED (IPM)	LENGTH OF CUT (L)	RATED SPEED (RPM)	RPM (R)	IPM (F)	RECOMMENDED	TO, HIGHER	ALUMINUM	ESTIMATED
200	0.015	400	100	3	15	1219	\$1080	\$11.20	
200	0.02	400	100	3	15	1219	\$1080	\$11.20	
200	0.025	400	100	3	15	1219	\$1080	\$11.20	
200	0.03	400	100	3	15	1219	\$1080	\$11.20	
200	0.04	400	100	3	15	1219	\$1080	\$11.20	
200	0.05	400	100	3	15	1219	\$1080	\$11.20	
200	0.06	400	100	3	15	1219	\$1080	\$11.20	
200	0.08	400	100	3	15	1219	\$1080	\$11.20	
200	0.1	400	100	3	15	1219	\$1080	\$11.20	
200	0.15	400	100	3	15	1219	\$1080	\$11.20	
200	0.2	400	100	3	15	1219	\$1080	\$11.20	
200	0.3	400	100	3	15	1219	\$1080	\$11.20	
200	0.4	400	100	3	15	1219	\$1080	\$11.20	

CUTTING SPEED (MPM)	FEED (IPM)	LENGTH OF CUT (L)	RATED SPEED (RPM)	RPM (R)	IPM (F)	RECOMMENDED	TO, HIGHER	ALUMINUM	ESTIMATED
200	0.015	300	100	3	15	1219	\$765	\$11.20	
200	0.02	300	100	3	15	1219	\$765	\$11.20	
200	0.025	300	100	3	15	1219	\$765	\$11.20	
200	0.03	300	100	3	15	1219	\$765	\$11.20	
200	0.04	300	100	3	15	1219	\$765	\$11.20	
200	0.05	300	100	3	15	1219	\$765	\$11.20	
200	0.06	300	100	3	15	1219	\$765	\$11.20	
200	0.08	300	100	3	15	1219	\$765	\$11.20	
200	0.1	300	100	3	15	1219	\$765	\$11.20	
200	0.15	300	100	3	15	1219	\$765	\$11.20	
200	0.2	300	100	3	15	1219	\$765	\$11.20	
200	0.3	300	100	3	15	1219	\$765	\$11.20	
200	0.4	300	100	3	15	1219	\$765	\$11.20	
200	0.015	300	100	3	15	1219	\$765	\$11.20	
200	0.02	300	100	3	15	1219	\$765	\$11.20	
200	0.025	300	100	3	15	1219	\$765	\$11.20	
200	0.03	300	100	3	15	1219	\$765	\$11.20	
200	0.04	300	100	3	15	1219	\$765	\$11.20	
200	0.05	300	100	3	15	1219	\$765	\$11.20	
200	0.06	300	100	3	15	1219	\$765	\$11.20	
200	0.08	300	100	3	15	1219	\$765	\$11.20	
200	0.1	300	100	3	15	1219	\$765	\$11.20	
200	0.15	300	100	3	15	1219	\$765	\$11.20	
200	0.2	300	100	3	15	1219	\$765	\$11.20	
200	0.3	300	100	3	15	1219	\$765	\$11.20	
200	0.4	300	100	3	15	1219	\$765	\$11.20	
200	0.015	300	100	3	15	1219	\$765	\$11.20	
200	0.02	300	100	3	15	1219	\$765	\$11.20	
200	0.025	300	100	3	15	1219	\$765	\$11.20	
200	0.03	300	100	3	15	1219	\$765	\$11.20	
200	0.04	300	100	3	15	1219	\$765	\$11.20	
200	0.05	300	100	3	15	1219	\$765	\$11.20	
200	0.06	300	100	3	15	1219	\$765	\$11.20	
200	0.08	300	100	3	15	1219	\$765	\$11.20	
200	0.1	300	100	3	15	1219	\$765	\$11.20	
200	0.15	300	100	3	15	1219	\$765	\$11.20	
200	0.2	300	100	3	15	1219	\$765	\$11.20	
200	0.3	300	100	3	15	1219	\$765	\$11.20	
200	0.4	300	100	3	15	1219	\$765	\$11.20	
200	0.015	300	100	3	15	1219	\$765	\$11.20	
200	0.02	300	100	3	15	1219	\$765	\$11.20	
200	0.025	300	100	3	15	1219	\$765	\$11.20	
200	0.03	300	100	3	15	1219	\$765	\$11.20	
200	0.04	300	100	3	15	1219	\$765	\$11.20	
200	0.05	300	100	3	15	1219	\$765	\$11.20	
200	0.06	300	100	3	15	1219	\$765	\$11.20	
200	0.08	300	100	3	15	1219	\$765	\$11.20	
200	0.1	300	100	3	15	1219	\$765	\$11.20	
200	0.15	300	100	3	15	1219	\$765	\$11.20	
200	0.2	300	100	3	15	1219	\$765	\$11.20	
200	0.3	300	100	3	15	1219	\$765	\$11.20	
200	0.4	300	100	3	15	1219	\$765	\$11.20	

*(continued on next page)*

## VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Square (cont.)

Continued from previous page

CUTTER INFORMATION			LUBRICANT	FLUTE LENGTH	FLUTE DIA.	FLUTE LEAD	RECOMMENDED		RECOMMENDED FEEDS	RECOMMENDED SPEEDS
ITEM NO.	ITEM NAME	ITEM CODE					SPINDLE SPEED (RPM)	FEED (IPR)		
200-10-05	1/2" 1/2" 2-FLUTE	200-10-05	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	0.0000
200-10-06	1/2" 1/2" 3-FLUTE	200-10-06	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	0.0000
200-10-07	1/2" 1/2" 4-FLUTE	200-10-07	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	0.0000
200-10-08	1/2" 1/2" 5-FLUTE	200-10-08	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	0.0000
200-10-09	1/2" 1/2" 6-FLUTE	200-10-09	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	0.0000
200-10-10	1/2" 1/2" 7-FLUTE	200-10-10	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	0.0000
200-10-11	1/2" 1/2" 8-FLUTE	200-10-11	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	0.0000

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

Application: Used for all aluminum alloys and non-ferrous alloys. For the best results, please refer to the technical manual for the specific alloy. The feed rates are based on a 100% chip load. The feed rates are based on a 100% chip load. The feed rates are based on a 100% chip load.

ITEM NO.	ITEM NAME	ITEM CODE	LUBRICANT	FLUTE LENGTH	FLUTE DIA.	FLUTE LEAD	RECOMMENDED		RECOMMENDED FEEDS	RECOMMENDED SPEEDS
							SPINDLE SPEED (RPM)	FEED (IPR)		
200-10-05	1/2" 1/2" 2-FLUTE	200-10-05	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	
200-10-06	1/2" 1/2" 3-FLUTE	200-10-06	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	
200-10-07	1/2" 1/2" 4-FLUTE	200-10-07	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	
200-10-08	1/2" 1/2" 5-FLUTE	200-10-08	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	
200-10-09	1/2" 1/2" 6-FLUTE	200-10-09	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	
200-10-10	1/2" 1/2" 7-FLUTE	200-10-10	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	
200-10-11	1/2" 1/2" 8-FLUTE	200-10-11	0	0.10	0.10	0.0000	0.0000	0.0000	0.0000	

\* Feed rates are based on a 100% chip load. For other chip loads, please refer to the technical manual for the specific alloy. The feed rates are based on a 100% chip load. The feed rates are based on a 100% chip load.







## VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Square - Downcut



- Optimized for aluminum and plastic that offers excellent performance in edge, chamfer, groove, and groove chamfer
- Variable helix design (variable  $\pm 15^\circ$ ) reducing chatter and burr formation and increasing process window costs
- Prevents fluting of workpiece
- All diameters feature the high performance coatings:  $\pm 2 \mu\text{m}$  hard wear, right hand cut flutes
- Coated cutting:  $\pm$  hard coating
- DMC ground to the 5th

ITEM NUMBER		DIA. (mm)	LENGTH (mm)	FLUTES	SHAPE AT END (mm)	TOTAL LENGTH (mm)	COATING		DL (mm)	
12345	12345						1A	1A		
<b>D</b>										
6011100	12345	10.0	100.0	2	10.0	100.0	0.05	0.05	0.05	0.05
6011101	12345	12.0	100.0	2	12.0	100.0	0.05	0.05	0.05	0.05
6011102	12345	16.0	100.0	2	16.0	100.0	0.05	0.05	0.05	0.05
6011103	12345	20.0	100.0	2	20.0	100.0	0.05	0.05	0.05	0.05
6011104	12345	25.0	100.0	2	25.0	100.0	0.05	0.05	0.05	0.05
6011105	12345	32.0	100.0	2	32.0	100.0	0.05	0.05	0.05	0.05
6011106	12345	40.0	100.0	2	40.0	100.0	0.05	0.05	0.05	0.05
6011107	12345	50.0	100.0	2	50.0	100.0	0.05	0.05	0.05	0.05
6011108	12345	63.0	100.0	2	63.0	100.0	0.05	0.05	0.05	0.05
6011109	12345	80.0	100.0	2	80.0	100.0	0.05	0.05	0.05	0.05
6011110	12345	100.0	100.0	2	100.0	100.0	0.05	0.05	0.05	0.05
6011111	12345	125.0	100.0	2	125.0	100.0	0.05	0.05	0.05	0.05
<b>D</b>										
6011112	12345	10.0	100.0	2	10.0	100.0	0.05	0.05	0.05	0.05
6011113	12345	12.0	100.0	2	12.0	100.0	0.05	0.05	0.05	0.05
6011114	12345	16.0	100.0	2	16.0	100.0	0.05	0.05	0.05	0.05
6011115	12345	20.0	100.0	2	20.0	100.0	0.05	0.05	0.05	0.05
6011116	12345	25.0	100.0	2	25.0	100.0	0.05	0.05	0.05	0.05
6011117	12345	32.0	100.0	2	32.0	100.0	0.05	0.05	0.05	0.05
6011118	12345	40.0	100.0	2	40.0	100.0	0.05	0.05	0.05	0.05
6011119	12345	50.0	100.0	2	50.0	100.0	0.05	0.05	0.05	0.05
6011120	12345	63.0	100.0	2	63.0	100.0	0.05	0.05	0.05	0.05
6011121	12345	80.0	100.0	2	80.0	100.0	0.05	0.05	0.05	0.05
6011122	12345	100.0	100.0	2	100.0	100.0	0.05	0.05	0.05	0.05
6011123	12345	125.0	100.0	2	125.0	100.0	0.05	0.05	0.05	0.05
6011124	12345	150.0	100.0	2	150.0	100.0	0.05	0.05	0.05	0.05
6011125	12345	175.0	100.0	2	175.0	100.0	0.05	0.05	0.05	0.05
6011126	12345	200.0	100.0	2	200.0	100.0	0.05	0.05	0.05	0.05
6011127	12345	250.0	100.0	2	250.0	100.0	0.05	0.05	0.05	0.05
6011128	12345	315.0	100.0	2	315.0	100.0	0.05	0.05	0.05	0.05
6011129	12345	400.0	100.0	2	400.0	100.0	0.05	0.05	0.05	0.05
6011130	12345	500.0	100.0	2	500.0	100.0	0.05	0.05	0.05	0.05

PLEASE SEE SPEEDS & FEEDS ON PAGE 146



## VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Ball nose 1

continued from previous page

CUTTER ITEM #	CUTTER LENGTH INCH	CUTTER DIAMETER INCH	LENGTH TO CENTER OF CUTTING EDGE INCH	SHAFT DIAMETER - DIA. INCH		MATERIAL		TOOL-TO-TOOL		APPROXIMATE CUTTING LENGTH	
				Ø INCH	INCH	AL	INCH	AL	INCH	AL	INCH
919-1150	1.750	1.000	1.150	1.000	1.125	AL7050	10.00	919-1150	10.00		
919-1151	1.750	1.000	1.150	1.000	1.125	AL7050	10.00	919-1151	10.00		
919-1152	1.750	1.000	1.150	1.000	1.125	AL7050	10.00	919-1152	10.00		
	1.750	1.000	1.200	1.000	1.125	AL7050	10.00	919-1153	10.00		
	1.750	1.000	1.250	1.000	1.125	AL7050	10.00	919-1154	10.00		
919-1155	1.750	1.000	1.300	1.000	1.125	AL7050	10.00	919-1155	10.00		
919-1156	1.750	1.000	1.350	1.000	1.125	AL7050	10.00	919-1156	10.00	919-1156	10.00
919-1157	1.750	1.000	1.400	1.000	1.125	AL7050	10.00	919-1157	10.00		
919-1158	1.750	1.000	1.450	1.000	1.125	AL7050	10.00	919-1158	10.00		
919-1159	1.750	1.000	1.500	1.000	1.125	AL7050	10.00	919-1159	10.00		
919-1160	1.750	1.000	1.550	1.000	1.125	AL7050	10.00	919-1160	10.00		
919-1161	1.750	1.000	1.600	1.000	1.125	AL7050	10.00	919-1161	10.00		
919-1162	1.750	1.000	1.650	1.000	1.125	AL7050	10.00	919-1162	10.00		
919-1163	1.750	1.000	1.700	1.000	1.125	AL7050	10.00	919-1163	10.00		
919-1164	1.750	1.000	1.750	1.000	1.125	AL7050	10.00	919-1164	10.00		
919-1165	1.750	1.000	1.800	1.000	1.125	AL7050	10.00	919-1165	10.00		
919-1166	1.750	1.000	1.850	1.000	1.125	AL7050	10.00	919-1166	10.00		
919-1167	1.750	1.000	1.900	1.000	1.125	AL7050	10.00	919-1167	10.00		
919-1168	1.750	1.000	1.950	1.000	1.125	AL7050	10.00	919-1168	10.00		
919-1169	1.750	1.000	2.000	1.000	1.125	AL7050	10.00	919-1169	10.00		
919-1170	1.750	1.000	2.050	1.000	1.125	AL7050	10.00	919-1170	10.00		
919-1171	1.750	1.000	2.100	1.000	1.125	AL7050	10.00	919-1171	10.00		
919-1172	1.750	1.000	2.150	1.000	1.125	AL7050	10.00	919-1172	10.00		
919-1173	1.750	1.000	2.200	1.000	1.125	AL7050	10.00	919-1173	10.00		
919-1174	1.750	1.000	2.250	1.000	1.125	AL7050	10.00	919-1174	10.00		
919-1175	1.750	1.000	2.300	1.000	1.125	AL7050	10.00	919-1175	10.00		
919-1176	1.750	1.000	2.350	1.000	1.125	AL7050	10.00	919-1176	10.00		
919-1177	1.750	1.000	2.400	1.000	1.125	AL7050	10.00	919-1177	10.00		
919-1178	1.750	1.000	2.450	1.000	1.125	AL7050	10.00	919-1178	10.00		
919-1179	1.750	1.000	2.500	1.000	1.125	AL7050	10.00	919-1179	10.00		
919-1180	1.750	1.000	2.550	1.000	1.125	AL7050	10.00	919-1180	10.00		
919-1181	1.750	1.000	2.600	1.000	1.125	AL7050	10.00	919-1181	10.00		
919-1182	1.750	1.000	2.650	1.000	1.125	AL7050	10.00	919-1182	10.00		
919-1183	1.750	1.000	2.700	1.000	1.125	AL7050	10.00	919-1183	10.00		
919-1184	1.750	1.000	2.750	1.000	1.125	AL7050	10.00	919-1184	10.00		
919-1185	1.750	1.000	2.800	1.000	1.125	AL7050	10.00	919-1185	10.00		
919-1186	1.750	1.000	2.850	1.000	1.125	AL7050	10.00	919-1186	10.00		
919-1187	1.750	1.000	2.900	1.000	1.125	AL7050	10.00	919-1187	10.00		
919-1188	1.750	1.000	2.950	1.000	1.125	AL7050	10.00	919-1188	10.00		
919-1189	1.750	1.000	3.000	1.000	1.125	AL7050	10.00	919-1189	10.00		
919-1190	1.750	1.000	3.050	1.000	1.125	AL7050	10.00	919-1190	10.00		
919-1191	1.750	1.000	3.100	1.000	1.125	AL7050	10.00	919-1191	10.00		
919-1192	1.750	1.000	3.150	1.000	1.125	AL7050	10.00	919-1192	10.00		
919-1193	1.750	1.000	3.200	1.000	1.125	AL7050	10.00	919-1193	10.00		
919-1194	1.750	1.000	3.250	1.000	1.125	AL7050	10.00	919-1194	10.00		
919-1195	1.750	1.000	3.300	1.000	1.125	AL7050	10.00	919-1195	10.00		
919-1196	1.750	1.000	3.350	1.000	1.125	AL7050	10.00	919-1196	10.00		
919-1197	1.750	1.000	3.400	1.000	1.125	AL7050	10.00	919-1197	10.00		
919-1198	1.750	1.000	3.450	1.000	1.125	AL7050	10.00	919-1198	10.00		
919-1199	1.750	1.000	3.500	1.000	1.125	AL7050	10.00	919-1199	10.00		

PLEASE SEE SPEEDS & FEEDS ON PAGE 198



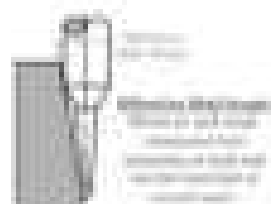
# HIGH HELIX END MILLS FOR ALUMINUM ALLOYS

## Mult - Tapered Flank (Mild Cutters)



Excellent in Aluminum & Other Non-Ferrous Materials

- Very short length of cut and zero tapered neck for maximum rigidity
- 1°, 2°, 3°, 4°, 5°, and 7° back angles to address common chip angles for better chip evacuation
- 40° face, large back angle, and narrow cutting edge for better chip evacuation and better finish
- Coated with TiN, coating is removed during grinding and enhances performance
- 2 flutes to center
- 3mm length
- CNC ground to the 200



MILL SERIES	CUTTER DIA.	LENGTH OF CUT	TAPERED FLANKS		EFFECTIVE BACK ANGLE	SHANK DIA.		LENGTH		WEIGHT		VOLUME	
			L1	L2		L1	L2	IN	MM	IN	MM		
40°	4011114	1/8"	1/8"	1/8"	4.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011115	1/8"	1/8"	1/8"	5.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011116	1/8"	1/8"	1/8"	6.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011117	1/8"	1/8"	1/8"	7.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011118	1/8"	1/8"	1/8"	1.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011119	1/8"	1/8"	1/8"	2.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011120	1/8"	1/8"	1/8"	3.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011121	1/8"	1/8"	1/8"	4.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011122	1/8"	1/8"	1/8"	5.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011123	1/8"	1/8"	1/8"	6.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
5.0°	4011124	1/8"	1/8"	1/8"	5.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011125	1/8"	1/8"	1/8"	5.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011126	1/8"	1/8"	1/8"	5.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011127	1/8"	1/8"	1/8"	5.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011128	1/8"	1/8"	1/8"	5.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011129	1/8"	1/8"	1/8"	5.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011130	1/8"	1/8"	1/8"	5.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011131	1/8"	1/8"	1/8"	5.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011132	1/8"	1/8"	1/8"	5.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000
	4011133	1/8"	1/8"	1/8"	5.0°	3/16"	3/16"	1.000"	1.000"	0.000	0.000	0.000	0.000

continued on next page

TYPE I



TYPE II



## HIGH HOLD END MILLS FOR ALUMINUM ALLOYS

Ball - Tapered Bevel (Mold Cutters) (cont.)

continued from previous page

BALL NUMBER	LOT/DA	LENGTH (D-CUT)	TAPERED BEVEL TYPE	OVERALL LENGTH		EFFECTIVE BALL LENGTH	SHANK DIA.		MATERIAL		SPL. NUMBER	
				L <sub>1</sub>	L <sub>2</sub>		D <sub>1</sub> (in)	D <sub>2</sub>	15%	90%	15%	90%
A	001000	.005	1	.005	.005	0.0	0.00	0.00	7075	0.00	000010	0.00
	001100	.005	0	1.00	1.00	0.0	0.00	0.00	7075	0.00	000110	0.00
	001200	.005	1	.05	.05	0.0	0.00	0.00	7075	0.00	000210	0.00
	001300	.005	0	1.00	1.00	0.0	0.00	0.00	7075	0.00	000310	0.00
	001400	.005	1	.05	.05	0.0	0.00	0.00	7075	0.00	000410	0.00
	001500	.005	0	1.00	1.00	0.0	0.00	0.00	7075	0.00	000510	0.00
	001600	.005	0	1.00	1.00	0.0	0.00	0.00	7075	0.00	000610	0.00
	001700	.010	0	.05	.05	0.0	0.00	0	7075	0.00	000710	0.00
	001800	.010	0	1.00	1.00	0.0	0.00	0.00	7075	0.00	000810	0.00
	001900	.010	0	.10	.10	0.0	0.00	0.00	7075	0.00	000910	0.00
	002000	.010	0	1.00	1.00	0.0	0.00	0	7075	0.00	001010	0.00
	002100	.010	0	1.00	1.00	0.0	0.00	0.00	7075	0.00	001110	0.00
B	002200	.005	0	.05	.05	0.0	0.00	0	7075	0.00	001210	0.00
	002300	.005	0	.05	.05	0.0	0.00	0	7075	0.00	001310	0.00
	002400	.005	0	.05	.05	0.0	0.00	0	7075	0.00	001410	0.00
	002500	.005	0	1.00	1.00	0.0	0.00	0.00	7075	0.00	001510	0.00
	002600	.010	0	.05	.05	0.0	0.00	0.00	7075	0.00	001610	0.00
	002700	.010	0	.05	.05	0.0	0.00	0.00	7075	0.00	001710	0.00
	002800	.010	0	.05	.05	0.0	0.00	0.00	7075	0.00	001810	0.00
C	002900	.005	0	.05	.05	0.0	0.00	0	7075	0.00	001910	0.00
	003000	.005	0	.05	.05	0.0	0.00	0	7075	0.00	002010	0.00
	003100	.005	0	.05	.05	0.0	0.00	0.00	7075	0.00	002110	0.00
	003200	.010	0	.05	.05	0.0	0.00	0.00	7075	0.00	002210	0.00
	003300	.010	0	.05	.05	0.0	0.00	0.00	7075	0.00	002310	0.00
	003400	.010	0	.05	.05	0.0	0.00	0.00	7075	0.00	002410	0.00
	003500	.010	0	.05	.05	0.0	0.00	0.00	7075	0.00	002510	0.00

MATERIAL: 7075-T6



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## VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

### Corner Radius



- Optimized for aluminum and aluminum alloys with excellent performance in rough, finish, and broach stages
- Variable flute design (varying 45°) reduces chatter and burrs, and increases material removal rates
- 40° chamfer designed for high precision tool grinding
- 2-Flute = Groove cutting
- 3-Flute = CNC ground to the USA

<b>Top Material</b>	Best used in Non-Ferrous Aluminum Alloy and Magnesium Alloy. Suitable for Steels in production. Results limited in cutting cast and pre-hardened steels and SS.
<b>Bottom Material</b>	Manufacturing experience in Steels, Steels, Alloys and High Speed Steels.

D	CUTTER DIAMETER		CORNER RADIUS	LENGTH OF CUT	FLUTE FLAVOR	FLUTE V.A.	FLUTE L.A.	SHEET METAL		MATERIAL REMOVAL	
	IN	MM						IN	MM	IN	MM
1/8"	0.125	3.175	0.015	0.125	0.50	0	0.125	3.175	0.0025	0.0635	
	0.125	3.175	0.030	0.125	0.50	0	0.125	3.175	0.0050	0.1270	
3/16"	0.1875	4.7625	0.015	0.1875	0.75	0	0.1875	4.7625	0.0025	0.0635	
	0.1875	4.7625	0.030	0.1875	0.75	0	0.1875	4.7625	0.0050	0.1270	
1/4"	0.2500	6.3500	0.015	0.2500	1.00	0	0.2500	6.3500	0.0025	0.0635	
	0.2500	6.3500	0.030	0.2500	1.00	0	0.2500	6.3500	0.0050	0.1270	
5/16"	0.3125	7.9375	0.015	0.3125	1.25	0	0.3125	7.9375	0.0025	0.0635	
	0.3125	7.9375	0.030	0.3125	1.25	0	0.3125	7.9375	0.0050	0.1270	
3/8"	0.3750	9.5250	0.015	0.3750	1.50	0	0.3750	9.5250	0.0025	0.0635	
	0.3750	9.5250	0.030	0.3750	1.50	0	0.3750	9.5250	0.0050	0.1270	
1/2"	0.5000	12.7000	0.015	0.5000	2.00	0	0.5000	12.7000	0.0025	0.0635	
	0.5000	12.7000	0.030	0.5000	2.00	0	0.5000	12.7000	0.0050	0.1270	
5/8"	0.6250	15.8750	0.015	0.6250	2.50	0	0.6250	15.8750	0.0025	0.0635	
	0.6250	15.8750	0.030	0.6250	2.50	0	0.6250	15.8750	0.0050	0.1270	
3/4"	0.7500	19.0500	0.015	0.7500	3.00	0	0.7500	19.0500	0.0025	0.0635	
	0.7500	19.0500	0.030	0.7500	3.00	0	0.7500	19.0500	0.0050	0.1270	
7/8"	0.8750	22.2250	0.015	0.8750	3.50	0	0.8750	22.2250	0.0025	0.0635	
	0.8750	22.2250	0.030	0.8750	3.50	0	0.8750	22.2250	0.0050	0.1270	
1"	1.0000	25.4000	0.015	1.0000	4.00	0	1.0000	25.4000	0.0025	0.0635	
	1.0000	25.4000	0.030	1.0000	4.00	0	1.0000	25.4000	0.0050	0.1270	
1 1/8"	1.1250	28.5750	0.015	1.1250	4.50	0	1.1250	28.5750	0.0025	0.0635	
	1.1250	28.5750	0.030	1.1250	4.50	0	1.1250	28.5750	0.0050	0.1270	
1 1/4"	1.2500	31.7500	0.015	1.2500	5.00	0	1.2500	31.7500	0.0025	0.0635	
	1.2500	31.7500	0.030	1.2500	5.00	0	1.2500	31.7500	0.0050	0.1270	
1 3/8"	1.3750	34.9250	0.015	1.3750	5.50	0	1.3750	34.9250	0.0025	0.0635	
	1.3750	34.9250	0.030	1.3750	5.50	0	1.3750	34.9250	0.0050	0.1270	
1 1/2"	1.5000	38.1000	0.015	1.5000	6.00	0	1.5000	38.1000	0.0025	0.0635	
	1.5000	38.1000	0.030	1.5000	6.00	0	1.5000	38.1000	0.0050	0.1270	
1 3/4"	1.6250	41.2750	0.015	1.6250	6.50	0	1.6250	41.2750	0.0025	0.0635	
	1.6250	41.2750	0.030	1.6250	6.50	0	1.6250	41.2750	0.0050	0.1270	
1 7/8"	1.7500	44.4500	0.015	1.7500	7.00	0	1.7500	44.4500	0.0025	0.0635	
	1.7500	44.4500	0.030	1.7500	7.00	0	1.7500	44.4500	0.0050	0.1270	
2"	2.0000	50.8000	0.015	2.0000	8.00	0	2.0000	50.8000	0.0025	0.0635	
	2.0000	50.8000	0.030	2.0000	8.00	0	2.0000	50.8000	0.0050	0.1270	

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## VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Corner Radius (mm)

continued from previous page

CUTTER ID NUMBER	CUTTER LENGTH	LENGTH OF CUT	CUTTER FLUTE	CUTTER DIA.	CUTTER L	RPM/FEED		M/REV/FEED		RECOMMENDED STOCKING	
						R.P.M.	F.M.	M/REV	F.M.	R.P.M.	F.M.
900	100	900	100 (1.00)	0	100	1.00	8170	0.20	0.17000	0.40	
900	100	900	100 (1.00)	0	100	1.00	8000	0.20	0.16667	0.40	
900	100	900	100 (1.00)	0	100	1.00	7820	0.20	0.16333	0.40	
1.000	100	900	100 (1.00)	0	100	1.00	7640	0.20	0.16000	0.40	
900	100	900	100 (1.00)	0	100	1.00	7460	0.20	0.15667	0.40	
900	100	900	100 (1.00)	0	100	1.00	7280	0.20	0.15333	0.40	
900	100	900	100 (1.00)	0	100	1.00	7100	0.20	0.15000	0.40	
900	100	900	100 (1.00)	0	100	1.00	6920	0.20	0.14667	0.40	
900	100	900	100 (1.00)	0	100	1.00	6740	0.20	0.14333	0.40	
900	100	900	100 (1.00)	0	100	1.00	6560	0.20	0.14000	0.40	
900	100	900	100 (1.00)	0	100	1.00	6380	0.20	0.13667	0.40	
900	100	900	100 (1.00)	0	100	1.00	6200	0.20	0.13333	0.40	
900	100	900	100 (1.00)	0	100	1.00	6020	0.20	0.13000	0.40	
900	100	900	100 (1.00)	0	100	1.00	5840	0.20	0.12667	0.40	
900	100	900	100 (1.00)	0	100	1.00	5660	0.20	0.12333	0.40	
900	100	900	100 (1.00)	0	100	1.00	5480	0.20	0.12000	0.40	
900	100	900	100 (1.00)	0	100	1.00	5300	0.20	0.11667	0.40	
900	100	900	100 (1.00)	0	100	1.00	5120	0.20	0.11333	0.40	
900	100	900	100 (1.00)	0	100	1.00	4940	0.20	0.11000	0.40	
900	100	900	100 (1.00)	0	100	1.00	4760	0.20	0.10667	0.40	
900	100	900	100 (1.00)	0	100	1.00	4580	0.20	0.10333	0.40	
900	100	900	100 (1.00)	0	100	1.00	4400	0.20	0.10000	0.40	
900	100	900	100 (1.00)	0	100	1.00	4220	0.20	0.09667	0.40	
900	100	900	100 (1.00)	0	100	1.00	4040	0.20	0.09333	0.40	
900	100	900	100 (1.00)	0	100	1.00	3860	0.20	0.09000	0.40	
900	100	900	100 (1.00)	0	100	1.00	3680	0.20	0.08667	0.40	
900	100	900	100 (1.00)	0	100	1.00	3500	0.20	0.08333	0.40	
900	100	900	100 (1.00)	0	100	1.00	3320	0.20	0.08000	0.40	
900	100	900	100 (1.00)	0	100	1.00	3140	0.20	0.07667	0.40	
900	100	900	100 (1.00)	0	100	1.00	2960	0.20	0.07333	0.40	
900	100	900	100 (1.00)	0	100	1.00	2780	0.20	0.07000	0.40	
900	100	900	100 (1.00)	0	100	1.00	2600	0.20	0.06667	0.40	
900	100	900	100 (1.00)	0	100	1.00	2420	0.20	0.06333	0.40	
900	100	900	100 (1.00)	0	100	1.00	2240	0.20	0.06000	0.40	
900	100	900	100 (1.00)	0	100	1.00	2060	0.20	0.05667	0.40	
900	100	900	100 (1.00)	0	100	1.00	1880	0.20	0.05333	0.40	
900	100	900	100 (1.00)	0	100	1.00	1700	0.20	0.05000	0.40	
900	100	900	100 (1.00)	0	100	1.00	1520	0.20	0.04667	0.40	
900	100	900	100 (1.00)	0	100	1.00	1340	0.20	0.04333	0.40	
900	100	900	100 (1.00)	0	100	1.00	1160	0.20	0.04000	0.40	
900	100	900	100 (1.00)	0	100	1.00	980	0.20	0.03667	0.40	
900	100	900	100 (1.00)	0	100	1.00	800	0.20	0.03333	0.40	
900	100	900	100 (1.00)	0	100	1.00	620	0.20	0.03000	0.40	
900	100	900	100 (1.00)	0	100	1.00	440	0.20	0.02667	0.40	
900	100	900	100 (1.00)	0	100	1.00	260	0.20	0.02333	0.40	
900	100	900	100 (1.00)	0	100	1.00	80	0.20	0.02000	0.40	
900	100	900	100 (1.00)	0	100	1.00	0	0.20	0.01667	0.40	
900	100	900	100 (1.00)	0	100	1.00	0	0.20	0.01333	0.40	
900	100	900	100 (1.00)	0	100	1.00	0	0.20	0.01000	0.40	
900	100	900	100 (1.00)	0	100	1.00	0	0.20	0.00667	0.40	
900	100	900	100 (1.00)	0	100	1.00	0	0.20	0.00333	0.40	
900	100	900	100 (1.00)	0	100	1.00	0	0.20	0.00000	0.40	

(continued on next page)



# VARIABLE HOLD END MILLS FOR ALUMINUM ALLOYS

Corner Buffer (cont.)

continued from previous page

D <sub>1</sub> / T <sub>1</sub> (D)	D <sub>2</sub> / T <sub>2</sub> (D)	CORNER RADIUS (D)	LENGTH (D)	CUTTER FLUTES	WHEEL SPEED (RPM)	RECOMMENDED		MIN. RECOMM.		MAXIMUM RECOMM.	
						FPM	MSPM	FPM	MSPM	FPM	MSPM
0.125 / 0.250	0.0625 / 0.125	0.03125 / 0.0625	0.125	2	10000	2000	3000	1000	1000		
0.125 / 0.250	0.0625 / 0.125	0.0625 / 0.125	0.125	2	10000	2000	3000	1000	1000		
0.125 / 0.250	0.0625 / 0.125	0.125 / 0.250	0.125	2	10000	2000	3000	1000	1000		
0.125 / 0.250	0.0625 / 0.125	0.250 / 0.500	0.125	2	10000	2000	3000	1000	1000		
0.125 / 0.250	0.0625 / 0.125	0.375 / 0.750	0.125	2	10000	2000	3000	1000	1000		
0.125 / 0.250	0.0625 / 0.125	0.500 / 1.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	0.750 / 1.500	0.125	2	10000	2000	3000	1000	1000		
0.125 / 0.250	0.0625 / 0.125	1.000 / 2.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	1.500 / 3.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	2.000 / 4.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	3.000 / 6.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	4.000 / 8.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	6.000 / 12.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	8.000 / 16.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	12.000 / 24.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	16.000 / 32.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	24.000 / 48.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	32.000 / 64.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	48.000 / 96.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	64.000 / 128.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	96.000 / 192.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	128.000 / 256.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	192.000 / 384.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	256.000 / 512.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	384.000 / 768.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	512.000 / 1024.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	768.000 / 1536.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	1024.000 / 2048.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	1536.000 / 3072.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	2048.000 / 4096.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	4096.000 / 8192.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	8192.000 / 16384.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	16384.000 / 32768.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	32768.000 / 65536.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	65536.000 / 131072.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	131072.000 / 262144.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	262144.000 / 524288.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	524288.000 / 1048576.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	1048576.000 / 2097152.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	2097152.000 / 4194304.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	4194304.000 / 8388608.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	8388608.000 / 16777216.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	16777216.000 / 33554432.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	33554432.000 / 67108864.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	67108864.000 / 134217728.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250
0.125 / 0.250	0.0625 / 0.125	134217728.000 / 268435456.000	0.125	2	10000	2000	3000	1000	1000	0.125 / 0.250	0.250

PLEASE SEE SPECS & FEEDS ON PAGE 146

# MACHINING ADVISOR PRO

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— Ryan S. —

Shop Owner

Shop Owner, Avonia, PA





## VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

Corner Radius - Long Reach, Six-Flute (cont.)

Continued from previous page

ITEM #	ITEM NAME	LENGTH (IN)	DIA. (IN)	LENGTH OF CUT (IN)	SPINDLE SPEED (RPM)	FEED (IPM)	DEPTH OF CUT (IN)	CHIPS (IN)	RECOMMENDATION		FINISH (RA)	
									MIN	MAX	MIN	MAX
981100	1.00	0.00	0.00	1.000 1.000	0	1.00	0.010	0.010	0.010	0.010	0.010	0.010
981101	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981102	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981103	1.00	0.00	0.00	1.000 1.000	0	1.00	0.010	0.010	0.010	0.010	0.010	0.010
981104	1.00	0.00	0.00	1.000 1.000	0	1.00	0.010	0.010	0.010	0.010	0.010	0.010
981105	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981106	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0.010	0.010	0.010	0.010
981107	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981108	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981109	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981110	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981111	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981112	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981113	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981114	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981115	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981116	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981117	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981118	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981119	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010
981120	1.00	0.00	0.00	1.000 1.000	0	1.00	0	0.010	0	0.010	0.010	0.010

### SPEED & FEED Variable Helix - Long Reach, Six-Flute (for Aluminum Alloys)

**General Note:** Speed and feed values are based on a cutting speed of 1000 SFM. For more complete information on SFM and feed rates, please refer to the "Cutting Data" section of this catalog. For more complete information on SFM and feed rates, please refer to the "Cutting Data" section of this catalog.

ITEM #	ITEM NAME	LENGTH (IN)	DIA. (IN)	SFM and Feed (IPM) by Work Material																				
				Al	Al	Al	Al	Al	Al	Al	Al	Al	Al											
981100	1.00	0.00	0.00	Al	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000		
				Al	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
				Al	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
				Al	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
				Al	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
				Al	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
				Al	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
				Al	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
				Al	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
				Al	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

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## VARIABLE HOLD END MILLS FOR ALUMINUM ALLOYS

Finishes - Square



- Optimized for aluminum and magnesium alloys with excellent performance in copper, brass, and bronze alloys.
- Multiple flute design (up to 4- 8T) reduces chatter and improves chip removal.
- High flute helix reduces chip evacuation. • 40 Micro features for high precision fine finishes.
- Heat treating and wear treating. • Solid carbide. • 100% ground to the 4th.

CUTTER DIMENSION	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	WEIGHTS		VOL. WEIGHT	
					100 g	100 g	100 g	100 g
1/16" (1.6mm)	1.00"	4T	1/16"	2.14"	37.0	38.0	37.0	38.0
1/16" (1.6mm)	1.50"	4T	1/16"	2.64"	57.0	58.0	57.0	58.0
1/8" (3.2mm)	1.00"	4T	1/8"	2.14"	110.0	112.0	110.0	112.0
1/8" (3.2mm)	1.50"	4T	1/8"	2.64"	170.0	172.0	170.0	172.0
1/8" (3.2mm)	2.00"	4T	1/8"	3.14"	230.0	232.0	230.0	232.0
1/4" (6.4mm)	1.00"	4T	1/4"	2.14"	380.0	385.0	380.0	385.0
1/4" (6.4mm)	1.50"	4T	1/4"	2.64"	580.0	585.0	580.0	585.0
1/4" (6.4mm)	2.00"	4T	1/4"	3.14"	780.0	785.0	780.0	785.0
3/16" (4.8mm)	1.00"	4T	3/16"	2.14"	490.0	495.0	490.0	495.0
3/16" (4.8mm)	1.50"	4T	3/16"	2.64"	690.0	695.0	690.0	695.0
3/16" (4.8mm)	2.00"	4T	3/16"	3.14"	890.0	895.0	890.0	895.0
1/2" (12.8mm)	1.00"	4T	1/2"	2.14"	1380.0	1390.0	1380.0	1390.0
1/2" (12.8mm)	1.50"	4T	1/2"	2.64"	1980.0	1990.0	1980.0	1990.0
1/2" (12.8mm)	2.00"	4T	1/2"	3.14"	2580.0	2590.0	2580.0	2590.0
5/16" (7.9mm)	1.00"	4T	5/16"	2.14"	1080.0	1090.0	1080.0	1090.0
5/16" (7.9mm)	1.50"	4T	5/16"	2.64"	1480.0	1490.0	1480.0	1490.0
5/16" (7.9mm)	2.00"	4T	5/16"	3.14"	1880.0	1890.0	1880.0	1890.0
3/8" (9.5mm)	1.00"	4T	3/8"	2.14"	1380.0	1390.0	1380.0	1390.0
3/8" (9.5mm)	1.50"	4T	3/8"	2.64"	1780.0	1790.0	1780.0	1790.0
3/8" (9.5mm)	2.00"	4T	3/8"	3.14"	2180.0	2190.0	2180.0	2190.0
7/16" (11.1mm)	1.00"	4T	7/16"	2.14"	1680.0	1690.0	1680.0	1690.0
7/16" (11.1mm)	1.50"	4T	7/16"	2.64"	2080.0	2090.0	2080.0	2090.0
7/16" (11.1mm)	2.00"	4T	7/16"	3.14"	2480.0	2490.0	2480.0	2490.0
1/2" (12.8mm)	1.00"	4T	1/2"	2.14"	1980.0	1990.0	1980.0	1990.0
1/2" (12.8mm)	1.50"	4T	1/2"	2.64"	2380.0	2390.0	2380.0	2390.0
1/2" (12.8mm)	2.00"	4T	1/2"	3.14"	2780.0	2790.0	2780.0	2790.0
9/16" (14.3mm)	1.00"	4T	9/16"	2.14"	2280.0	2290.0	2280.0	2290.0
9/16" (14.3mm)	1.50"	4T	9/16"	2.64"	2680.0	2690.0	2680.0	2690.0
9/16" (14.3mm)	2.00"	4T	9/16"	3.14"	3080.0	3090.0	3080.0	3090.0
5/8" (15.9mm)	1.00"	4T	5/8"	2.14"	2580.0	2590.0	2580.0	2590.0
5/8" (15.9mm)	1.50"	4T	5/8"	2.64"	2980.0	2990.0	2980.0	2990.0
5/8" (15.9mm)	2.00"	4T	5/8"	3.14"	3380.0	3390.0	3380.0	3390.0
3/4" (19.1mm)	1.00"	4T	3/4"	2.14"	2880.0	2890.0	2880.0	2890.0
3/4" (19.1mm)	1.50"	4T	3/4"	2.64"	3280.0	3290.0	3280.0	3290.0
3/4" (19.1mm)	2.00"	4T	3/4"	3.14"	3680.0	3690.0	3680.0	3690.0
7/8" (21.7mm)	1.00"	4T	7/8"	2.14"	3180.0	3190.0	3180.0	3190.0
7/8" (21.7mm)	1.50"	4T	7/8"	2.64"	3580.0	3590.0	3580.0	3590.0
7/8" (21.7mm)	2.00"	4T	7/8"	3.14"	3980.0	3990.0	3980.0	3990.0
1" (25.4mm)	1.00"	4T	1"	2.14"	3480.0	3490.0	3480.0	3490.0
1" (25.4mm)	1.50"	4T	1"	2.64"	3880.0	3890.0	3880.0	3890.0
1" (25.4mm)	2.00"	4T	1"	3.14"	4280.0	4290.0	4280.0	4290.0

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## VARIABLE HELIX END MILLS FOR ALUMINUM ALLOYS

### Features - Symbols (cont.)

continued from previous page

CUTTER DIAMETER	LENGTH OF CUT	FLUTE LENGTH	FLUTE ANGLE	FLUTE DEPTH	OVERALL LENGTH	REMOVED		TEL. RANGE	
						MM/IN	MPG	MM/IN	MPG
1/8	1/4	3/8	9	1/16	3/16	8800	11.0	3300-18	45-80
1/8	1/4	3/8	9	1/8	3/32	8100	10.0	3700-18	50-80
1/8 (1/8)	1/4	3/8	9	1/8	3/32	8600	11.0	3600-18	40-80
1/8 (1/8)	1/4	3/8	9	1/8	3/32	8100	12.0	3700-18	50-80
1/4	1/2	5/8	9	1/16	5/16	8100	10.0	3700-18	50-80
1/4	1/2	5/8	9	1/8	5/16	8700	11.0	3700-18	50-80
3/8	3/4	7/8	9	1/16	7/8	7700	10.0	3700-18	50-80
3/8	3/4	7/8	9	1/8	7/8	8300	11.0	3700-18	50-80
1/2	3/4	1 1/8	9	1/16	1 1/8	7700	10.0	3700-18	50-80
1/2	3/4	1 1/8	9	1/8	1 1/8	8300	11.0	3700-18	50-80
5/8	3/4	1 1/4	9	1/16	1 3/8	7700	10.0	3700-18	50-80
5/8	3/4	1 1/4	9	1/8	1 3/8	8300	11.0	3700-18	50-80
3/4	1	1 1/2	9	1/16	1 1/2	7700	10.0	3700-18	50-80
3/4	1	1 1/2	9	1/8	1 1/2	8300	11.0	3700-18	50-80
1	1 1/4	1 7/8	9	1/16	1 7/8	7700	10.0	3700-18	50-80
1	1 1/4	1 7/8	9	1/8	1 7/8	8300	11.0	3700-18	50-80

SPEEDS & FEEDS (High Speed Tooling for Aluminum & Non-Ferrous Alloys)																
CUTTER DIAMETER	FLUTE LENGTH	CUTTER LENGTH	MATERIAL	Feed Rate (in/min)												
				.005	.010	.015	.020	.025	.030	.035	.040	.045	.050			
1/8	3/8	1/2	Aluminum (annealed)	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	
			Aluminum (hard)	150	300	450	600	750	900	1050	1200	1350	1500	1650	1800	
			Aluminum (soft)	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	
			Aluminum (medium)	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	
			Aluminum (cast)	180	360	540	720	900	1080	1260	1440	1620	1800	2000	2200	
	5/8	3/4	1 1/4	Aluminum (annealed)	100	200	300	400	500	600	700	800	900	1000	1100	1200
				Aluminum (hard)	75	150	225	300	375	450	525	600	675	750	825	900
				Aluminum (soft)	150	300	450	600	750	900	1050	1200	1350	1500	1650	1800
				Aluminum (medium)	100	200	300	400	500	600	700	800	900	1000	1100	1200
				Aluminum (cast)	90	180	270	360	450	540	630	720	810	900	1000	1100



## HIGH HOLD END MILLS FOR ALUMINUM ALLOYS

45° Flute • Square



Down to .010"

- 2 Flute and 3 Flute, high hold design improves results in aluminum and other non-ferrous applications.
- 45° Flute for faster chip removal and better feed.
- All diameters, maximum life, high precision tool holders.
- Gentle cutting.
- Solid carbide.
- DMC ground to the 4th.

Consulting to  
Manufacturing

CUTTER DIAMETER	LENGTH OF CUT	MAX. FEED	CUTTING LENGTH	UNFINISHED			FINISHED		REWORK		
				RPM	SFM	IPM	RPM	IPM	RPM	SFM	IPM
.05	.020	.004	.12	7100	3000				8400		600
.06	.020	.004	.12	7100	3120				8400		600
.08	.020	.004	.12	7100	3240				8400		600
.10	.020	.004	.12	7100	3360				8400		600
.12	.020	.004	.12	7100	3480				8400		600
.15	.020	.004	.12	7100	3600				8400		600
.20	.020	.004	.12	7100	3840				8400		600
.25	.020	.004	.12	7100	4080				8400		600
.30	.020	.004	.12	7100	4320				8400		600
.35	.020	.004	.12	7100	4560				8400		600
.40	.020	.004	.12	7100	4800				8400		600
.50	.020	.004	.12	7100	5400				8400		600
.75	.020	.004	.12	7100	7200		6000	300	8400	1800	600
1.00	.020	.004	.12	7100	9000		6000	300	8400	1800	600
1.50	.020	.004	.12	7100	13500		6000	300	8400	1800	600
2.00	.020	.004	.12	7100	18000		6000	300	8400	1800	600
2.50	.020	.004	.12	7100	22500		6000	300	8400	1800	600
3.00	.020	.004	.12	7100	27000		6000	300	8400	1800	600
3.50	.020	.004	.12	7100	31500		6000	300	8400	1800	600
4.00	.020	.004	.12	7100	36000		6000	300	8400	1800	600
5.00	.020	.004	.12	7100	45000		6000	300	8400	1800	600
7.50	.020	.004	.12	7100	67500		6000	300	8400	1800	600
10.00	.020	.004	.12	7100	90000		6000	300	8400	1800	600
15.00	.020	.004	.12	7100	135000		6000	300	8400	1800	600
20.00	.020	.004	.12	7100	180000		6000	300	8400	1800	600
25.00	.020	.004	.12	7100	225000		6000	300	8400	1800	600
30.00	.020	.004	.12	7100	270000		6000	300	8400	1800	600
35.00	.020	.004	.12	7100	315000		6000	300	8400	1800	600
40.00	.020	.004	.12	7100	360000		6000	300	8400	1800	600
50.00	.020	.004	.12	7100	450000		6000	300	8400	1800	600
75.00	.020	.004	.12	7100	675000		6000	300	8400	1800	600
100.00	.020	.004	.12	7100	900000		6000	300	8400	1800	600
150.00	.020	.004	.12	7100	1350000		6000	300	8400	1800	600
200.00	.020	.004	.12	7100	1800000		6000	300	8400	1800	600

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# HIGH HELIX END MILLS FOR ALUMINUM ALLOYS

## 45° Helix - Square end

Continued from previous page

D Ø	Length L	Speed SFM	Feed IPM	Material			SAE 3030		7050-T6		
				RA	TA	HA	RA	TA	HA	RA	TA
1/8" (3.175)	1.125" (28.575)	170	0.005	10000	10000	10000			10000	10000	10000
1/8" (3.175)	1.125" (28.575)	140	0.005	10000	10000	10000			10000	10000	10000
1/8" (3.175)	1.125" (28.575)	110	0.005	10000	10000	10000	10000	10000	10000	10000	10000
1/8" (3.175)	1.125" (28.575)	90	0.005	10000	10000	10000	10000	10000	10000	10000	10000
1/8" (3.175)	1.125" (28.575)	70	0.005	10000	10000	10000	10000	10000	10000	10000	10000
1/8" (3.175)	1.125" (28.575)	50	0.005	10000	10000	10000	10000	10000	10000	10000	10000
1/8" (3.175)	1.125" (28.575)	30	0.005	10000	10000	10000	10000	10000	10000	10000	10000
1/8" (3.175)	1.125" (28.575)	15	0.005	10000	10000	10000	10000	10000	10000	10000	10000
1/8" (3.175)	1.125" (28.575)	10	0.005	10000	10000	10000	10000	10000	10000	10000	10000
1/8" (3.175)	1.125" (28.575)	5	0.005	10000	10000	10000	10000	10000	10000	10000	10000
1/8" (3.175)	1.125" (28.575)	3	0.005	10000	10000	10000	10000	10000	10000	10000	10000

## SPEED & FEED (45° Helix)

Speeds/feeds should be calculated and adjusted as needed to fit tool & workpiece. For more information, see the white PDF tool document #11 for details & a full featured Speed & Feed calculator. Always use the lowest speed & feed rate when starting a new job. Always use the lowest speed & feed rate when changing materials.

Material	Tool	D	SAE 3030								SAE 7050-T6
			RA	TA	HA	RA	TA	HA	RA	TA	
Aluminum	End Mill	1/8"	10000	10000	10000	10000	10000	10000	10000	10000	10000
		1/4"	10000	10000	10000	10000	10000	10000	10000	10000	10000
		1/2"	10000	10000	10000	10000	10000	10000	10000	10000	10000
Aluminum	End Mill	1/8"	10000	10000	10000	10000	10000	10000	10000	10000	10000
		1/4"	10000	10000	10000	10000	10000	10000	10000	10000	10000
		1/2"	10000	10000	10000	10000	10000	10000	10000	10000	10000
Aluminum	End Mill	1/8"	10000	10000	10000	10000	10000	10000	10000	10000	10000
		1/4"	10000	10000	10000	10000	10000	10000	10000	10000	10000
		1/2"	10000	10000	10000	10000	10000	10000	10000	10000	10000



# HIGH HELIX END MILLS FOR ALUMINUM ALLOYS

## 60° Helix - Square



- 60° helix for excellent finishing operations in aluminum and other non-ferrous materials
- High helix design for longer chip removal
- All versions for high pressure coolant
- Double coating
- Solid carbide
- CNC ground to fine finish

Compliance to  
DIN 6350

CUTTER DIMENSION	LENGTH OF CUT	NUMBER OF FLUTES	CORNER RADIUS	OPERATIONS		MATERIAL	
				V (m/min)	F (mm/rev)	V (m/min)	F (mm/rev)
<b>Ø1 (125)</b>	<b>L1 (125)</b>	<b>3</b>	<b>0.1</b>	<b>1400</b>	<b>0.15</b>	<b>AL</b>	<b>6061</b>
Ø1 (125)	L2 (125)	3	0.1	1400	0.15	AL	6061
Ø1 (125)	L3 (125)	3	0.1	1400	0.15	AL	6061
Ø1 (125)	L4 (125)	3	0.1	1400	0.15	AL	6061
<b>Ø1 (125)</b>	<b>L1 (125)</b>	<b>4</b>	<b>0.1</b>	<b>1400</b>	<b>0.15</b>	<b>AL</b>	<b>6061</b>
Ø1 (125)	L2 (125)	4	0.1	1400	0.15	AL	6061
Ø1 (125)	L3 (125)	4	0.1	1400	0.15	AL	6061
Ø1 (125)	L4 (125)	4	0.1	1400	0.15	AL	6061
Ø1 (125)	L5 (125)	4	0.1	1400	0.15	AL	6061

## SPEEDS & FEEDS High Mills for Aluminum & Non Ferrous Alloys

Approximate values with respect to the cutting speed and feed rate. For precise cutting speed and feed rate of 60° helix end mill the user must refer to the technical drawing of the tool, the tool catalog or the website [www.dynalene.com](http://www.dynalene.com).

CUTTER DIMENSION	Material	Type	SPEED (m/min)										Feed (mm/rev)				
			Ø1	Ø2	Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12	Ø15	V	F			
Ø1 (125)	Aluminum	Solid Carbide	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	0.15	0.15
	Aluminum Alloy		1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	0.15	0.15
	Aluminum Alloy		1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	0.15	0.15
	Aluminum Alloy		1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	0.15	0.15
Ø1 (125)	Aluminum	Solid Carbide	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	0.15	0.15
	Aluminum Alloy		1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	0.15	0.15
	Aluminum Alloy		1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	0.15	0.15
	Aluminum Alloy		1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	1400	0.15	0.15

## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

CVD Diamond - Square



### Outstanding in Graphite

- Top crystalline CVD diamond on solid carbide substrate
- 4 µm CVD diamond coating yields a sharper cutting edge and smoother finish in difficult-to-cut non-ferrous alloys and composites
- 9 µm CVD diamond coating offers increased tool life for non-ferrous alloys and composites, especially higher-tensile materials such as graphite, green carbides, and green ceramics
- Excellent vibration resistance increases tool life
- 6 flutes - 1 HR alloy substrate for high productivity tool holders
- Center cutting - 100% ground in the USA



CVD Diamond  
 4 µm thickness for a  
 sharper cutting edge  
 and smoother finish



CVD Diamond  
 9 µm thickness for  
 increased tool life  
 especially in  
 difficult-to-cut

ITEM NUMBER	LENGTH OF CUT	SHARPENING	CUTTING LENGTH	CVD DIAMOND COATING		CVD DIAMOND COATING	
				THICKNESS	FINISH	THICKNESS	FINISH
201 1100	200 1100	10	1.00			201 11	21.00
201 1102	200 1100	10	1.02	9.00	10.00	201 11	21.00
201 1104	200 1100	10	1.04			201 11	21.00
201	200 1100	10	1.00			201 11	21.00
201	200 1100	10	1.00	9.00	10.00	201 11	21.00
201	200 1100	10	1.00			201 11	21.00
201 1101	200 1100	10	1.01			201 11	21.00
201 1102	200 1100	10	1.02	9.00	10.00	201 11	21.00
201 1103	200 1100	10	1.03			201 11	21.00
201 1104	200 1100	10	1.04			201 11	21.00
201 1105	200 1100	10	1.05			201 11	21.00
201 1106	200 1100	10	1.06			201 11	21.00
201	200 1100	10	1.00			201 11	21.00
201	200 1100	10	1.00	9.00	10.00	201 11	21.00
201	200 1100	10	1.00			201 11	21.00
201 1101	200 1100	10	1.01			201 11	21.00
201	200 1100	10	1.00			201 11	21.00
201	200 1100	10	1.00	9.00	10.00	201 11	21.00
201	200 1100	10	1.00			201 11	21.00
201 1101	200 1100	10	1.01			201 11	21.00
201 1102	200 1100	10	1.02	9.00	10.00	201 11	21.00
201 1103	200 1100	10	1.03			201 11	21.00
201 1104	200 1100	10	1.04			201 11	21.00
201 1105	200 1100	10	1.05			201 11	21.00
201 1106	200 1100	10	1.06			201 11	21.00
201	200 1100	10	1.00			201 11	21.00
201	200 1100	10	1.00	9.00	10.00	201 11	21.00
201	200 1100	10	1.00			201 11	21.00
201 1101	200 1100	10	1.01			201 11	21.00
201 1102	200 1100	10	1.02	9.00	10.00	201 11	21.00
201 1103	200 1100	10	1.03			201 11	21.00
201 1104	200 1100	10	1.04			201 11	21.00
201 1105	200 1100	10	1.05			201 11	21.00
201 1106	200 1100	10	1.06			201 11	21.00
201	200 1100	10	1.00			201 11	21.00
201	200 1100	10	1.00	9.00	10.00	201 11	21.00
201	200 1100	10	1.00			201 11	21.00
201 1101	200 1100	10	1.01			201 11	21.00
201 1102	200 1100	10	1.02	9.00	10.00	201 11	21.00
201 1103	200 1100	10	1.03			201 11	21.00
201 1104	200 1100	10	1.04			201 11	21.00
201 1105	200 1100	10	1.05			201 11	21.00
201 1106	200 1100	10	1.06			201 11	21.00

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## DIAMOND-END MILLS FOR NON-FERROUS MATERIALS

### CVD Diamond – Square (cont.)

Continued from previous page.

CUTTER DESCRIPTION	LENGTH OF TOOL	LENGTH OF SHANK	INTERNAL CORNER	CVD DIAMOND WEIGHT		CVD DIAMOND PRICE	
				gms.	USD	gms.	USD
D-1100	6-1100	2-1100	1.0	0.10		95000	80.00
D-1200	6-1200	2-1200	1.5	0.15		95000	80.00
D-1300	6-1300	2-1300	2.0	0.20		95000	80.00
D-1400	6-1400	2-1400	3.0	0.30		95000	80.00
D-1500	6-1500	2-1500	4.0	0.40		95000	80.00
D-1600	6-1600	2-1600	5.0	0.50		95000	80.00
D-1700	6-1700	2-1700	6.0	0.60		95000	80.00
D-1800	6-1800	2-1800	8.0	0.80		95000	80.00
D-1900	6-1900	2-1900	10.0	1.00		95000	80.00
D-2000	6-2000	2-2000	15.0	1.50		95000	80.00
D-2100	6-2100	2-2100	20.0	2.00		95000	80.00
D-2200	6-2200	2-2200	30.0	3.00		95000	80.00
D-2300	6-2300	2-2300	40.0	4.00		95000	80.00
D-2400	6-2400	2-2400	50.0	5.00		95000	80.00
D-2500	6-2500	2-2500	60.0	6.00		95000	80.00
D-2600	6-2600	2-2600	80.0	8.00		95000	80.00
D-2700	6-2700	2-2700	100.0	10.00		95000	80.00
D-2800	6-2800	2-2800	150.0	15.00		95000	80.00
D-2900	6-2900	2-2900	200.0	20.00		95000	80.00
D-3000	6-3000	2-3000	300.0	30.00		95000	80.00
D-3100	6-3100	2-3100	400.0	40.00		95000	80.00
D-3200	6-3200	2-3200	500.0	50.00		95000	80.00
D-3300	6-3300	2-3300	600.0	60.00		95000	80.00
D-3400	6-3400	2-3400	800.0	80.00		95000	80.00
D-3500	6-3500	2-3500	1000.0	100.00		95000	80.00
D-3600	6-3600	2-3600	1500.0	150.00		95000	80.00
D-3700	6-3700	2-3700	2000.0	200.00		95000	80.00
D-3800	6-3800	2-3800	3000.0	300.00		95000	80.00
D-3900	6-3900	2-3900	4000.0	400.00		95000	80.00
D-4000	6-4000	2-4000	5000.0	500.00		95000	80.00



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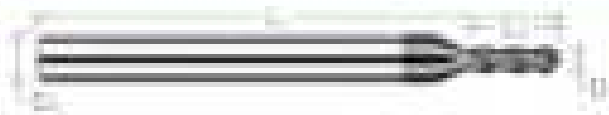






## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

CVD Diamond - Ball



► Outstanding in Graphite!

- True crystalline CVD Diamond on solid carbide substrate
- 6 µm CVD Diamond coating yields a stable cutting edge and  
 generates heavy & structural loads on non-ferrous alloys and composites
- 8 µm CVD Diamond coating offers increased benefits for non-ferrous alloys  
 and composites, especially higher abrasive materials such as graphite,  
 green ceramics, and green ceramics
- Flute on diameter resistance increases tool life
- 4 Flute → 10 flute systems for high precision tool holders
- Center cutting → CMC ground in the USA



CUTTER ID NUMBER	LENGTH OF TOOL	DIA. OF SHANK	SHANK LENGTH	CVD DIAMOND COATING		CVD DIAMOND COATING	
				µm	mm	µm	mm
W12130	80 1/8"	3/8"	3 1/2"			12130	06-30
W12135	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12135	06-30
W12140	80 1/8"	3/8"	3 1/2"			12140	11-30
W12145	80 1/8"	3/8"	3 1/2"			12145	06-30
W12150	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12150	06-30
W12155	80 1/8"	3/8"	3 1/2"			12155	11-30
W12160	80 1/8"	3/8"	3 1/2"			12160	06-30
W12165	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12165	06-30
W12170	80 1/8"	3/8"	3 1/2"			12170	11-30
W12175	80 1/8"	3/8"	3 1/2"			12175	06-30
W12180	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12180	06-30
W12185	80 1/8"	3/8"	3 1/2"			12185	11-30
W12190	80 1/8"	3/8"	3 1/2"			12190	06-30
W12195	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12195	06-30
W12200	80 1/8"	3/8"	3 1/2"			12200	11-30
W12205	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12205	06-30
W12210	80 1/8"	3/8"	3 1/2"			12210	11-30
W12215	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12215	06-30
W12220	80 1/8"	3/8"	3 1/2"			12220	11-30
W12225	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12225	06-30
W12230	80 1/8"	3/8"	3 1/2"			12230	11-30
W12235	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12235	06-30
W12240	80 1/8"	3/8"	3 1/2"			12240	11-30
W12245	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12245	06-30
W12250	80 1/8"	3/8"	3 1/2"			12250	11-30
W12255	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12255	06-30
W12260	80 1/8"	3/8"	3 1/2"			12260	11-30
W12265	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12265	06-30
W12270	80 1/8"	3/8"	3 1/2"			12270	11-30
W12275	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12275	06-30
W12280	80 1/8"	3/8"	3 1/2"			12280	11-30
W12285	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12285	06-30
W12290	80 1/8"	3/8"	3 1/2"			12290	11-30
W12295	80 1/8"	3/8"	3 1/2"	6µm	0.00024"	12295	06-30
W12300	80 1/8"	3/8"	3 1/2"			12300	11-30

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WALTER TYPENORM

## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

### CVD Diamond - Ball nose

continued from preceding page

CUTTER Description	LENGTH of CUT	DIA. of SHANK	OVERALL LENGTH	CUTTING SPEEDS (ft/min)		CUTTING FEEDS (in/rev)	
				175	200	0.01	0.015
80-100	1.00 (100)	1.00	1.00			0.005	0.010
80-120	1.00 (120)	1.00	1.00	10000	40.00	0.005	0.010
80-150	1.00 (150)	1.00	1.00			0.005	0.010
80-180	1.00 (180)	1.00	1.00			0.005	0.010
80-200	1.00 (200)	1.00	1.00			0.005	0.010
80-250	1.00 (250)	1.00	1.00			0.005	0.010
80-300	1.00 (300)	1.00	1.00			0.005	0.010
80-350	1.00 (350)	1.00	1.00			0.005	0.010
80-400	1.00 (400)	1.00	1.00			0.005	0.010
80-450	1.00 (450)	1.00	1.00	10000	40.00	0.005	0.010
80-500	1.00 (500)	1.00	1.00			0.005	0.010
80-550	1.00 (550)	1.00	1.00	10000	40.00	0.005	0.010
80-600	1.00 (600)	1.00	1.00			0.005	0.010
80-650	1.00 (650)	1.00	1.00			0.005	0.010
80-700	1.00 (700)	1.00	1.00			0.005	0.010
80-750	1.00 (750)	1.00	1.00			0.005	0.010
80-800	1.00 (800)	1.00	1.00			0.005	0.010
80-850	1.00 (850)	1.00	1.00			0.005	0.010
80-900	1.00 (900)	1.00	1.00			0.005	0.010
80-950	1.00 (950)	1.00	1.00			0.005	0.010
80-1000	1.00 (1000)	1.00	1.00			0.005	0.010



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## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

CVD Diamond - Ball - Long Reach, Long Flute



Outstanding in Graphite!

- True cylindrical CVD diamond on both sides surfaces
- Ideal for machining graphite and numerous gray cast irons and gray steels
- Maximum diameter available increases tool life
- Reduced risk for chatter and vibration issues
- 50% more tolerance for high pressure cast alloys
- 4 Flute
- Center cutting
- CVD grown in the USA

ITEM #	DIAMETER (IN)	LENGTH (IN)	SHANK DIAMETER (IN)	SHANK LENGTH (IN)	MAXIMUM RPM	MAXIMUM FEED (IPM)
EM1100	0.75	3.00	0.75	1.00	12,000	100.0
EM1101	0.875	3.00	0.875	1.00	12,000	100.0
EM1102	1.00	3.00	1.00	1.00	12,000	100.0
EM1103	1.125	3.00	1.125	1.00	12,000	100.0
EM1104	1.25	3.00	1.25	1.00	12,000	100.0
EM1105	1.375	3.00	1.375	1.00	12,000	100.0
EM1106	1.50	3.00	1.50	1.00	12,000	100.0
EM1107	1.625	3.00	1.625	1.00	12,000	100.0
EM1108	1.75	3.00	1.75	1.00	12,000	100.0
EM1109	1.875	3.00	1.875	1.00	12,000	100.0
EM1110	2.00	3.00	2.00	1.00	12,000	100.0
EM1111	2.125	3.00	2.125	1.00	12,000	100.0
EM1112	2.25	3.00	2.25	1.00	12,000	100.0
EM1113	2.375	3.00	2.375	1.00	12,000	100.0
EM1114	2.50	3.00	2.50	1.00	12,000	100.0

ITEM #



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## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

CVD Diamond - Corner Radius - Long Reach, Stub Flute



Outstanding in Graphite

- Non-cohesive CVD diamond on wear-resistant substrate
- Ideal for finishing graphite and composites, green castings, and green ceramics
- Maximum clearance - excellent formability
- Reduced tooling for improved and increased rigidity
- Stub-flute design for increased strength
- 4-Flute
- All clearly indicated for high precision tool holders
- General milling - CVD ground in the USA



Diameter (mm)	Diameter (inch)	LENGTH (mm)		LENGTH (inch)		CORNER RADIUS	STEP TO WIDTH (mm)	
		L1	L2	L1	L2		L1	L2
0.5mm	0.020	50	60	2.0	2.4	0.12	0.12	0.50
0.75mm	0.030	50	60	2.0	2.4	0.12	0.12	0.50
1.0mm	0.040	50	60	2.0	2.4	0.12	0.12	0.50
1.25mm	0.050	50	60	2.0	2.4	0.12	0.12	0.50
1.5mm	0.060	50	60	2.0	2.4	0.12	0.12	0.50
2.0mm	0.080	50	60	2.0	2.4	0.12	0.12	0.50
2.5mm	0.100	50	60	2.0	2.4	0.12	0.12	0.50
3.0mm	0.120	50	60	2.0	2.4	0.12	0.12	0.50
3.5mm	0.140	50	60	2.0	2.4	0.12	0.12	0.50
4.0mm	0.160	50	60	2.0	2.4	0.12	0.12	0.50
4.5mm	0.180	50	60	2.0	2.4	0.12	0.12	0.50
5.0mm	0.200	50	60	2.0	2.4	0.12	0.12	0.50
6.0mm	0.240	50	60	2.0	2.4	0.12	0.12	0.50
7.0mm	0.280	50	60	2.0	2.4	0.12	0.12	0.50
8.0mm	0.320	50	60	2.0	2.4	0.12	0.12	0.50
9.0mm	0.360	50	60	2.0	2.4	0.12	0.12	0.50
10.0mm	0.400	50	60	2.0	2.4	0.12	0.12	0.50
12.0mm	0.480	50	60	2.0	2.4	0.12	0.12	0.50
15.0mm	0.600	50	60	2.0	2.4	0.12	0.12	0.50
18.0mm	0.720	50	60	2.0	2.4	0.12	0.12	0.50
20.0mm	0.800	50	60	2.0	2.4	0.12	0.12	0.50
25.0mm	1.000	50	60	2.0	2.4	0.12	0.12	0.50
30.0mm	1.200	50	60	2.0	2.4	0.12	0.12	0.50
35.0mm	1.400	50	60	2.0	2.4	0.12	0.12	0.50
40.0mm	1.600	50	60	2.0	2.4	0.12	0.12	0.50
45.0mm	1.800	50	60	2.0	2.4	0.12	0.12	0.50
50.0mm	2.000	50	60	2.0	2.4	0.12	0.12	0.50
60.0mm	2.400	50	60	2.0	2.4	0.12	0.12	0.50
75.0mm	3.000	50	60	2.0	2.4	0.12	0.12	0.50
90.0mm	3.600	50	60	2.0	2.4	0.12	0.12	0.50
100.0mm	4.000	50	60	2.0	2.4	0.12	0.12	0.50

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## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

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

continued from previous page

ITEM NUMBER	LENGTH (IN)	LENGTH OF CUT (IN)	OVERALL DIAMETER (IN)	LENGTH OF FLUTE (IN)	CORNER RADIUS (IN)	CUTTING SPEEDS	
						FEED (IPM)	PSG/M
201110	0.75	0.5	0.75 (0.75)	0.5	0.125	60000	10000
201112	0.75	0.5	1.000 (0.75)	0.5	0.125	60000	10000
201114	0.75	0.5	0.75 (0.75)	0.5	0.125	60000	10000
201116	0.75	0.5	1.000 (0.75)	0.5	0.125	60000	10000
201118	0.75	0.5	1.000 (1.0)	0.5	0	60000	10000
201120	0.75	0.5	1.000 (0.75)	0.5	0	60000	10000
201122	0.75	0.5	1.000 (0.75)	0.5	0	60000	10000
201124	0.75	0.5	1.000 (0.75)	0.5	0	60000	10000
201126	0.75	0.5	1.000 (0.75)	0.5	0	60000	10000
201128	0.75	0.5	1.000 (0.75)	0.5	0	60000	10000
201130	0.75	0.5	1.000 (0.75)	0.5	0	60000	10000



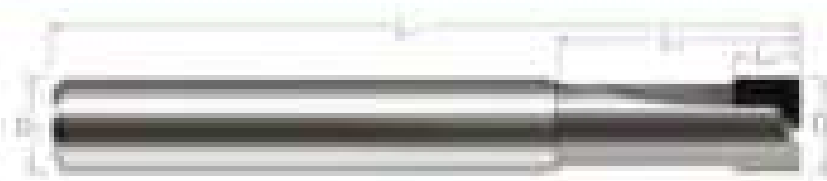
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## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

PCD Diamond - Square



- PCD diamond grades are used to cut hard steels for significant cost advantages over carbide
- Recommended work piece material: aluminum, brass, lead, steel, plastic, graphite, copper, various fine plastics, green sands, gold, silver, magnesium, zinc, green steels
- Center cutting for 1 and 2 flutes
- End cutting (not recommended) for 4 flutes

DRILL DIAMETER	LENGTH OF CUT	MAXIMUM DEPTH	FLUTES	SHANK DIAMETER	LENGTH (mm)	PCD GRADES	
						TYPE 1	TYPE 2
10	100	10	2	10	100	PCD 1	PCD 2
12	100	12	2	12	100	PCD 1	PCD 2
14	100	14	2	14	100	PCD 1	PCD 2
16	100	16	2	16	100	PCD 1	PCD 2
18	100	18	2	18	100	PCD 1	PCD 2
20	100	20	2	20	100	PCD 1	PCD 2
22	100	22	2	22	100	PCD 1	PCD 2
24	100	24	2	24	100	PCD 1	PCD 2
26	100	26	2	26	100	PCD 1	PCD 2
28	100	28	2	28	100	PCD 1	PCD 2
30	100	30	2	30	100	PCD 1	PCD 2
32	100	32	2	32	100	PCD 1	PCD 2
34	100	34	2	34	100	PCD 1	PCD 2
36	100	36	2	36	100	PCD 1	PCD 2
38	100	38	2	38	100	PCD 1	PCD 2
40	100	40	2	40	100	PCD 1	PCD 2
42	100	42	2	42	100	PCD 1	PCD 2
44	100	44	2	44	100	PCD 1	PCD 2
46	100	46	2	46	100	PCD 1	PCD 2
48	100	48	2	48	100	PCD 1	PCD 2
50	100	50	2	50	100	PCD 1	PCD 2
52	100	52	2	52	100	PCD 1	PCD 2
54	100	54	2	54	100	PCD 1	PCD 2

For cutting into steel, cutting for 4 flutes.

Single Flute designed for stable operation



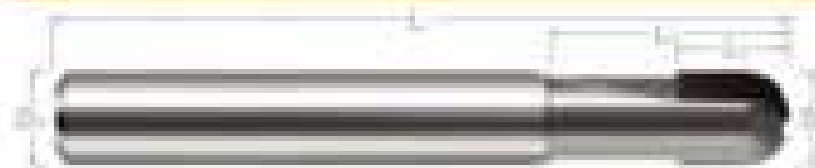
4 Flute used for finishing operation



For PCD High Performance Drills, see page 457.

## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

### PCD Diamond - Ball



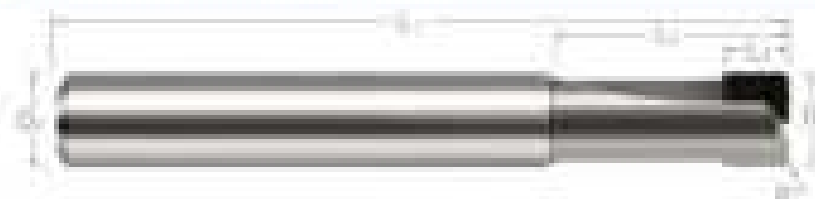
Also Available in Single Flute Style

- PCD diamond coated on solid carbide body allows for significant load life improvement over carbide.
- Recommended work piece materials: Aluminum, Inconel, Super Inconel, Stainless, Titanium, Graphite, Nickel, Brass, Cast Alloys, Green Inconel, Gold, Silver, Magnesium, Zinc, Green Stainless.
- Dry cutting.

CUTTER NUMBER	LENGTH OF CUT	OVERALL LENGTH	FLUTES	SHANK DIAMETER	BALL RADIUS	PRICE PER MILL	
						ITEM #	PRICE
010	0.10	0.10	2	0.05	0.05	1000	\$21.00
020	0.20	0.20	2	0.10	0.10	1000	\$21.00
030	0.30	0.30	2	0.15	0	1000	\$42.00
040	0.40	0.40	2	0.20	0.050	1000	\$63.00
050	0.50	0.50	2	0.25	0.100	1000	\$84.00
070	0.70	0.70	2	0.35	0	1000	\$105.00
080	0.80	0.80	2	0.40	0.100	1000	\$126.00
090	0.90	0.90	2	0.45	0	1000	\$147.00

## DIAMOND END MILLS FOR NON-FERROUS MATERIALS

### PCD Diamond - Corner Radius



Also Available in Single Flute Style

- PCD diamond coated on solid carbide body allows for significant load life improvement over carbide.
- Recommended work piece materials: Aluminum, Inconel, Super Inconel, Stainless, Titanium, Graphite, Nickel, Brass, Cast Alloys, Green Inconel, Gold, Silver, Magnesium, Zinc, Green Stainless.
- Dry cutting.

CUTTER NUMBER	LENGTH OF CUT	OVERALL LENGTH	CORNER RADIUS	FLUTES	SHANK DIAMETER	CORNER RADIUS	PRICE PER MILL	
							ITEM #	PRICE
010	0.10	0.10	0.05	2	0.05	0.05	1000	\$21.00
020	0.20	0.20	0.10	2	0.10	0.10	1000	\$21.00
030	0.30	0.30	0.15	2	0.15	0	1000	\$42.00
040	0.40	0.40	0.20	2	0.20	0.050	1000	\$63.00
050	0.50	0.50	0.25	2	0.25	0.100	1000	\$84.00
070	0.70	0.70	0.35	2	0.35	0.050	1000	\$105.00
080	0.80	0.80	0.40	2	0.40	0.100	1000	\$126.00
090	0.90	0.90	0.45	2	0.45	0.050	1000	\$147.00
095	0.90	0.90	0.50	2	0.50	0	1000	\$168.00

For PCD High Performance DBA, see page 80F.

## END MILLS FOR PLASTICS

Rougher - Square Upcut - 3 Flute (Slow Helix)



- Recommended for turning applications in plastics
- Designed with unique chip geometry for chip control and increased cutting speed
- Extra shock absorption during attack
- Double fluting
- Good finish
- ISO ground to the flute

CUTTING DIAMETER D <sub>1</sub> (mm)	LENGTH OF CUT L <sub>1</sub> (mm)	CUTTING DIAMETER D <sub>2</sub> (mm)	TOTAL LENGTH L <sub>2</sub> (mm)	LENGTH (mm)		WEIGHT (g)	
				ISO	ANSI	ISO	ANSI
1.0	100	1.0	110	10000	10.00	10000.00	10.00
1.25	125	1.25	135	12500	12.50	12500.00	12.50
1.5	150	1.5	160	15000	15.00	15000.00	15.00
2.0	200	2.0	210	20000	20.00	20000.00	20.00
2.5	250	2.5	260	25000	25.00	25000.00	25.00
3.0	300	3.0	310	30000	30.00	30000.00	30.00
3.5	350	3.5	360	35000	35.00	35000.00	35.00
4.0	400	4.0	410	40000	40.00	40000.00	40.00
5.0	500	5.0	510	50000	50.00	50000.00	50.00
6.0	600	6.0	610	60000	60.00	60000.00	60.00
8.0	800	8.0	810	80000	80.00	80000.00	80.00
10.0	1000	10.0	1010	100000	100.00	100000.00	100.00
12.0	1200	12.0	1210	120000	120.00	120000.00	120.00



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## END MILLS FOR PLASTICS

### Square Upool - Single Flute



Do the Material Account  
with Improved Finish Over  
Standard End Mills!

- Design allows for maximum stock removal while maintaining excellent finish
- High rake, high relief design produces shorter chips for improved chip clearing action while maintaining heat into the chip
- Large flute valley wear resistant for the chip and ease of chip evacuation
- Slower hole removal, strong forces, making design preferable to other reinforced applications and account table design
- Sizes were available with standard, hard-to-use models
- High flute finish makes chip cutting - 1/2 DPC using or change if required
- High speed steel, high front eye - 1/2 DPC outside - 1/2 DPC around in the chip



Square Upool  
Single Flute

CUTTING Diameter	LENGTH Overall	Length to Center	CORNER Radius	CUTTING SPEED		FEED RATE		CHIPS REMOVED (Approximate)	
				FPM	M/MIN	FPM	M/MIN	FPM	M/MIN
1/16	1/8	1/16	0						
1/16	1/4	1/8	0						
1/16	3/8	1/4	0						
1/16	1/2	3/8	0						
1/16	5/8	1/2	0						
1/16	3/4	5/8	0						
1/16	7/8	3/4	0						
1/16	1	7/8	0						
1/8	1/4	1/8	0						
1/8	1/2	1/4	0						
1/8	3/4	1/2	0						
1/8	5/8	3/4	0						
1/8	7/8	5/8	0						
1/8	1	7/8	0						
1/4	1/2	1/4	0						
1/4	3/4	1/2	0						
1/4	5/8	3/4	0						
1/4	7/8	5/8	0						
1/4	1	7/8	0						
3/8	1/2	1/4	0						
3/8	3/4	1/2	0						
3/8	5/8	3/4	0						
3/8	7/8	5/8	0						
3/8	1	7/8	0						
1/2	1/2	1/4	0						
1/2	3/4	1/2	0						
1/2	5/8	3/4	0						
1/2	7/8	5/8	0						
1/2	1	7/8	0						
5/8	1/2	1/4	0						
5/8	3/4	1/2	0						
5/8	5/8	3/4	0						
5/8	7/8	5/8	0						
5/8	1	7/8	0						
3/4	1/2	1/4	0						
3/4	3/4	1/2	0						
3/4	5/8	3/4	0						
3/4	7/8	5/8	0						
3/4	1	7/8	0						
7/8	1/2	1/4	0						
7/8	3/4	1/2	0						
7/8	5/8	3/4	0						
7/8	7/8	5/8	0						
7/8	1	7/8	0						

These figures are intended as a guide only. They do not guarantee consistent results with all chips.

(continued on next page)

**PLEASE USE SPEEDS & FEEDS ON PAGE 226**

## END MILLS FOR PLASTICS

Square Upcut - Single Flute (cont.)

(continued from previous page)

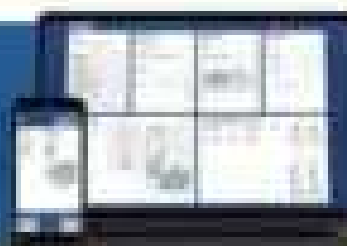
CUTER # PART#	LENGTH OF CUT	Speed of rotation	Diameter Length	MATERIAL		MATERIAL		MATERIAL	
				1.4	1.6	1.4	1.6	1.4	1.6
010	0.8 100	10	0	1011.00	10.00	1011.00	10.00	1011.00	10.00
010	1 100	10	0	1011.00	10.00	1011.00	10.00	1011.00	10.00
10	0.8 100	10	0.10	1011.00	10.00	1011.00	10.00	1011.00	10.00
10	0.8 100	10	0.15	1011.00	10.00	1011.00	10.00	1011.00	10.00
10	1 100	10	0	1011.00	10.00	1011.00	10.00	1011.00	10.00
10	1.4 100	10	0	1011.00	10.00	1011.00	10.00	1011.00	10.00
10	0.8 100	10	0.10	1011.00	10.00	1011.00	10.00	1011.00	10.00
10	0.8 100	10	0.15	1011.00	10.00	1011.00	10.00	1011.00	10.00
10	1 100	10	0	1011.00	10.00	1011.00	10.00	1011.00	10.00
10	1.4 100	10	0	1011.00	10.00	1011.00	10.00	1011.00	10.00
10	0.8 100	10	0	1011.00	10.00	1011.00	10.00	1011.00	10.00
10	1 100	10	0	1011.00	10.00	1011.00	10.00	1011.00	10.00
10	1.4 100	10	0	1011.00	10.00	1011.00	10.00	1011.00	10.00

Total length of cut = 0.01" (0.254mm) Total length of material used for cut = 0.015" (0.381mm)

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## END MILLS FOR PLASTICS

### Square Downcut - Single Flute



Prevents Fraying,  
Chip-Out, and Lifting

- Prevents fraying and chip-out of the edge of work piece
- Prevents fling or vacuum failure
- Left hand and right hand cut
- High speed, high taper design produces smooth edge for improved finishing and allows transferring heat into the chip
- Material setting: 1 Tool holder: 1 240 grade or better

CUTTING DIAMETER	LENGTH OF CUT	SHANK DIAMETER	SHANK LENGTH	ITEM NUMBER		ITEM NUMBER		MATERIAL RECOMMENDATION
				1 FL.	RIGHT	1 FL.	RIGHT	
0.100	1.125	0.100	1.125					
0.125	0.875	0.125	1.125			2000	2000	
0.125	1.125	0.125	1.125			2000	2000	
0.150	0.875	0.150	1.125	2000	2000	2000	2000	
0.150	1.125	0.150	1.125			2000	2000	
0.175	0.875	0.175	1.125			2000	2000	
0.175	1.125	0.175	1.125			2000	2000	
0.200	0.875	0.200	1.125	2000	2000	2000	2000	2000 2000
0.200	1.125	0.200	1.125			2000	2000	
0.250	0.875	0.250	1.125	2000	2000	2000	2000	2000 2000
0.250	1.125	0.250	1.125			2000	2000	
0.300	0.875	0.300	1.125	2000	2000	2000	2000	2000 2000
0.300	1.125	0.300	1.125			2000	2000	
0.350	0.875	0.350	1.125	2000	2000	2000	2000	2000 2000
0.350	1.125	0.350	1.125			2000	2000	
0.400	0.875	0.400	1.125	2000	2000	2000	2000	2000 2000
0.400	1.125	0.400	1.125			2000	2000	
0.450	0.875	0.450	1.125	2000	2000	2000	2000	2000 2000
0.450	1.125	0.450	1.125			2000	2000	
0.500	0.875	0.500	1.125	2000	2000	2000	2000	2000 2000
0.500	1.125	0.500	1.125			2000	2000	
0.550	0.875	0.550	1.125	2000	2000	2000	2000	2000 2000
0.550	1.125	0.550	1.125			2000	2000	
0.600	0.875	0.600	1.125	2000	2000	2000	2000	2000 2000
0.600	1.125	0.600	1.125			2000	2000	
0.650	0.875	0.650	1.125	2000	2000	2000	2000	2000 2000
0.650	1.125	0.650	1.125			2000	2000	
0.700	0.875	0.700	1.125	2000	2000	2000	2000	2000 2000
0.700	1.125	0.700	1.125			2000	2000	
0.750	0.875	0.750	1.125	2000	2000	2000	2000	2000 2000
0.750	1.125	0.750	1.125			2000	2000	
0.800	0.875	0.800	1.125	2000	2000	2000	2000	2000 2000
0.800	1.125	0.800	1.125			2000	2000	
0.850	0.875	0.850	1.125	2000	2000	2000	2000	2000 2000
0.850	1.125	0.850	1.125			2000	2000	
0.900	0.875	0.900	1.125	2000	2000	2000	2000	2000 2000
0.900	1.125	0.900	1.125			2000	2000	
0.950	0.875	0.950	1.125	2000	2000	2000	2000	2000 2000
0.950	1.125	0.950	1.125			2000	2000	
1.000	0.875	1.000	1.125	2000	2000	2000	2000	2000 2000
1.000	1.125	1.000	1.125			2000	2000	

PLEASE SEE SPEEDS & FEEDS ON PAGE 229



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## END MILLS FOR PLASTICS

Ball Tipmill - Single Flute



- Design allows for maximum stock removal with maximum coolant flow
- High rake, high relief design produces smoother edge for improved shearing action when machining hard 2nd Op step
- Large flute volume allows room for the chip and acts as chip accumulator
- Shorter flute reduces string forces, making design preferable for thin-walled applications and narrow slots where a high duty ratio results chip grinding
- 40% longer in length if required
- Right hand design, right hand cut
- Solid Carbide
- ISO ground to the edge

SERIES	SERIES NUMBER	LENGTH (IN)	SHANK DIAMETER (IN)	TYPICAL LENGTH (IN)	RECOMMENDATION	
					FEED	SPINDLE RPM
B200	1.10	1.00 (1.0)	1.0	1.10	0.0025	1000
	1.15	1.50 (1.5)	1.0	1.10	0.0025	1000
	1.20	2.00 (2.0)	1.0	1.10	0.0025	1000
	1.30	3.00 (3.0)	1.0	1.10	0.0025	1000
	1.4	4.0 (4.0)	1.0	1.10	0.0025	1000
	1.5	5.0 (5.0)	1.0	1.10	0.0025	1000
	1.6	6.0 (6.0)	1.0	1.10	0.0025	1000
	1.7	7.0 (7.0)	1.0	1.10	0.0025	1000
	1.8	8.0 (8.0)	1.0	1.10	0.0025	1000
	1.9	9.0 (9.0)	1.0	1.10	0.0025	1000
B250	2.2	2.0 (2.0)	2.0	2.20	0.0025	800
	2.5	2.5 (2.5)	2.0	2.20	0.0025	800
	3.0	3.0 (3.0)	2.0	2.20	0.0025	800

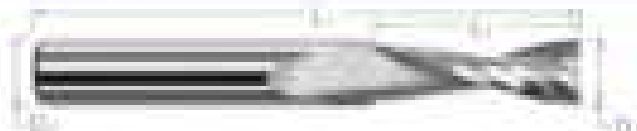
### B2000 & B2500 (Single Flute Plastic Cutting End Mills)

Maximum RPMs shown in this chart assume tool is used as directed in the range of stock removal. For those applications where maximum RPM is required for the maximum feed, the upper range of the table should be followed. The chart is intended to serve as a guideline to assist with tool selection only. For product specifications, please contact us at 1-800-541-8800.

Material	Finish	RPM	Feed and Chip Load (in) per Tooth & Spindle RPM																Height of Cut (in)				
			0.005	0.010	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.055	0.060	0.065	0.070	0.075	0.080	0.085	0.090			
			0.002	0.004	0.006	0.008	0.010	0.012	0.014	0.016	0.018	0.020	0.022	0.024	0.026	0.028	0.030	0.032	0.034	0.036			
Aluminum 6061	Fine	0.010	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000	9500	10000	1.000	1.000
		0.015	700	1000	1300	1600	1900	2200	2500	2800	3100	3400	3700	4000	4300	4600	4900	5200	5500	5800	6100	0.750	0.750
	Medium	0.010	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000	9500	10000	1.000	1.000
		0.015	700	1000	1300	1600	1900	2200	2500	2800	3100	3400	3700	4000	4300	4600	4900	5200	5500	5800	6100	0.750	0.750
Steel A304	Fine	0.010	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000	6400	6800	7200	7600	8000	1.000	1.000
		0.015	550	800	1050	1300	1550	1800	2050	2300	2550	2800	3050	3300	3550	3800	4050	4300	4550	4800	5050	0.750	0.750
	Medium	0.010	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000	6400	6800	7200	7600	8000	1.000	1.000
		0.015	550	800	1050	1300	1550	1800	2050	2300	2550	2800	3050	3300	3550	3800	4050	4300	4550	4800	5050	0.750	0.750
Titanium 6Al-4V	Fine	0.010	600	900	1200	1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5100	5400	5700	6000	1.000	1.000
		0.015	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	0.750	0.750
	Medium	0.010	600	900	1200	1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5100	5400	5700	6000	1.000	1.000
		0.015	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3800	4000	0.750	0.750

## END MILLS FOR PLASTICS

### Square Upcut - 2 Flute (Slow Helix)



2 Flute Design Improves Bottom Finish and Accuracy

- High speed, high relief design with large flute volume maximizes chip removal and performance
- 2-flute design improves rigidity for higher accuracy, less deflection, and longer tool life
- Slow helix reduces wing forces, making design preferable for thin-walled applications and difficult materials
- Specific cutting design minimizes plunging and jamming → Solid carbide → 100% precision to the job

ITEM NUMBER	ITEM DESCRIPTION	LENGTH OF CUT	NUMBER OF FLUTES	SHANK DIAMETER	TOOLING DATA		APPROXIMATE CAPACITY	
					RPM	FEED	D <sub>max</sub>	D <sub>min</sub>
100	1.000	2.500	2	1.000	1200	0.050		
101	1.000	2.000	2	1.000	1000	0.040		
102	1.000	1.500	2	1.000	800	0.030		
103	1.000	1.000	2	1.000	600	0.020		
104	1.000	0.500	2	1.000	400	0.010		
105	1.000	0.500	2	0.500	400	0.010		
106	1.000	0.500	2	0.500	400	0.010	0.001 in.	0.010
107	1.000	0.500	2	0.500	400	0.010		
108	1.000	0.500	2	0.500	400	0.010		
109	1.000	0.500	2	0.500	400	0.010		
110	1.000	0.500	2	0.500	400	0.010		
111	1.000	0.500	2	0.500	400	0.010		
112	1.000	0.500	2	0.500	400	0.010		
113	1.000	0.500	2	0.500	400	0.010		
114	1.000	0.500	2	0.500	400	0.010	0.001 in.	0.010
115	1.000	0.500	2	0.500	400	0.010		
116	1.000	0.500	2	0.500	400	0.010	0.001 in.	0.010
117	1.000	0.500	2	0.500	400	0.010		
118	1.000	0.500	2	0.500	400	0.010		
119	1.000	0.500	2	0.500	400	0.010		
120	1.000	0.500	2	0.500	400	0.010		
121	1.000	0.500	2	0.500	400	0.010		
122	1.000	0.500	2	0.500	400	0.010		
123	1.000	0.500	2	0.500	400	0.010		
124	1.000	0.500	2	0.500	400	0.010		
125	1.000	0.500	2	0.500	400	0.010		
126	1.000	0.500	2	0.500	400	0.010		
127	1.000	0.500	2	0.500	400	0.010		
128	1.000	0.500	2	0.500	400	0.010		
129	1.000	0.500	2	0.500	400	0.010		
130	1.000	0.500	2	0.500	400	0.010		
131	1.000	0.500	2	0.500	400	0.010		
132	1.000	0.500	2	0.500	400	0.010		
133	1.000	0.500	2	0.500	400	0.010		
134	1.000	0.500	2	0.500	400	0.010		
135	1.000	0.500	2	0.500	400	0.010	0.001 in.	0.010
136	1.000	0.500	2	0.500	400	0.010	0.001 in.	0.010
137	1.000	0.500	2	0.500	400	0.010		
138	1.000	0.500	2	0.500	400	0.010		
139	1.000	0.500	2	0.500	400	0.010		
140	1.000	0.500	2	0.500	400	0.010		

Continued on next page



**END MILLS FOR PLASTICS**

Square Endcut - 2 Flute (Wire Hole) (cont.)

continued from previous page

PART NUMBER			LENGTH OF CUT	LENGTH TO CENTER	LENGTH TO POINT	CUTTING SPEED		RECOMMENDED FEEDS	
1-1/2" DIA.	2" DIA.	3" DIA.				FT./MIN.	IPR.	IPR.	IPR.
111	111	111	0.00	1.00	1.00	1100	0.00		
112	112	112	0.10	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
113	113	113	0.20	1.00	1.00	1100	0.00		
114	114	114	0.30	1.00	1.00	1100	0.00		
115	115	115	0.40	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
116	116	116	0.50	1.00	1.00	1100	0.00		
117	117	117	0.60	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
118	118	118	0.80	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
119	119	119	1.00	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
120	120	120	1.20	1.00	1.00	1100	0.00		
121	121	121	1.40	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
122	122	122	1.60	1.00	1.00	1100	0.00		
123	123	123	1.80	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
124	124	124	2.00	1.00	1.00	1100	0.00		
125	125	125	2.20	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
126	126	126	2.40	1.00	1.00	1100	0.00		
127	127	127	2.60	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
128	128	128	2.80	1.00	1.00	1100	0.00		
129	129	129	3.00	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
130	130	130	3.20	1.00	1.00	1100	0.00		
131	131	131	3.40	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
132	132	132	3.60	1.00	1.00	1100	0.00		
133	133	133	3.80	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
134	134	134	4.00	1.00	1.00	1100	0.00		
135	135	135	4.20	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
136	136	136	4.40	1.00	1.00	1100	0.00		
137	137	137	4.60	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
138	138	138	4.80	1.00	1.00	1100	0.00		
139	139	139	5.00	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
140	140	140	5.20	1.00	1.00	1100	0.00		
141	141	141	5.40	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
142	142	142	5.60	1.00	1.00	1100	0.00		
143	143	143	5.80	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
144	144	144	6.00	1.00	1.00	1100	0.00		
145	145	145	6.20	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
146	146	146	6.40	1.00	1.00	1100	0.00		
147	147	147	6.60	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
148	148	148	6.80	1.00	1.00	1100	0.00		
149	149	149	7.00	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
150	150	150	7.20	1.00	1.00	1100	0.00		
151	151	151	7.40	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
152	152	152	7.60	1.00	1.00	1100	0.00		
153	153	153	7.80	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
154	154	154	8.00	1.00	1.00	1100	0.00		
155	155	155	8.20	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
156	156	156	8.40	1.00	1.00	1100	0.00		
157	157	157	8.60	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
158	158	158	8.80	1.00	1.00	1100	0.00		
159	159	159	9.00	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
160	160	160	9.20	1.00	1.00	1100	0.00		
161	161	161	9.40	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
162	162	162	9.60	1.00	1.00	1100	0.00		
163	163	163	9.80	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
164	164	164	10.00	1.00	1.00	1100	0.00		
165	165	165	10.20	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
166	166	166	10.40	1.00	1.00	1100	0.00		
167	167	167	10.60	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
168	168	168	10.80	1.00	1.00	1100	0.00		
169	169	169	11.00	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
170	170	170	11.20	1.00	1.00	1100	0.00		
171	171	171	11.40	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
172	172	172	11.60	1.00	1.00	1100	0.00		
173	173	173	11.80	1.00	1.00	1100	0.00	0.0001-0.0010	0.005
174	174	174	12.00	1.00	1.00	1100	0.00		

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### END MILLS FOR PLASTICS

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

Continued from previous page

DIVERGENCE			LENGTH OF CUT L <sub>2</sub>	DEPTH OF CUT D <sub>1</sub>	WIDTH OF CUT L <sub>1</sub>	CUTTING SPEED		RECOMMENDED FEED	
mm	in	mm/min				in/min	mm/rev	in/rev	
Ø12	Ø1/2	113	Ø 4.0 157	Ø10	0	2400	40.0		
Ø18	Ø3/4	159	Ø 6.0 235	Ø15	0	1800	40.0	0.075 - 0.15	1600
Ø24	Ø1	215	Ø 8.0 313	Ø20	0	1200	50.0		
Ø30	Ø1 1/4	283	Ø 12.0 471	Ø25	0	900	50.0		
	Ø1.5	335	Ø 16.0 628	Ø30	0	720	75.0		
Ø36	Ø1 3/8	381	Ø 20.0 785	Ø35	0.02	600	75.0	0.075 - 0.15	600
Ø42	Ø1 1/2	441	Ø 24.0 942	Ø40	0.03	500	75.0	0.075 - 0.15	600
Ø48	Ø1 5/8	501	Ø 28.0 1100	Ø45	0.04	450	75.0		
Ø54	Ø1 7/8	561	Ø 32.0 1257	Ø50	0.05	400	75.0		
Ø60	Ø2	617	Ø 36.0 1414	Ø55	0.06	360	75.0		
Ø66	Ø2 1/8	673	Ø 40.0 1571	Ø60	0.07	320	75.0		
Ø72	Ø2 1/4	729	Ø 44.0 1728	Ø65	0.08	280	75.0		
Ø78	Ø2 3/8	785	Ø 48.0 1885	Ø70	0.09	250	75.0		
Ø84	Ø2 1/2	841	Ø 52.0 2042	Ø75	0.10	220	75.0		
Ø90	Ø2 3/4	897	Ø 56.0 2200	Ø80	0.11	200	75.0		
Ø96	Ø2 7/8	953	Ø 60.0 2357	Ø85	0.12	180	75.0		
Ø102	Ø3	1009	Ø 64.0 2514	Ø90	0.13	160	75.0		
Ø108	Ø3 1/8	1065	Ø 68.0 2671	Ø95	0.14	150	75.0		
Ø114	Ø3 1/4	1121	Ø 72.0 2828	Ø100	0.15	140	75.0		
Ø120	Ø3 1/2	1177	Ø 76.0 2985	Ø105	0.16	130	75.0		
Ø126	Ø3 3/8	1233	Ø 80.0 3142	Ø110	0.17	120	75.0		
Ø132	Ø3 1/2	1289	Ø 84.0 3300	Ø115	0.18	110	75.0		
Ø138	Ø3 5/8	1345	Ø 88.0 3457	Ø120	0.19	100	75.0		
Ø144	Ø3 7/8	1401	Ø 92.0 3614	Ø125	0.20	95	75.0		
Ø150	Ø4	1457	Ø 96.0 3771	Ø130	0.21	90	75.0		
Ø156	Ø4 1/8	1513	Ø 100.0 3928	Ø135	0.22	85	75.0		
Ø162	Ø4 1/4	1569	Ø 104.0 4086	Ø140	0.23	80	75.0		
Ø168	Ø4 3/8	1625	Ø 108.0 4243	Ø145	0.24	75	75.0		
Ø174	Ø4 1/2	1681	Ø 112.0 4400	Ø150	0.25	70	75.0		
Ø180	Ø4 3/4	1737	Ø 116.0 4557	Ø155	0.26	65	75.0		
Ø186	Ø4 7/8	1793	Ø 120.0 4714	Ø160	0.27	60	75.0		
Ø192	Ø5	1849	Ø 124.0 4871	Ø165	0.28	55	75.0		
Ø198	Ø5 1/8	1905	Ø 128.0 5028	Ø170	0.29	50	75.0		
Ø204	Ø5 1/4	1961	Ø 132.0 5186	Ø175	0.30	45	75.0		
Ø210	Ø5 3/8	2017	Ø 136.0 5343	Ø180	0.31	40	75.0		
Ø216	Ø5 1/2	2073	Ø 140.0 5500	Ø185	0.32	35	75.0		
Ø222	Ø5 5/8	2129	Ø 144.0 5657	Ø190	0.33	30	75.0		
Ø228	Ø5 3/4	2185	Ø 148.0 5814	Ø195	0.34	25	75.0		
Ø234	Ø5 7/8	2241	Ø 152.0 5971	Ø200	0.35	20	75.0		
Ø240	Ø6	2297	Ø 156.0 6128	Ø205	0.36	15	75.0		
Ø246	Ø6 1/8	2353	Ø 160.0 6286	Ø210	0.37	10	75.0		
Ø252	Ø6 1/4	2409	Ø 164.0 6443	Ø215	0.38	5	75.0		

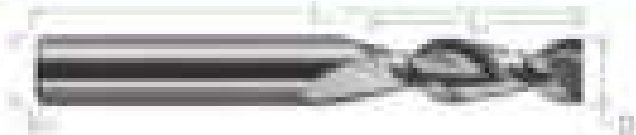
### SPEEDS & FEEDS (2 Flute Plastic Cutting End Mills - Slow Helix)

Important Note: Tables are a convenient reference. Actual speeds and feeds depend on tool and work. For more details on tool application for plastics contact us at 1-800-941-6990. For general advice, contact us at 1-800-941-6990. Maximum length of cut, maximum RPM and maximum feed rate are shown in bold text. For more information, visit our website [www.iscar.com](http://www.iscar.com).

Tool Size	Type	Cutting Direction	Suggested Feed Rates (IPR) by Tool Diameter																Depth of Cut Range (mm)			
			100	120	150	200	250	300	350	400	450	500	600	700	800	900	1000					
1/2"	Up Cut	Top Flute	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00	1.10		
		Bottom Flute	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.00	
1/4"	Up Cut	Top Flute	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.10	1.20	
		Bottom Flute	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.10	
	Down Cut	Top Flute	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.10	1.20	
		Bottom Flute	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.10	
3/8"	Up Cut	Top Flute	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.20	1.30	
		Bottom Flute	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.20	
	Down Cut	Top Flute	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.20	1.30
		Bottom Flute	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	1.20

## END MILLS FOR PLASTICS

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



#### 2 Flute Design Improves Bottom Finish and Accuracy

- High speed, high feed design with large flute cutting, maintains chip removal pattern over
- 2 flute design improves rigidity for better accuracy, less deflection, and longer tool life
- Higher helix (up to 40°) for faster chip removal and better finish
- Better cutting design improves chiping and burning
- Good surface
- CNC ground to the flute

OUTER DIAMETER	LENGTH OVER CUT	INNER DIAMETER	TOTAL LENGTH	SPEEDS		FEEDS	
D <sub>1</sub>	L <sub>1</sub>	D <sub>2</sub>	L <sub>2</sub>	FPM	M/MIN	IPM	M/REV
1/8"	1-1/8" 100	3/16"	1-1/8"	3000-4000	30-45		
1/4"	1-3/4" 100	3/8"	1-3/4"	2000-3000	20-30		
3/8"	2-1/8" 100	1/2"	2-1/8"	1500-2000	15-20		
1/2"	2-3/4" 100	5/8"	2-3/4"	1200-1500	12-15		
5/8"	3-1/4" 100	3/4"	3-1/4"	1000-1200	10-12		
3/4"	3-3/4" 100	7/8"	3-3/4"	900-1000	9-10		
7/8"	4-1/8" 100	1"	4-1/8"	800-900	8-9		
1"	4-3/4" 100	1-1/8"	4-3/4"	700-800	7-8		
1-1/8"	5-1/8" 100	1-1/4"	5-1/8"	650-750	6-7		
1-1/4"	5-3/4" 100	1-3/8"	5-3/4"	600-700	6-7		
1-3/8"	6-1/8" 100	1-5/8"	6-1/8"	550-650	5-6		
1-5/8"	6-3/4" 100	1-7/8"	6-3/4"	500-600	5-6		
2"	7-1/8" 100	1-7/8"	7-1/8"	450-550	4-5		
2-1/8"	7-3/4" 100	2"	7-3/4"	400-500	4-5		
2-3/8"	8-1/8" 100	2-1/8"	8-1/8"	350-450	3-4		
2-1/2"	8-3/4" 100	2-1/4"	8-3/4"	300-400	3-4		
2-7/8"	9-1/8" 100	2-3/8"	9-1/8"	250-350	2-3		
3"	9-3/4" 100	2-7/8"	9-3/4"	200-300	2-3		
3-1/8"	10-1/8" 100	3"	10-1/8"	150-250	1-2		
3-1/4"	10-3/4" 100	3-1/8"	10-3/4"	100-200	1-2		

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

**Important Note:** Always use the table and formulas provided for the purpose of general only. For every material there is a variation of SP. For more information, visit [www.harsco.com](http://www.harsco.com). The values listed in this table are for general reference only. Always consult the manufacturer's literature for more information.

Material	Feed	SPM	Speeds and Feeds (SPM & M/Rev)																Equivalent Feed	Feed					
			1/8"	1/4"	3/8"	1/2"	5/8"	3/4"	7/8"	1"	1-1/8"	1-1/4"	1-3/8"	1-1/2"	1-3/4"	2"	2-1/2"	3"							
Aluminum	Standard	80-120	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	
	High Speed	80-120	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	
Steel	Standard	80-120	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150
	High Speed	80-120	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150	100-150

**END MILLS FOR PLASTICS**

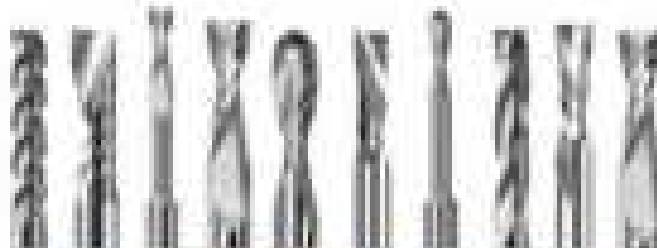
**Square Shank - 2 Flute (Slow Helix)**



- Prevents chipping and chip-out on the top of the workpiece
- Reduces chipping caused by noise
- 2-flute design offers light load cut force
- High rake, high relief design with large flute relief maximizes chip removal and performance
- 2 flute design offers light cutting forces, less deflection, and longer run life
- Built-in relief > 180° ground in the flute

COOPER QUANTUM SERIES ITEM #	LENGTH OF CUT	SHANK DIAMETER	CUTTING DIAMETER	OVERALL LENGTH	OPERATING		MAXIMUM SPINDLE SPEEDS	
					RPM	FEED (mm/min)	RPM	FEED (mm/min)
403	244 (9.6)	1/2"	1/2"	1.13	30000	60.00		
414	200 (7.87)	1/4"	1/4"	1.13	30000	60.00		
418	4.00 (157)	1/8"	1/8"	1.10	30000	60.00	30000 RPM	18.00
419	4.00 (157)	3/16"	3/16"	1.10	30000	60.00		
427	200 (7.87)	1/4"	1/4"	1.10	30000	60.00		
428	200 (7.87)	1/8"	1/8"	1.10	30000	60.00	30000 RPM	18.00
433	275 (10.8)	3/8"	3/8"	1.13	30000	60.00		
434	4.00 (157)	1/8"	1/8"	1.13	30000	60.00		
435	4.00 (157)	3/16"	3/16"	1.13	30000	60.00	30000 RPM	18.00
436	4.00 (157)	1/4"	1/4"	1.13	30000	60.00		
437	4.00 (157)	3/8"	3/8"	1.13	30000	60.00		
438	4.00 (157)	1/2"	1/2"	1.13	30000	60.00		
439	4.00 (157)	1/8"	1/8"	1.10	30000	60.00	30000 RPM	18.00
440	4.00 (157)	3/16"	3/16"	1.10	30000	60.00		
441	4.00 (157)	1/4"	1/4"	1.10	30000	60.00		
442	4.00 (157)	3/8"	3/8"	1.10	30000	60.00		
443	4.00 (157)	1/2"	1/2"	1.10	30000	60.00		
444	4.00 (157)	1/8"	1/8"	1.07	30000	60.00	30000 RPM	18.00
445	4.00 (157)	3/16"	3/16"	1.07	30000	60.00		
446	4.00 (157)	1/4"	1/4"	1.07	30000	60.00		
447	4.00 (157)	3/8"	3/8"	1.07	30000	60.00		
448	4.00 (157)	1/2"	1/2"	1.07	30000	60.00		
449	4.00 (157)	1/8"	1/8"	1.04	30000	60.00	30000 RPM	18.00
450	4.00 (157)	3/16"	3/16"	1.04	30000	60.00		
451	4.00 (157)	1/4"	1/4"	1.04	30000	60.00		
452	4.00 (157)	3/8"	3/8"	1.04	30000	60.00		
453	4.00 (157)	1/2"	1/2"	1.04	30000	60.00		
454	4.00 (157)	1/8"	1/8"	1.01	30000	60.00	30000 RPM	18.00
455	4.00 (157)	3/16"	3/16"	1.01	30000	60.00		
456	4.00 (157)	1/4"	1/4"	1.01	30000	60.00		
457	4.00 (157)	3/8"	3/8"	1.01	30000	60.00		
458	4.00 (157)	1/2"	1/2"	1.01	30000	60.00		

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COOPER QUANTUM END MILLS (SIZES VARY)



## END MILLS FOR PLASTICS

### Square Downcut - 2 Flute (High Relief)



- Prevents chipping and chip-out on the top of the workpiece.
- Prevents chipping on narrow walls.
- 2-Flute design, right hand cut flutes.
- High relief, high relief design with large flat relief increases chip removal and performance.
- High relief (approx. 20°) for faster chip removal and better finish.
- Solid carbide.
- ISO grade in the USA.

OUTER DIAMETER	LENGTH	SHANK DIAMETER	LENGTH FROM SHANK	PART NUMBER	
D	L	D	L	USA	EUROPE
1/8"	0.98" (25)	1/8"	1.18"	77801	8181
1/8"	0.98" (25)	1/8"	1.18"	88801	9181
3/16"	0.84" (21)	3/16"	1.04"	77802	8182
3/16"	0.84" (21)	3/16"	1.04"	88802	9182

OUTER DIAMETER	LENGTH	SHANK DIAMETER	LENGTH FROM SHANK	PART NUMBER	
D	L	D	L	USA	EUROPE
1/4"	1.98" (50)	1/4"	2.18"	77803	8183
1/4"	1.98" (50)	1/4"	2.18"	88803	9183
5/16"	2.02" (52)	5/16"	2.22"	77804	8184
5/16"	2.02" (52)	5/16"	2.22"	88804	9184
3/8"	2.02" (52)	3/8"	2.22"	77805	8185
3/8"	2.02" (52)	3/8"	2.22"	88805	9185
1/2"	2.02" (52)	1/2"	2.22"	77806	8186
1/2"	2.02" (52)	1/2"	2.22"	88806	9186
5/8"	2.02" (52)	5/8"	2.22"	77807	8187
5/8"	2.02" (52)	5/8"	2.22"	88807	9187
3/4"	2.02" (52)	3/4"	2.22"	77808	8188
3/4"	2.02" (52)	3/4"	2.22"	88808	9188
7/8"	2.02" (52)	7/8"	2.22"	77809	8189
7/8"	2.02" (52)	7/8"	2.22"	88809	9189

PLEASE SEE DIMENSIONS & TOLERANCES ON PAGE 262



Access Simulation Files in DXF Format  
for Every Harvey Tool Product

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**END MILLS FOR PLASTICS**

Square Upcut - Long Reach - 2 Flute



- High speed, high relief design with large flute cutting through chip removal and performance
- Special cutting design for precise plunging and ramping
- Removes heat effectively to avoid burning
- Length of cut - 5x diameter
- ISO standards
- ISO grades to the 1909

CUTTING DIAMETER	LENGTH OF CUT	CUTTING FLUTE	WEIGHT GRAMME	CUTTING LENGTH	HSS		HSS COATED	
					HSS	HSS	HSS	HSS
0.150	0.150	0.08	0.06	0.03	1.10	98505	30.00	
0.20	0.20	0.14	0.08	0.05	1.10	98505	31.00	
0.25	0.25	0.20	0.10	0.06	1.10	98505	32.00	
0.30	0.30	0.26	0.12	0.07	1.10	98505	33.00	
0.35	0.35	0.32	0.14	0.08	1.10	98505	34.00	
0.40	0.40	0.38	0.16	0.09	1.10	98505	35.00	
0.45	0.45	0.44	0.18	0.10	1.10	98505	36.00	
0.50	0.50	0.50	0.20	0.11	1.10	98505	37.00	
0.55	0.55	0.56	0.22	0.12	1.10	98505	38.00	
0.60	0.60	0.62	0.24	0.13	1.10	98505	39.00	

CUTTING DIAMETER	LENGTH OF CUT	CUTTING FLUTE	WEIGHT GRAMME	CUTTING LENGTH	HSS	HSS	HSS COATED	
							HSS	HSS
0.75	0.75	0.75	0.30	0.15	1.10	98505	40.00	
0.80	0.80	0.8	0.32	0.16	1.10	98505	41.00	98505L12 40.00
0.90	0.90	0.9	0.36	0.18	1.10	98505	42.00	
1.00	1.00	1.0	0.40	0.20	1.10	98505	43.00	
1.10	1.10	1.1	0.44	0.22	1.10	98505	44.00	
1.25	1.25	1.25	0.50	0.25	1.10	98505	45.00	
1.40	1.40	1.4	0.56	0.28	1.10	98505	46.00	
1.50	1.50	1.5	0.60	0.30	1.10	98505	47.00	
1.60	1.60	1.6	0.64	0.32	1.10	98505	48.00	
1.80	1.80	1.8	0.72	0.36	1.10	98505	49.00	
2.00	2.00	2.0	0.80	0.40	1.10	98505	50.00	
2.50	2.50	2.5	1.00	0.50	1.10	98505	54.00	
3.00	3.00	3.0	1.20	0.60	1.10	98505	58.00	
3.50	3.50	3.5	1.40	0.70	1.10	98505	62.00	
4.00	4.00	4.0	1.60	0.80	1.10	98505	66.00	98505L12 66.00
4.50	4.50	4.5	1.80	0.90	1.10	98505	70.00	
5.00	5.00	5.0	2.00	1.00	1.10	98505	74.00	
5.50	5.50	5.5	2.20	1.10	1.10	98505	78.00	
6.00	6.00	6.0	2.40	1.20	1.10	98505	82.00	
6.50	6.50	6.5	2.60	1.30	1.10	98505	86.00	
7.00	7.00	7.0	2.80	1.40	1.10	98505	90.00	
8.00	8.00	8.0	3.20	1.60	1.10	98505	98.00	
9.00	9.00	9.0	3.60	1.80	1.10	98505	106.00	
10.00	10.00	10.0	4.00	2.00	1.10	98505	114.00	
12.00	12.00	12.0	4.80	2.40	1.10	98505	130.00	

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

## END MILLS FOR PLASTICS

### Multi-Flute - 2 Flute



- End mill for cutting complex shapes
- End mill has increased flute area called for improved cutting action at 90° of cut
- Square flute - reduces chipping forces - cutting always preferable for their reinforced geometries and superior edge design
- Center cutting - 4 flute cutters - ISO ground in the USA

FLUTE DIAMETER	LENGTH OF CUT	FLUTE DIAMETER	OVERALL LENGTH	SPRINDLERS		APPROXIMATE FLANGES	
				1/2"	9/16"	1/2"	9/16"
1/16"	0.64	1/16"	1.10	00000	00.00		
1/8"	0.64	1/8"	1.10	01000	00.00		
3/16"	0.64	3/16"	1.10	02000	00.00		
1/4"	0.64	1/4"	1.10	03000	00.00		
5/16"	0.64	5/16"	1.10	04000	00.00		
3/8"	0.64	3/8"	1.10	05000	00.00		
1/2"	0.64	1/2"	1.10	06000	00.00		
5/8"	0.64	5/8"	1.10	07000	00.00	0000 00	00.00
3/4"	0.64	3/4"	1.10	08000	00.00	1000 00	00.00
7/8"	0.64	7/8"	1.10	09000	00.00		
1.000"	0.64	1.000"	1.10	10000	00.00		
1.125"	0.64	1.125"	1.10	11000	00.00		
1.250"	0.64	1.250"	1.10	12000	00.00		
1.375"	0.64	1.375"	1.10	13000	00.00		
1.500"	0.64	1.500"	1.10	14000	00.00		
1.625"	0.64	1.625"	1.10	15000	00.00		
1.750"	0.64	1.750"	1.10	16000	00.00		
1.875"	0.64	1.875"	1.10	17000	00.00		
2.000"	0.64	2.000"	1.10	18000	00.00		
1.000"	0.64	1.000"	1.10	00000	00.00		
1.125"	0.64	1.125"	1.10	01000	00.00	0000 00	00.00
1.250"	0.64	1.250"	1.10	02000	00.00	0000 00	00.00
1.375"	0.64	1.375"	1.10	03000	00.00	1000 00	00.00
1.500"	0.64	1.500"	1.10	04000	00.00		
1.625"	0.64	1.625"	1.10	05000	00.00		
1.750"	0.64	1.750"	1.10	06000	00.00		
1.875"	0.64	1.875"	1.10	07000	00.00		
2.000"	0.64	2.000"	1.10	08000	00.00		
2.125"	0.64	2.125"	1.10	09000	00.00		
2.250"	0.64	2.250"	1.10	10000	00.00		
2.375"	0.64	2.375"	1.10	11000	00.00		
2.500"	0.64	2.500"	1.10	12000	00.00		
2.625"	0.64	2.625"	1.10	13000	00.00		
2.750"	0.64	2.750"	1.10	14000	00.00		
2.875"	0.64	2.875"	1.10	15000	00.00		
3.000"	0.64	3.000"	1.10	16000	00.00		
3.125"	0.64	3.125"	1.10	17000	00.00		
3.250"	0.64	3.250"	1.10	18000	00.00		

Continued on next page



## END MILLS FOR PLASTICS

Ball Upcut - 3 Flute (cont.)

continued from previous page

CUTTING WIDTH (IN)	CUTTING DEPTH (IN)	DIA. OF BALL (IN)	LENGTH OF CUT (IN)	MATERIALS		RECOMMENDED FEEDS (IPR)	
				IPR	FEED	IPR	FEED
0.125	0.125	0.125	1.0	0.005	0.005		
0.125	0.125	0.125	1.5	0.005	0.005	0.005-0.010	0.005
0.125	0.125	0.125	2.0	0.005	0.005	0.005-0.010	0.005
0.125	0.125	0.125	2.5	0.005	0.005		
0.125	0.125	0.125	3.0	0.005	0.005	0.005-0.010	0.005
0.125	0.125	0.125	3.5	0.005	0.005		
0.125	0.125	0.125	4.0	0.005	0.005	0.005-0.010	0.005
0.125	0.125	0.125	4.5	0.005	0.005		
0.125	0.125	0.125	5.0	0.005	0.005	0.005-0.010	0.005
0.125	0.125	0.125	5.5	0.005	0.005		

PLEASE USE SPEEDS & FEEDS ON PAGE 191



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## END MILLS FOR PLASTICS

### Ball Upright - Long Reach - 2 Flute



- Ball end has increased life and used for improved cutting action of top or ball
- Reduced work distortion for most finishing
- Ball end for finishing complex shapes
- Length of cut = 3x diameter
- Great hole depths (up to 3mm), making design preferable for free-forming applications and almost full range
- Center cutting
- Non-wear
- Good ground in the USA

TOTAL LENGTH	LENGTH TO FLUTE	TOTAL RADIUS	BALL DIAMETER	SHOULDER LENGTH	Material	
					15%	90%
100	40	4.00	10	1.00	6040	10.00
120	40	4.0	10	1.00	6040	10.00
140	40	4.0	10	1.00	6040	10.00
160	40	4.0	10	1.00	6040	10.00
200	40	4.00	10	1.00	6040	10.00
250	40	4.00	10	1.00	6040	10.00
300	40	4.00	10	1.00	6040	10.00
350	40	4.00	10	1.00	6040	10.00
400	40	4.00	10	1.00	6040	10.00
450	40	4.00	10	1.00	6040	10.00
500	40	4.00	10	1.00	6040	10.00
550	40	4.00	10	1.00	6040	10.00
600	40	4.00	10	1.00	6040	10.00
650	40	4.00	10	1.00	6040	10.00
700	40	4.00	10	1.00	6040	10.00
750	40	4.00	10	1.00	6040	10.00
800	40	4.00	10	1.00	6040	10.00
850	40	4.00	10	1.00	6040	10.00
900	40	4.00	10	1.00	6040	10.00
950	40	4.00	10	1.00	6040	10.00
1000	40	4.00	10	1.00	6040	10.00

### SPECIAL FEEDS: Square & Ball - Long Reach Plastic Turning End Mills

**Important Note:** Square end mills are used to machine slots and grooves in cylindrical parts. The end mills are ground to the square diameter, approximately 0.01 inch per corner. Ball end mills are used to machine rounded corners and grooves in cylindrical parts. The end mills are ground to the ball diameter, approximately 0.01 inch per corner.

Type	Size	Material	Long Reach End Mill (LREM) Feed Rates																Maximum RPM				
			0.010	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.055	0.060	0.065	0.070	0.075	0.080	0.085	0.090	0.095			
Standard	1/8"	Aluminum	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1100	1200
		Steel	80	120	160	200	240	280	320	360	400	440	480	520	560	600	640	680	720	760	800	850	900
Premium	1/8"	Aluminum	120	180	240	300	360	420	480	540	600	660	720	780	840	900	960	1020	1080	1140	1200	1300	1400
		Steel	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000	1050	1100
Premium	1/4"	Aluminum	150	225	300	375	450	525	600	675	750	825	900	975	1050	1125	1200	1275	1350	1425	1500	1600	1700
		Steel	120	180	240	300	360	420	480	540	600	660	720	780	840	900	960	1020	1080	1140	1200	1250	1300
Premium	1/4"	Aluminum	180	270	360	450	540	630	720	810	900	990	1080	1170	1260	1350	1440	1530	1620	1710	1800	1900	2000
		Steel	150	225	300	375	450	525	600	675	750	825	900	975	1050	1125	1200	1275	1350	1425	1500	1550	1600
Premium	3/8"	Aluminum	225	337	450	562	675	787	900	1012	1125	1237	1350	1462	1575	1687	1800	1912	2025	2137	2250	2350	2450
		Steel	180	270	360	450	540	630	720	810	900	990	1080	1170	1260	1350	1440	1530	1620	1710	1800	1850	1900
Premium	3/8"	Aluminum	270	405	540	675	810	945	1080	1215	1350	1485	1620	1755	1890	2025	2160	2295	2430	2565	2700	2800	2900
		Steel	225	337	450	562	675	787	900	1012	1125	1237	1350	1462	1575	1687	1800	1912	2025	2137	2250	2300	2350
Premium	1/2"	Aluminum	337	506	675	844	1012	1181	1350	1519	1688	1857	2026	2195	2364	2533	2702	2871	3040	3209	3378	3478	3578
		Steel	270	405	540	675	810	945	1080	1215	1350	1485	1620	1755	1890	2025	2160	2295	2430	2565	2700	2750	2800

## END MILLS FOR PLASTICS

### Corner Radius Upcut - 2 Flute



- High speed, high power design with large flute volume, maximum chip removal and performance
- Square flute, refined fluting design, creating design quiet life for fine, consistent applications and reduced tool chatter
- Corner cutting design, optimized plunging and ramping
- Solid carbide
- ISO 9001 certified ISO 9001

CUTTER ID Length	CUTTER Diameter	LENGTH OF CUT	FLUTE LENGTH	CORNER RADIUS	WEIGHT (g)	
					1/2L	FULL
1.00	.05	0.50	.05	0.0	0.00	0.00
1.12	.05	0.56	.05	0.0	0.00	0.00
1.25	.05	0.63	.05	0.0	0.00	0.00
1.38	.05	0.69	.05	0.0	0.00	0.00
1.50	.05	0.75	.05	0.0	0.00	0.00
1.63	.05	0.81	.05	0.0	0.00	0.00
1.75	.05	0.88	.05	0.0	0.00	0.00
1.88	.05	0.94	.05	0.0	0.00	0.00
2.00	.05	1.00	.05	0.0	0.00	0.00
2.13	.05	1.06	.05	0.0	0.00	0.00
2.25	.05	1.13	.05	0.0	0.00	0.00
2.38	.05	1.19	.05	0.0	0.00	0.00
2.50	.05	1.25	.05	0.0	0.00	0.00
2.63	.05	1.31	.05	0.0	0.00	0.00
2.75	.05	1.38	.05	0.0	0.00	0.00
2.88	.05	1.44	.05	0.0	0.00	0.00
3.00	.05	1.50	.05	0.0	0.00	0.00
3.13	.05	1.56	.05	0.0	0.00	0.00
3.25	.05	1.63	.05	0.0	0.00	0.00
3.38	.05	1.69	.05	0.0	0.00	0.00
3.50	.05	1.75	.05	0.0	0.00	0.00
3.63	.05	1.81	.05	0.0	0.00	0.00
3.75	.05	1.88	.05	0.0	0.00	0.00
3.88	.05	1.94	.05	0.0	0.00	0.00
4.00	.05	2.00	.05	0.0	0.00	0.00
4.13	.05	2.06	.05	0.0	0.00	0.00
4.25	.05	2.13	.05	0.0	0.00	0.00
4.38	.05	2.19	.05	0.0	0.00	0.00
4.50	.05	2.25	.05	0.0	0.00	0.00
4.63	.05	2.31	.05	0.0	0.00	0.00
4.75	.05	2.38	.05	0.0	0.00	0.00
4.88	.05	2.44	.05	0.0	0.00	0.00
5.00	.05	2.50	.05	0.0	0.00	0.00

(continued on next page)

## END MILLS FOR PLASTICS

### Corner Radius Lipcut - 2 Flute (mm)

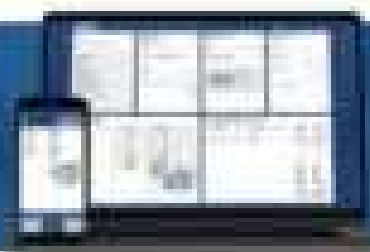
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Cutting to width	Cutting height	Length to cut	Depth to cut	Number of flutes	Number of flutes	Material	
						1.5	2.0
1.0	0.1	0.4 - 0.5	0.4	1.0	0.10	1000	10.0
1.0	0.15	0.4 - 0.5	0.4	1.0	0.15	1000	10.0
1.0	0.20	0.4 - 0.5	0.4	1.0	0.20	1000	10.0
1.0	0.25	0.4 - 0.5	0.4	1.0	0.25	1000	10.0
1.0	0.30	0.4 - 0.5	0.4	1.0	0.30	1000	10.0
1.0	0.35	0.4 - 0.5	0.4	1.0	0.35	1000	10.0
1.0	0.40	0.4 - 0.5	0.4	1.0	0.40	1000	10.0
1.0	0.45	0.4 - 0.5	0.4	1.0	0.45	1000	10.0
1.0	0.50	0.4 - 0.5	0.4	1.0	0.50	1000	10.0
1.0	0.55	0.4 - 0.5	0.4	1.0	0.55	1000	10.0
1.0	0.60	0.4 - 0.5	0.4	1.0	0.60	1000	10.0
1.0	0.65	0.4 - 0.5	0.4	1.0	0.65	1000	10.0
1.0	0.70	0.4 - 0.5	0.4	1.0	0.70	1000	10.0
1.0	0.75	0.4 - 0.5	0.4	1.0	0.75	1000	10.0
1.0	0.80	0.4 - 0.5	0.4	1.0	0.80	1000	10.0
1.0	0.85	0.4 - 0.5	0.4	1.0	0.85	1000	10.0
1.0	0.90	0.4 - 0.5	0.4	1.0	0.90	1000	10.0
1.0	0.95	0.4 - 0.5	0.4	1.0	0.95	1000	10.0
1.0	1.00	0.4 - 0.5	0.4	1.0	1.00	1000	10.0

PLEASE SEE SPEEDS & FEEDS ON PAGE 147

### APPLYING ADDITIONAL POST

FREE for shipping,  
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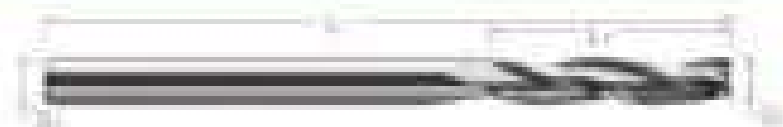
### Customize Turning Parameters For Optimized Machining


  
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## END MILLS FOR PLASTICS

Finishers – Square Upcut – 3 Flute (Slow Helix)



Wiper Flat  
 Option for an  
 Improved Finish

• 3 Flute length strengthens rigidity and decreases end forces

• Square End Tool Type

– **Without Wiper Flat (Type II)**: Standard and generally designed with a cut angle to a slight angle

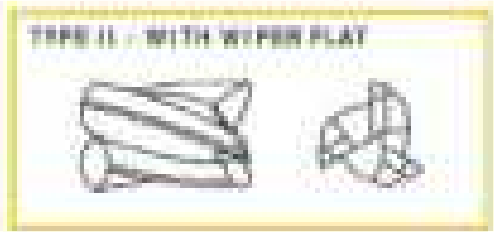
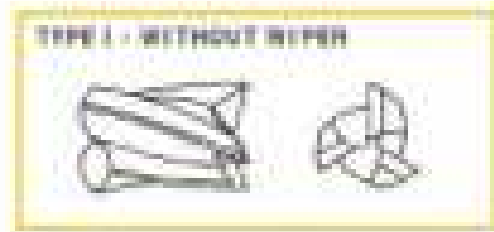
– **With Wiper Flat (Type III)**: Used for wet grinding that enhances surface finish by reducing traditional grinding marks with a wiper channel to create corners

• Square ends (square, 30°) reduces strong forces for less restricted applications and reduces hole elongation

• Center cutting | • Solid carbide | • CBN ground at the tip

TYPE DIAMETER	LENGTH INCH	FLUTE	SHARP DIAMETER	CORNER LENGTH	SPINDLE RPM		RECOMMENDED FEED RATE	
					FPM	MMPM	IPM	MPM
Type III	1/16	0-10	0.00	0	1-100	20-100	0.001	0.001
	1/8	0-10	0.00	0	1-100	20-100	0.001	0.001
	3/16	1-8	0.00	0	1-100	20-100	0.001	0.001
	1/4	1-8	0.00	0	1-100	20-100	0.001	0.001
	5/16	1-8	0.00	0	1-100	20-100	0.001	0.001
Type II	1/16	0-10	0.00	0	1-100	20-100	0.001	0.001
	1/8	0-10	0.00	0	1-100	20-100	0.001	0.001
	3/16	0-10	0.00	0	1-100	20-100	0.001	0.001
	1/4	0-10	0.00	0	1-100	20-100	0.001	0.001
	5/16	0-10	0.00	0	1-100	20-100	0.001	0.001
	3/8	0-10	0.00	0	1-100	20-100	0.001	0.001
	1/2	0-10	0.00	0	1-100	20-100	0.001	0.001
	5/8	0-10	0.00	0	1-100	20-100	0.001	0.001
	3/4	0-10	0.00	0	1-100	20-100	0.001	0.001
	7/8	0-10	0.00	0	1-100	20-100	0.001	0.001
	1	0-10	0.00	0	1-100	20-100	0.001	0.001
	1 1/8	0-10	0.00	0	1-100	20-100	0.001	0.001
	1 1/4	0-10	0.00	0	1-100	20-100	0.001	0.001
	1 3/8	0-10	0.00	0	1-100	20-100	0.001	0.001
	1 1/2	0-10	0.00	0	1-100	20-100	0.001	0.001

continued on next page



# END MILLS FOR PLASTICS

Finishers - Square Flute - 1 Flute (Slow Helix) (cont)

(continued from previous page)

ITEM NUMBER	CUTTING DIAMETER	LENGTH	TYPE	WHEEL DIAMETER	WHEEL LENGTH	WEIGHT		APPROXIMATE STOCK	
						LB	KG	WT	PKTS
010	1/4" (6.35)	3.00	0	3/8"	0	0.0022	0.0010		
020	3/16" (4.75)	3.00	0	3/8"	0	0.0008	0.0004		
030	1/8" (3.18)	3.00	1	3/8"	0	0.0010	0.475		
040	3/16" (4.75)	3.00	0	3/8"	0	0.0018	0.82		
050	1/8" (3.18)	3.00	1	3/8"	0	0.0010	0.475		
070	1/4" (6.35)	3.00	0	3/8"	0	0.0018	0.82	48462-16	14.00
080	3/16" (4.75)	3.00	0	3/8"	0	0.0008	0.375		
100	1/8" (3.18)	3.00	1	1/2"	0.100	0.0018	0.82		
120	3/16" (4.75)	3.00	0	1/2"	0.100	0.0018	0.82		
140	1/8" (3.18)	3.00	1	1/2"	0	0.0010	0.475		
160	1/4" (6.35)	3.00	0	1/2"	0	0.0018	0.82	48462-16	14.00
180	3/16" (4.75)	3.00	0	1/2"	0	0.0008	0.375		
200	1/8" (3.18)	3.00	1	1/2"	0	0.0010	0.475		
220	1/4" (6.35)	3.00	0	1/2"	0	0.0018	0.82		
240	3/16" (4.75)	3.00	0	1/2"	0	0.0008	0.375		
260	1/8" (3.18)	3.00	1	1/2"	0	0.0010	0.475		
280	1/4" (6.35)	3.00	0	1/2"	0	0.0018	0.82		
300	3/16" (4.75)	3.00	0	1/2"	0	0.0008	0.375		

PLEASE SEE SPEEDS & FEEDS ON PAGE 187

## END MILLS FOR PLASTICS

Finishers – Square Shank – 3 Flute (High Helix)



- Wiper Flat
- Option for air-impregnated Flutes

- 3 Flute, higher helix reduces 40% average uncut chip load, and increases cutting velocity to increase wall finish.
- Shaves from the sides
- **Without Wiper Flat (Type I)** – Standard end geometry designed with a flat wiper in a sharp corner
- **With Wiper Flat (Type II)** – Wiper flat end geometry that extends to the front by reducing traditional groove width, with a slight chamfer to ground corners
- Design is ideally suited for fine-machining applications and highly accurate economics
- Gentle cutting
- Good surface
- CNC ground to the 1/2th

CUTTING DIAMETER	LENGTH OF CUT	FLUTE	SHANK DIAMETER	OVERALL LENGTH	WEIGHT (G)		MATERIAL REMOVAL RATE (MM <sup>3</sup> /MIN)	
					Type I	Type II	Type I	Type II
1/16"	1 1/2"	3	1/16"	1 1/2"	40000	40000		
1/8"	1 1/2"	3	1/8"	1 1/2"	40000	40000		
3/16"	1 1/2"	3	3/16"	1 1/2"	40000	40000		
1/4"	1 1/2"	3	1/4"	1 1/2"	40000	40000		
5/16"	1 1/2"	3	5/16"	1 1/2"	40000	40000		
3/8"	1 1/2"	3	3/8"	1 1/2"	40000	40000		
1/2"	1 1/2"	3	1/2"	1 1/2"	40000	40000		
5/8"	1 1/2"	3	5/8"	1 1/2"	40000	40000		
3/4"	1 1/2"	3	3/4"	1 1/2"	40000	40000		
7/8"	1 1/2"	3	7/8"	1 1/2"	40000	40000		
1"	1 1/2"	3	1"	1 1/2"	40000	40000		
1 1/8"	1 1/2"	3	1 1/8"	1 1/2"	40000	40000		
1 1/4"	1 1/2"	3	1 1/4"	1 1/2"	40000	40000		
1 1/2"	1 1/2"	3	1 1/2"	1 1/2"	40000	40000		
1 3/8"	1 1/2"	3	1 3/8"	1 1/2"	40000	40000		
1 1/2"	1 1/2"	3	1 1/2"	1 1/2"	40000	40000		
1 5/8"	1 1/2"	3	1 5/8"	1 1/2"	40000	40000		
1 3/4"	1 1/2"	3	1 3/4"	1 1/2"	40000	40000		
1 7/8"	1 1/2"	3	1 7/8"	1 1/2"	40000	40000		
2"	1 1/2"	3	2"	1 1/2"	40000	40000		

continued on next page

### TYPE I - WITHOUT WIPER



### TYPE II - WITH WIPER FLAT



PLEASE USE SPEED & FEED ON PAGE 100

## END MILLS FOR PLASTICS

Finishers - Square Upcut - 2 Flute (High Metals) (cont.)

continued from previous page

DIN ITEM NO.	DIN ITEM NO.	TYPE	DIN ITEM NO.	DIN ITEM NO.	PRICES		APPLICABLE FINISHES		
					STK	PRD	STK	PRD	
110	14-002	100	0	0.10	0	000000	0000		
110	0.10	100	0	0.10	0	000100	0000		
110	0.10	200	1	0.10	0	100000	0000		
110	0.10	100	0	0.10	0	000000	0000		
110	0.10	100	1	0.10	0	000000	0000		
110	0.10	100	0	0.10	0	000000	0000	000000	00 00
110	0.10	100	0	0.10	0	000000	0000		
110	0.10	1000	0	0.10	0.10	000000	0000		
110	0.10	100	1	0.10	0.10	100000	0000		
110	0.10	100	0	0.10	0.10	000000	0000		
110	0.10	100	1	0.10	0	000000	00 00		
110	0.10	100	0	0.10	0	000000	0000	000000	00 00
110	0.10	100	0	0.10	0	000000	0000		
110	0.10	100	0	0.10	0	000000	0000		
110	0.10	100	0	0.10	0	000000	0000		
110	0.10	100	0	0.10	0	000000	0000		
110	0.10	100	0	0.10	0	000000	0000		
110	0.10	100	0	0.10	0	000000	0000		
110	0.10	100	0	0.10	0	000000	0000		
110	0.10	100	0	0.10	0	000000	0000		
110	0.10	100	0	0.10	0	000000	0000		



## END MILLS FOR PLASTICS

### Finishers - Square Shankout - 3 Flute (Slow Helix)



- 3 Flute (slow helix), right hand cut flute design (strengths rigidity and increases tool life)
- Square flute (square) 32° angle for cutting. Helix angle 45°
- Square cutting
- Slow helix
- CNC ground to the 100°

CUTTING DIAMETER	LENGTH OF CUT	SHANK DIAMETER	FLUTES LENGTH	SPEED (M/Min)	
				F.P.S.	FEED
1/8" (3.175)	1.125"	1/8"	1.125"	4000	0.010
1/4"	1.875"	1/4"	1.875"	3000	0.015
3/8"	2.625"	3/8"	2.625"	2000	0.020
1/2"	3.375"	1/2"	3.375"	1500	0.025
5/8"	4.125"	5/8"	4.125"	1200	0.030
3/4"	4.875"	3/4"	4.875"	1000	0.035
7/8"	5.625"	7/8"	5.625"	900	0.040
1"	6.375"	1"	6.375"	800	0.045

### SPEED & FEED (3 Flute Plastic Finisher) - Slow Helix

Important Note: Values in this table are approximate and represent general guidelines for use only. For precise results, consult with a specialist for material and tooling. The values in this table are for general use only. For more detailed information, consult the technical data sheet for the material and tooling used.

Material	Speed (M/Min)	Feed (mm/Rev)	Tooling	SPEED & FEED (3 Flute Plastic Finisher)																Depth of Cut (mm)						
				Material Hardness (HRC)																						
				10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48			
Aluminum	1000	0.010	Non-Cutting	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	10.00	11.00	
			Cutting	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000			1000
	2000	0.015	Non-Cutting	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	10.00	11.00
			Cutting	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000		
Steel	1000	0.010	Non-Cutting	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	10.00	11.00	
			Cutting	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000			1000
	2000	0.015	Non-Cutting	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	10.00	11.00
			Cutting	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000		

## END MILLS FOR PLASTICS

### Finishers - Square Downtail - 3 Flute (High Helix)



- 3 left hand, right hand or face, right hand reamers, RT's design strengths apply and increased cutting speed is available over most
- Design is ideally suited to the metal application
- Hole finish
- Chamfering
- CNC ground in the USA

CUTTER Diameter	LENGTH of CUT	TAPER Diameter	Overall Length	MATERIALS	
				SAE	PMSC
1/8"	1.50" 38.1	1/8"	1.50"	SAE5210	PMSC
5/16"	2.125" 54.0	5/16"	2.125"	SAE5210	PMSC
3/8"	2.75" 70.0	3/8"	2.75"	SAE5210	PMSC
1/2"	3.375" 85.8	1/2"	3.375"	SAE5210	PMSC
5/8"	4.00" 101.6	5/8"	4.00"	SAE5210	PMSC
3/4"	4.625" 117.5	3/4"	4.625"	SAE5210	PMSC
7/8"	5.25" 133.4	7/8"	5.25"	SAE5210	PMSC
1"	5.875" 148.3	1"	5.875"	SAE5210	PMSC
1 1/8"	6.50" 165.1	1 1/8"	6.50"	SAE5210	PMSC
1 1/4"	7.125" 181.0	1 1/4"	7.125"	SAE5210	PMSC
1 1/2"	7.75" 196.9	1 1/2"	7.75"	SAE5210	PMSC
1 3/4"	8.375" 212.8	1 3/4"	8.375"	SAE5210	PMSC
2"	9.00" 228.6	2"	9.00"	SAE5210	PMSC

### SPINDLE & PITCH (3 Flute Square Finisher - High Helix)

Spindle RPM values are calculated on basis of diameter in the length of the spindle. For spindle length of cut 200% above of RPM recommended by manufacturer. The spindle length of cut 200% above of RPM implies 200% faster spindle RPM. For spindle length of cut 200% above of RPM implies 200% faster spindle RPM.

Spindle Type	RPM	Cutting Speed	Cut Feed Per Tooth (CFT) & Table Speed																Spindle Feed Rate				
			.001	.002	.003	.004	.005	.006	.007	.008	.009	.010	.012	.015	.020	.025	.030	.035	.040	Feet /Min	Meters /Min		
Spindle Type 1/2" Dia 3/4" Dia 1" Dia 1 1/8" Dia 1 1/4" Dia 1 1/2" Dia	SAE5210	HighSpeed	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
		Normal	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	
	SAE5210 SAE5210 SAE5210 SAE5210 SAE5210 SAE5210	HighSpeed	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
		Normal	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
	SAE5210 SAE5210 SAE5210 SAE5210 SAE5210 SAE5210	HighSpeed	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
		Normal	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
SAE5210 SAE5210 SAE5210 SAE5210 SAE5210 SAE5210	HighSpeed	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
	Normal	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	
SAE5210 SAE5210 SAE5210 SAE5210 SAE5210 SAE5210	HighSpeed	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
	Normal	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	

## END MILLS FOR PLASTICS

Finishers - Ball Upcut - 3 Flute (Slow Helix)



- Ball end for increased tool life and for increased cutting width at the tip
- 3 Flute design for smooth finish and increased tool life
- Slow helix reduces stringing issues for thin walled applications and ensures stable set up
- Coated cutting
- Excellent grain stability to ensure a steady cutting edge
- HSS ground in the USA

CUTTING DIAMETER	LENGTH OF TOOL	SHANK DIAMETER	LENGTH OF SHANK	ITEM NO.	
				1.5"	2.0"
1/8"	1.00" (25)	1/8"	1.12"	80000	80001
3/16"	1.25" (32)	3/16"	1.37"	80002	80003
1/4"	1.50" (38)	1/4"	1.63"	80004	80005
5/16"	1.75" (44)	5/16"	1.88"	80006	80007
3/8"	2.00" (51)	3/8"	2.13"	80008	80009
1/2"	2.50" (64)	1/2"	2.63"	80010	80011

PLEASE SEE SPECIFICATIONS PAGE OR PAGE 167

## END MILLS FOR COMPOSITES

### Square - 3 Straight Flutes



- Designed to cut various glass fiber reinforced CFR, fiberglass, fiber and carbon laminates
- Straight flute design improves tool life and minimizes loading of fiber reinforced and laminated materials by not "loading" fibers
- Ballnose corner design with high performance to minimize tool wear • Designed to cut to improve edge life
- Blanks change length, for order to ply thickness • Short cuts available with standard, stock length profiles
- Tool material: • HSS grades or TiN TiAlN



OUTER DIAMETER	LENGTH OF CUT	INNER DIAMETER	TOTAL LENGTH	HSS H90		HSS M2	
				PRICE	PRICE	PRICE	PRICE
1/16"	3/16"	1/16"	1/16"	2500	3500	3500	4500
1/8"	3/8"	1/8"	1/8"	4000	5000	5500	6500
3/16"	3/4"	3/16"	3/16"	5500	6500	7000	8000
1/4"	3/4"	1/4"	1/4"	7000	8000	8500	9500
5/16"	3/4"	5/16"	5/16"	8500	9500	10000	11000
3/8"	3/4"	3/8"	3/8"	10000	11000	11500	12500
1/2"	3/4"	1/2"	1/2"	11500	12500	13000	14000
5/8"	3/4"	5/8"	5/8"	13000	14000	14500	15500
3/4"	3/4"	3/4"	3/4"	14500	15500	16000	17000
7/8"	3/4"	7/8"	7/8"	16000	17000	17500	18500
1"	3/4"	1"	1"	17500	18500	19000	20000
1 1/8"	3/4"	1 1/8"	1 1/8"	19000	20000	20500	21500
1 1/4"	3/4"	1 1/4"	1 1/4"	20500	21500	22000	23000
1 3/8"	3/4"	1 3/8"	1 3/8"	22000	23000	23500	24500
1 1/2"	3/4"	1 1/2"	1 1/2"	23500	24500	25000	26000
1 3/4"	3/4"	1 3/4"	1 3/4"	25000	26000	26500	27500
2"	3/4"	2"	2"	26500	27500	28000	29000
2 1/8"	3/4"	2 1/8"	2 1/8"	28000	29000	29500	30500
2 1/4"	3/4"	2 1/4"	2 1/4"	29500	30500	31000	32000
2 3/8"	3/4"	2 3/8"	2 3/8"	31000	32000	32500	33500
2 1/2"	3/4"	2 1/2"	2 1/2"	32500	33500	34000	35000
2 5/8"	3/4"	2 5/8"	2 5/8"	34000	35000	35500	36500
3"	3/4"	3"	3"	35500	36500	37000	38000

Price does not include shipping charges. Tool prices shown are approximate and subject to change.

### SPR203 & PR203 - 3 Straight Flutes

Standard tool. Heavy or extra long tooling can be made to order. All tool lengths are in inches unless otherwise noted. The longer lengths of tool with corner of 0.015 inch maximum are for aluminum only. The complete product line is shown. Prices are approximate.

Tool Type	Size	Type	Top Load For Tooling (HSS) - Standard												Price	Stock		
			1/2"	3/4"	1"	1 1/4"	1 1/2"	1 3/4"	2"	2 1/4"	2 1/2"	2 3/4"	3"	3 1/4"				
Standard Tool	1/16"	3/16"	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"	1/16"
	1/8"	3/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"	1/8"
	3/16"	3/4"	3/16"	3/16"	3/16"	3/16"	3/16"	3/16"	3/16"	3/16"	3/16"	3/16"	3/16"	3/16"	3/16"	3/16"	3/16"	3/16"
	1/4"	3/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"

## END MILLS FOR COMPOSITES

### Compression Cutter



#### Prevents Burn & Delamination

- Double-flute flute geometry reduces material loading to avoid burn, tool wear, and delamination
- Chamfered top and bottom edge finish on top and bottom of workpiece
- Offered in two diameter ranges for increased tool life in a variety of abrasive composite materials
- Used in 2, 4, and 8 flute configurations for rough and finish machining
- Better cutting
- Better surface
- 25% ground in the USA

MILL NUMBER	LENGTH (INCH)	DIAMETER (INCH)	DIAMETER (MM)	FLUTES	SHANK DIA. (IN)	SHANK DIA. (MM)	MATERIALS		GEOMETRY (FLUTE)		CUTTING SPEED (FEET)	
							ALUMINA	STEEL	TYPE-A	TYPE-B	TYPE-A	TYPE-B
1-22	1.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
2-22	2.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
3-22	3.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
4-22	4.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
5-22	5.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
6-22	6.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
7-22	7.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
8-22	8.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
9-22	9.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
10-22	10.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
11-22	11.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
12-22	12.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
13-22	13.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
14-22	14.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
15-22	15.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
16-22	16.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
17-22	17.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
18-22	18.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
19-22	19.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
20-22	20.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
21-22	21.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200
22-22	22.00	1.32	33.5	2	.75	19.0	ALUMINA	STEEL	TYPE-A	TYPE-B	3000	1200

#### Choosing the Right Diameter

##### Compression Cutter

A 25% diameter diameter means that material loading and chip resistance during a 25% increase in RPM remains constant. This means that you can increase your RPM 25% with the same amount of material.

The cutting diameter stays the same.



##### Traditional End Mill

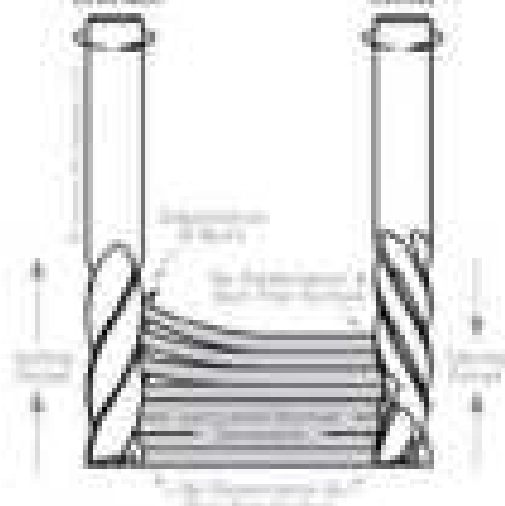
Any diameter 25% increase in speed results in a 25% increase in chip resistance. This means that you will have to reduce your RPM 25% to maintain the same amount of material. This means that you will have to reduce your RPM 25% to maintain the same amount of material. This means that you will have to reduce your RPM 25% to maintain the same amount of material.

The cutting diameter increases 25%.



#### Traditional End Mill

#### Compression Cutter



**Traditional End Mill:** Increase the rpm 25% and chip resistance increases 25%.

**Compression Cutter:** Increase the rpm 25% and chip resistance remains the same.

## END MILLS FOR COMPOSITES

### Chipteaker Cutter



Type 1  
Standard end



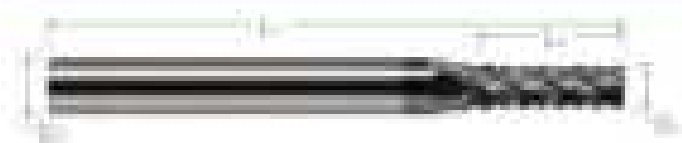
Type 2  
Chamfer ending

- Optimized geometry with chipbreakers efficiently remove chips and stresses thus for increased chip removal
- Suited for roughing and finishing in composite materials with high fiber or fill concentrations (CFR, FRK, etc.)
- Offered from two types
  - Type 1: Bar end-mill design for standard return / flat ended for plunge cutting
  - Type 2: Chamfer ending end mill for plunge cutting, reduced fly chip severity after parting, designed especially for GMP
- Tool details: [View details in the CAD](#)

CUTTER Diameter	Length of cut	Flutes	Type	Shank Diameter	Overall Length	Material		Mechanical in stock		Tool play-out of stock	
						TC1.1	MC.2	TC1.2	MC.2	TC1.2	MC.2
Ø 1.00	1.00	4	1	0.8	1.10	Ø1000	Ø1.00	Ø1000.00	Ø1.00		
Ø 1.50	1.50	4	1	1.2	1.10	Ø1000	Ø1.50	Ø1000.00	Ø1.50		
Ø 2.00	2.00	4	1	1.6	1.10	Ø1000	Ø2.00	Ø1000.00	Ø2.00	Ø1000	Ø2.00
Ø 2.50	2.50	4	1	2.0	1.10	Ø1000	Ø2.50	Ø1000.00	Ø2.50		
Ø 3.00	3.00	4	1	2.4	1.10	Ø1000	Ø3.00	Ø1000.00	Ø3.00		
Ø 4.00	4.00	4	1	3.2	1.10	Ø1000	Ø4.00	Ø1000.00	Ø4.00	Ø1000	Ø4.00
Ø 5.00	5.00	4	1	4.0	1.10	Ø1000	Ø5.00	Ø1000.00	Ø5.00	Ø1000	Ø5.00
Ø 6.00	6.00	4	1	4.8	1.10	Ø1000	Ø6.00	Ø1000.00	Ø6.00	Ø1000	Ø6.00
Ø 8.00	8.00	4	1	6.4	1.10	Ø1000	Ø8.00	Ø1000.00	Ø8.00	Ø1000	Ø8.00
Ø 10.00	10.00	4	1	8.0	1.10	Ø1000	Ø10.00	Ø1000.00	Ø10.00	Ø1000	Ø10.00
Ø 12.00	12.00	4	1	9.6	1.10	Ø1000	Ø12.00	Ø1000.00	Ø12.00	Ø1000	Ø12.00
Ø 15.00	15.00	4	1	12.0	1.10	Ø1000	Ø15.00	Ø1000.00	Ø15.00	Ø1000	Ø15.00
Ø 20.00	20.00	4	1	16.0	1.10	Ø1000	Ø20.00	Ø1000.00	Ø20.00	Ø1000	Ø20.00
Ø 25.00	25.00	4	1	20.0	1.10	Ø1000	Ø25.00	Ø1000.00	Ø25.00	Ø1000	Ø25.00
Ø 30.00	30.00	4	1	24.0	1.10	Ø1000	Ø30.00	Ø1000.00	Ø30.00	Ø1000	Ø30.00
Ø 40.00	40.00	4	1	32.0	1.10	Ø1000	Ø40.00	Ø1000.00	Ø40.00	Ø1000	Ø40.00
Ø 50.00	50.00	4	1	40.0	1.10	Ø1000	Ø50.00	Ø1000.00	Ø50.00	Ø1000	Ø50.00
Ø 60.00	60.00	4	1	48.0	1.10	Ø1000	Ø60.00	Ø1000.00	Ø60.00	Ø1000	Ø60.00
Ø 80.00	80.00	4	1	64.0	1.10	Ø1000	Ø80.00	Ø1000.00	Ø80.00	Ø1000	Ø80.00
Ø 100.00	100.00	4	1	80.0	1.10	Ø1000	Ø100.00	Ø1000.00	Ø100.00	Ø1000	Ø100.00

## END MILLS FOR COMPOSITES

### Diamond Cut - Bar Style



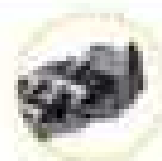
Bar Style End

- Excellent cut edge and high form speed allow for effective deburring with the same diameter as standard composites.
- Ideally suited for Carbon and Glass Fiber composites and other composites with high fiber reinforcement.
- Bar style end allows for change-overing, can be used for change-overing.
- Tool face width on the full depth end is equal to the amount of high speed teeth.
- Shallow grooves on the ID.
- Solid carbide.
- 20% ground to the size.

DIN 5462 ISO 527	Approx. Weight (g)	Max. Feed (mm)	Cut Speed (m/min)	Tool Diameter (mm)	Flute Length (mm)	VARIABLE		RECOMMENDED PARAMETER		
						Feed (mm/r)	SpRPM	Feed (mm/r)	SpRPM	
10-15-05	155	15	0	0	1.0	1.10	0.02	40.0	0.001-0.002	10000
15-20-05	225	20	0	0	1.0	1.10	0.02	40.0	0.001-0.002	10000
20-25-05	375	25	0	0	1.0	1.10	0.02	40.0	0.001-0.002	10000
25-30-05	525	30	0	0	1.0	1.10	0.02	40.0	0.001-0.002	10000
30-35-05	675	35	0	0	1.0	1.10	0.02	40.0	0.001-0.002	10000
35-40-05	825	40	0	0	1.0	1.10	0.02	40.0	0.001-0.002	10000

## END MILLS FOR COMPOSITES

### DiamondCut - End Mill Style



DiamondCut End Mill Style

- Diamond cut edge and high face count allows for effective reaping and grinding in abrasive composites
- Ideally suited for Carbon and Glass Fiber composites and other composites with high fiber reinforcement
- Center cutting (no flutes to correct) on end with tapered geometry on ID
- 100% coolant
- ISO grade 12 or 14

CUTTER #440700	LENGTH OF CUT	SHANK DIA. (mm)	IDT DIA. (mm)	SHANK DIA. (mm)	SHANK LENGTH	REACHES		CORRECTIVE CORRECTION		FLUTE TO CORRECT (mm)	
						THICK. (mm)	REACH	THICK. (mm)	REACH	THICK. (mm)	REACH
100-100	100	10	10	10	100	100	100	100	100	100	100
100-150	150	10	10	10	150	150	150	150	150	150	150
100-200	200	10	10	10	200	200	200	200	200	200	200
100-250	250	10	10	10	250	250	250	250	250	250	250
100-300	300	10	10	10	300	300	300	300	300	300	300
100-350	350	10	10	10	350	350	350	350	350	350	350
100-400	400	10	10	10	400	400	400	400	400	400	400
100-450	450	10	10	10	450	450	450	450	450	450	450
100-500	500	10	10	10	500	500	500	500	500	500	500
100-550	550	10	10	10	550	550	550	550	550	550	550
100-600	600	10	10	10	600	600	600	600	600	600	600
100-650	650	10	10	10	650	650	650	650	650	650	650
100-700	700	10	10	10	700	700	700	700	700	700	700
100-750	750	10	10	10	750	750	750	750	750	750	750
100-800	800	10	10	10	800	800	800	800	800	800	800
100-850	850	10	10	10	850	850	850	850	850	850	850
100-900	900	10	10	10	900	900	900	900	900	900	900
100-950	950	10	10	10	950	950	950	950	950	950	950
100-1000	1000	10	10	10	1000	1000	1000	1000	1000	1000	1000



## END MILLS FOR COMPOSITES

### Diamond Cut - Drill Mill Style



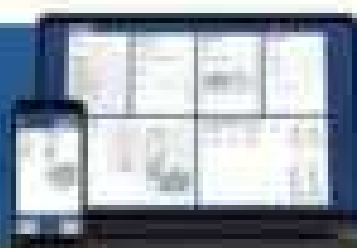
End Mill

- 140° point angle allows for efficient plunging through composite sheet material
- Diamond cut style with high flute count allows for effective chiping and pulling in clearing and profiling
- Ideally suited for Carbon and Glass Fiber Reinforced and other composites with high fiber reinforcement
- Standard geometry is 2F
- 3-flute option
- 2NC ground to the 100°

Overall Diameter	Length of Cut	flute count	flute angle	flute diameter	Overall Length	Standard		3-Flute	
						Part #	Price	Part #	Price
1/8" (3.175)	3/8" (9.525)	6	6°	1/8"	1.110	200000	\$1.00	200000-3	\$1.00
1/4" (6.350)	3/4" (19.050)	7	6°	1/4"	2.100	200000	\$1.00	200000-3	\$1.00
3/8" (9.525)	5/8" (15.875)	7	6°	1/4"	1.710	200000	\$1.00	200000-3	\$1.00
1/2" (12.700)	1" (25.400)	6	6°	1/2"	3.100	200000	\$1.00	200000-3	\$1.00
5/8" (15.875)	1 1/4" (31.750)	6	6°	5/8"	3.700	200000	\$1.00	200000-3	\$1.00
3/4" (19.050)	1 3/4" (44.475)	6	6°	3/4"	4.100	200000	\$1.00	200000-3	\$1.00
1" (25.400)	2" (50.800)	6	6°	1"	5.100	200000	\$1.00	200000-3	\$1.00
1 1/4" (31.750)	2 3/4" (69.875)	6	6°	1 1/4"	6.100	200000	\$1.00	200000-3	\$1.00

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## END MILLS FOR COMPOSITES

### Finister



Type 1  
Double Flute



Type 2  
Double Fluting

- Optimized geometry and high flute count for finishing of composite materials with high shear in the workpiece.
- Shim helps improve finish and reduces loading of fiber-reinforced and layered material by reducing contact length on the workpiece.
- Shimmed both end faces.
- Type 1: Six flute end design for shallow tapping and suited for plunge cutting.
- Type 2: Ten-flute end design for plunge cutting, reduced feed force generation, chip evicting, designed specifically for CFRP.

• Bonded carbide

• ISO 13121 compliant

ITEM NUMBER	LENGTH OF COIL	FLUTE COUNT		SHIMMED	SHIMMED LENGTH	FINISHING		PLUNGE CUTTING		TYPE 2 APPROX. (CFRP)	
		TYPE 1	TYPE 2			TYPE 1	TYPE 2	TYPE 1	TYPE 2		
110	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
115	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
118	1.27 (1/8)	4	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	0.015
119	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
120	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
121	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
122	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
123	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
124	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
125	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
126	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
127	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
128	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
129	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
130	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
131	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
132	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
133	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
134	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
135	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
136	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
137	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
138	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
139	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
140	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
141	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
142	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
143	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
144	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
145	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
146	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
147	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
148	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
149	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	
150	6.35 (1/4)	1	6	1.0	0.10	0.10	0.015	0.015	0.015	0.015	

## END MILLS FOR WOOD

Square Shank



Outstanding in MDF  
and Plywood

- Designed for cutting radial and tangential woods
- Rugged design optimized for clearing wood fiber (removes without chipping low cut) or leaving a fully grain-free
- 2-flute design with deep flute valleys for maximum space for chip evacuation
- Excellent cutting
- Best surface
- 25% ground to the 100°

Diameter Ø (mm)	Length mm	Shank Diameter mm	Overall Length mm	Material		Minimum Clearance	
				FT	IN	FT	IN
1/8"	100	1/8"	110	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	150	1/8"	160	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	200	1/8"	210	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	250	1/8"	260	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	300	1/8"	310	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	350	1/8"	360	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	400	1/8"	410	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	450	1/8"	460	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	500	1/8"	510	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	550	1/8"	560	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	600	1/8"	610	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	650	1/8"	660	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	700	1/8"	710	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	750	1/8"	760	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	800	1/8"	810	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	850	1/8"	860	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	900	1/8"	910	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	950	1/8"	960	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/8"	1000	1/8"	1010	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	100	1/4"	110	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	150	1/4"	160	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	200	1/4"	210	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	250	1/4"	260	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	300	1/4"	310	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	350	1/4"	360	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	400	1/4"	410	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	450	1/4"	460	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	500	1/4"	510	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	550	1/4"	560	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	600	1/4"	610	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	650	1/4"	660	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	700	1/4"	710	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	750	1/4"	760	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	800	1/4"	810	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	850	1/4"	860	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	900	1/4"	910	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	950	1/4"	960	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)
1/4"	1000	1/4"	1010	Aluminum	Steel	0.0015" (0.04)	0.0015" (0.04)

PLEASE SEE SPEEDS & FEEDS ON PAGE 244

## END MILLS FOR WOOD

### Square Downcut



Outstanding in MDF and Plywood!

- Designed for grinding accuracy and improved finish
- Strongly built optimized for cutting wood fiber materials without loading, tear-out or leaving a fuzzy grain finish
- Blended face, neck and shoulders on the top of the end faces
- Precise cutting on constant width
- Flat top, bottom, right hand and left
- Deep flute settings to maximize space for chip evacuation
- Longer cutting
- Safe to use
- ISO ground to the A/B

Diameter Ø (mm)	Length L (mm)	Neck Diameter Ø (mm)	Overall Length L <sub>1</sub> (mm)	MATERIAL		MATERIAL (Equivalent)	
				HRC	MPa	HRC	MPa
1.0	100 150	0.8	5	2550	40.0	2550 40.0	2550
1.2	110 160	0.9	5.5	2550	40.0	2550 40.0	2550
1.5	130 180	1.1	5	2550	40.0	2550 40.0	2550
2.0	160 210	1.4	5.5	2550	40.0	2550 40.0	2550
2.5	200 250	1.7	6	2550	40.0	2550 40.0	2550
3.0	240 290	2.0	6.5	2550	40.0	2550 40.0	2550
4.0	300 350	2.6	7	2550	40.0	2550 40.0	2550
5.0	360 410	3.2	7.5	2550	40.0	2550 40.0	2550
6.0	420 470	3.8	8	2550	40.0	2550 40.0	2550
8.0	540 590	5.0	8.5	2550	40.0	2550 40.0	2550
10	660 710	6.2	9	2550	40.0	2550 40.0	2550
12	780 830	7.4	9.5	2550	40.0	2550 40.0	2550
15	960 1010	9.0	10	2550	40.0	2550 40.0	2550
20	1260 1310	12.0	10.5	2550	40.0	2550 40.0	2550


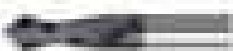














### Options & Pricing Issues - End Mills for Wood

**Important Note:** Prices include prices shown are provided as the best design component only. The actual weight of any combination of SP may increase by 0.10% above 0.001. All prices are based on the best design shown and are subject to change.

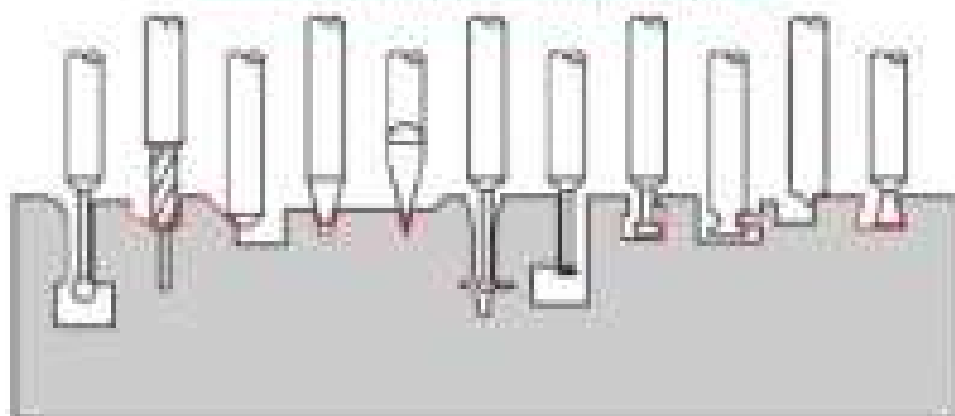
Item	Qty.	Part	Qty. Used Per Tool (SP) Qty. Total (Example)															Spool or Tool	
			100	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	Price	Lead
10217000 2.0mm Dia Downcut End Mill (SP) 10217000	100	SP - 100 (100)	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	1.000	1.000
		SP - 100 (100) (200)	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	1.000	1.000
10217000 2.5mm Dia Downcut End Mill (SP) 10217000	100	SP - 100 (100)	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	1.000	1.000
		SP - 100 (100) (200)	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	1.000	1.000
10217000 3.0mm Dia Downcut End Mill (SP) 10217000	100	SP - 100 (100)	300	600	900	1200	1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	4500	1.000	1.000
		SP - 100 (100) (200)	300	600	900	1200	1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	4500	1.000	1.000
10217000 4.0mm Dia Downcut End Mill (SP) 10217000	100	SP - 100 (100)	400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000	1.000	1.000
		SP - 100 (100) (200)	400	800	1200	1600	2000	2400	2800	3200	3600	4000	4400	4800	5200	5600	6000	1.000	1.000

## SPECIALTY PROFILES

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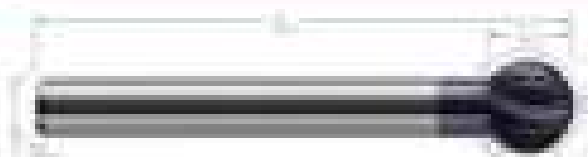
Undercutting End Mills <a href="#">View Item</a>		171
Drill End Mills <a href="#">View Item</a>		201
Chamber Cutters <a href="#">View Item</a> (202)		207
Floating Face Cutters		118
Runner Cutters <a href="#">View Item</a>		221
Rescuer Cutters <a href="#">View Item</a>		223
Engraving Cutters <a href="#">View Item</a> (202)		224
Double Angle Shank Cutters <a href="#">View Item</a>		244
Back Deburring Mills		255
Keyseat Cutters <a href="#">View Item</a>		256
Slitting Tools <a href="#">View Item</a>		257
Concrete Padlock End Mills		258
Corner Rounding End Mills <a href="#">View Item</a>		259
Boring Bars		262
Backdraft Cutters		268
Crystal Cutters		272

### Machine a Variety of Difficult Profiles!



## UNDERCUTTING END MILLS

### 270° Reduced Shank



- 270° chamfered end
- Designed for undercutting, slotting, and multi-axis machining
- Reduced strength shank allows for floating depth
- Corner cutting
- Solid carbide construction for maximum rigidity
- 8 Flutes
- 0.002 ground in the O.D.

Chuck at  
Any Depth!



CUTTER LENGTH	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	MATERIAL:		MATERIAL:	
					ALU	SS304	ALU	SS304
1/4" (25.4)	1/4" (25.4)	8	3/16"	2.125	99-115	205-215	99-115-02	205-215
3/8"	3/8"	8	3/16"	2.125	99-121	205-215	99-121-02	205-215
1/2"	1/2"	8	3/16"	2.125	99-127	205-215	99-127-02	215-220
3/4"	3/4"	8	3/16"	2	99-133	215-220	99-133-02	215-220
1"	1"	8	3/16"	2	99-139	215-220	99-139-02	215-220
1 1/4"	1 1/4"	8	3/16"	2	99-145	215-220	99-145-02	215-220
1 3/4"	1 3/4"	8	3/16"	2	99-151	215-220	99-151-02	215-220

## UNDERCUTTING END MILLS

### 300° Reduced Shank



- 300° chamfered end
- Designed for undercutting, slotting, and multi-axis machining
- Reduced strength shank allows for floating depth
- Corner cutting
- Solid carbide construction for maximum rigidity
- 8 Flutes
- 0.002 ground in the O.D.

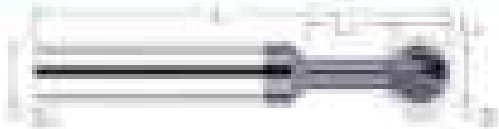
Chuck at  
Any Depth!



CUTTER LENGTH	LENGTH OF CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	MATERIAL:		MATERIAL:	
					ALU	SS304	ALU	SS304
1/4"	1/4"	8	3/16"	2.125	99-115	215-220	99-115-02	215-220
3/8"	3/8"	8	3/16"	2.125	99-121	215-220	99-121-02	215-220
1/2"	1/2"	8	3/16"	2.125	99-127	215-220	99-127-02	215-220
3/4"	3/4"	8	3/16"	2	99-133	215-220	99-133-02	215-220
1"	1"	8	3/16"	2	99-139	215-220	99-139-02	215-220
1 1/4"	1 1/4"	8	3/16"	2	99-145	215-220	99-145-02	215-220
1 3/4"	1 3/4"	8	3/16"	2	99-151	215-220	99-151-02	215-220

## UNDERCUTTING END MILLS

100\*

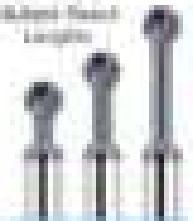


- 20° tapered ball
- Designed for undercutting, chamfering, deburring and finishing
- Ground cutting
- Solid carbide
- 0.001 ground to the ball

Use To:  
Chamfering  
Undercutting  
and Finishing



Standard in  
Multiple Thread  
Lengths



\*See Page 100 for Part Numbers

Diameter	Length of Shank	Shank Dia.	Ball Length	Flutes	Shank Diameter	Overall Length	Standard		ATCR Standard	
							Stock #	MSRP	Stock #	MSRP
1/16"	1/2"	0.125	0.24	2	0.125	1.12	00560	17.00	00560-12	17.00
1/16"	3/8"	0.125	0.20	2	0.125	1.10	07180	16.00	00560-10	17.00
0.03125" Dia.	1/2"	0.125	0.24	2	0.125	1.10	00560A	17.00	00560A-12	17.00
0.03125" Dia.	3/8"	0.125	0.20	2	0.125	1.10	07180A	16.00	00560A-10	17.00
1/8"	1/2"	0.1875	0.38	2	0.1875	1.12	00565	18.00	00565-12	17.00
1/8"	3/8"	0.1875	0.32	2	0.1875	1.10	00565	18.00	00565-10	17.00
1/8"	1/2"	0.1875	0.38	2	0.1875	1.10	07200	18.00	00565-12	17.00
1/8"	3/8"	0.1875	0.32	2	0.1875	1.10	07200	18.00	00565-10	17.00
1/8"	1/2"	0.1875	0.38	2	0.1875	1.10	00565	18.00	00565-12	17.00
1/8"	3/8"	0.1875	0.32	2	0.1875	1.10	00565	18.00	00565-10	17.00
1/4"	1/2"	0.25	0.47	2	0.25	1.10	00570	19.00	00570-12	18.00
1/4"	3/8"	0.25	0.40	2	0.25	1.10	00570	19.00	00570-10	18.00
1/4"	1/2"	0.25	0.47	2	0.25	1.10	00570	19.00	00570-12	18.00
1/4"	3/8"	0.25	0.40	2	0.25	1.10	00570	19.00	00570-10	18.00
3/16"	1/2"	0.3125	0.59	2	0.3125	1.10	00575	19.00	00575-12	18.00
3/16"	3/8"	0.3125	0.50	2	0.3125	1.10	00575	19.00	00575-10	18.00
3/16"	1/2"	0.3125	0.59	2	0.3125	1.10	00575	19.00	00575-12	18.00
3/16"	3/8"	0.3125	0.50	2	0.3125	1.10	00575	19.00	00575-10	18.00
1/2"	1/2"	0.50	0.75	2	0.50	1.10	00580	21.00	00580-12	18.00
1/2"	3/8"	0.50	0.65	2	0.50	1.10	00580	21.00	00580-10	18.00
5/16"	1/2"	0.3125	0.67	2	0.3125	1.12	00585	20.00	00585-12	18.00
5/16"	3/8"	0.3125	0.58	2	0.3125	1.10	00585	20.00	00585-10	18.00
3/8"	1/2"	0.375	0.75	2	0.375	1.12	00590	20.00	00590-12	19.00
3/8"	3/8"	0.375	0.65	2	0.375	1.10	00590	20.00	00590-10	18.00
1/2"	1/2"	0.50	0.75	2	0.50	1.10	00595	20.00	00595-12	19.00
1/2"	3/8"	0.50	0.65	2	0.50	1.10	00595	20.00	00595-10	19.00

\*continued on next page





# UNDERCUTTING END MILLS

300° Insert

(continued from previous page)

TOOTH QUANTITY	LENGTH (mm)	Ø DIA. (mm)	Ø DIA. (in.)	FLUTES	SHANK DIAMETER (mm)	SHANK DIAMETER (in.)	CUTTING LENGTH (mm)	CUTTING LENGTH (in.)	ITEM #	PRICE	ITEM #	PRICE
010	250	10	.394	4	010	010	200	7.87	20010	100.00	20010-12	100.00
020	250	15	.591	4	010	010	200	7.87	20020	117.00	20020-12	117.00
030	250	20	.787	4	010	010	200	7.87	20030	140.00	20030-12	140.00
040	250	25	.984	4	010	010	200	7.87	20040	162.00	20040-12	162.00
050	250	30	1.181	4	010	010	200	7.87	20050	184.00	20050-12	184.00
060	250	35	1.378	4	010	010	200	7.87	20060	206.00	20060-12	206.00
070	250	40	1.575	4	010	010	200	7.87	20070	228.00	20070-12	228.00
080	250	45	1.772	4	010	010	200	7.87	20080	250.00	20080-12	250.00
090	250	50	1.969	4	010	010	200	7.87	20090	272.00	20090-12	272.00
100	250	55	2.166	4	010	010	200	7.87	20100	294.00	20100-12	294.00
120	250	60	2.363	4	010	010	200	7.87	20120	334.00	20120-12	334.00
140	250	65	2.560	4	010	010	200	7.87	20140	374.00	20140-12	374.00
160	250	70	2.757	4	010	010	200	7.87	20160	414.00	20160-12	414.00
180	250	75	2.954	4	010	010	200	7.87	20180	454.00	20180-12	454.00
200	250	80	3.151	4	010	010	200	7.87	20200	494.00	20200-12	494.00
250	250	100	3.937	4	010	010	200	7.87	20250	614.00	20250-12	614.00
300	250	120	4.723	4	010	010	200	7.87	20300	734.00	20300-12	734.00
400	250	150	5.906	4	010	010	200	7.87	20400	914.00	20400-12	914.00
500	250	175	6.888	4	010	010	200	7.87	20500	1054.00	20500-12	1054.00
600	250	200	7.870	4	010	010	200	7.87	20600	1194.00	20600-12	1194.00
800	250	250	9.844	4	010	010	200	7.87	20800	1514.00	20800-12	1514.00
1000	250	300	11.818	4	010	010	200	7.87	21000	1834.00	21000-12	1834.00
1500	250	375	14.763	4	010	010	200	7.87	21500	2394.00	21500-12	2394.00
2000	250	450	17.710	4	010	010	200	7.87	22000	2954.00	22000-12	2954.00
3000	250	525	20.656	4	010	010	200	7.87	23000	3774.00	23000-12	3774.00
4000	250	600	23.604	4	010	010	200	7.87	24000	4594.00	24000-12	4594.00
5000	250	675	26.550	4	010	010	200	7.87	25000	5414.00	25000-12	5414.00
6000	250	750	29.499	4	010	010	200	7.87	26000	6234.00	26000-12	6234.00
8000	250	900	35.434	4	010	010	200	7.87	28000	8074.00	28000-12	8074.00
10000	250	1050	41.369	4	010	010	200	7.87	30000	9914.00	30000-12	9914.00



Check Out All of Our Undercutting Endmills!

## UNDERCUTTING END MILLS

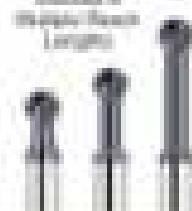
270°



Used for  
Undercutting  
Internal  
and External



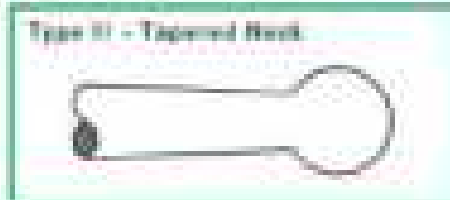
Stocked in  
Multiple Lengths



- 270° chamfered ball
- Designed for undercutting, deburring, and radiused machining
- Gentle cutting
- Choose from two types:
  - Type I: Straight neck
  - Type II: Tapered neck (1.5° taper)
- Round corners - R-DAC ground to the ball

ITEM NUMBER	LENGTH OF CUT	DIA.	DIA.	TYPE	RADIUS	SHANK DIA.	CFL	STOCKED		MATERIAL		DIMENSIONS (mm)	
								TYPE I	TYPE II	TYPE I	TYPE II	TYPE I	TYPE II
100001000	100	100	100	0	0	10	1.0	STAIN	15.00	STAINLESS	100.00	100.00	
100002000	200	200	200	0	0	10	1.0	STAIN	15.00	STAINLESS	200.00	200.00	
100003000	300	300	300	0	0	10	1.0	STAIN	15.00	STAINLESS	300.00	300.00	
100004000	400	400	400	0	0	10	1.0	STAIN	15.00	STAINLESS	400.00	400.00	
100005000	500	500	500	0	0	10	1.0	STAIN	15.00	STAINLESS	500.00	500.00	
100006000	600	600	600	0	0	10	1.0	STAIN	15.00	STAINLESS	600.00	600.00	
100007000	700	700	700	0	0	10	1.0	STAIN	15.00	STAINLESS	700.00	700.00	
100008000	800	800	800	0	0	10	1.0	STAIN	15.00	STAINLESS	800.00	800.00	
100009000	900	900	900	0	0	10	1.0	STAIN	15.00	STAINLESS	900.00	900.00	
100010000	1000	1000	1000	0	0	10	1.0	STAIN	15.00	STAINLESS	1000.00	1000.00	
100011000	100	100	100	0	0	10	1.0	STAIN	15.00	STAINLESS	100.00	100.00	
100012000	200	200	200	0	0	10	1.0	STAIN	15.00	STAINLESS	200.00	200.00	
100013000	300	300	300	0	0	10	1.0	STAIN	15.00	STAINLESS	300.00	300.00	
100014000	400	400	400	0	0	10	1.0	STAIN	15.00	STAINLESS	400.00	400.00	
100015000	500	500	500	0	0	10	1.0	STAIN	15.00	STAINLESS	500.00	500.00	
100016000	600	600	600	0	0	10	1.0	STAIN	15.00	STAINLESS	600.00	600.00	
100017000	700	700	700	0	0	10	1.0	STAIN	15.00	STAINLESS	700.00	700.00	
100018000	800	800	800	0	0	10	1.0	STAIN	15.00	STAINLESS	800.00	800.00	
100019000	900	900	900	0	0	10	1.0	STAIN	15.00	STAINLESS	900.00	900.00	
100020000	1000	1000	1000	0	0	10	1.0	STAIN	15.00	STAINLESS	1000.00	1000.00	
100021000	100	100	100	0	0	10	1.0	STAIN	15.00	STAINLESS	100.00	100.00	
100022000	200	200	200	0	0	10	1.0	STAIN	15.00	STAINLESS	200.00	200.00	
100023000	300	300	300	0	0	10	1.0	STAIN	15.00	STAINLESS	300.00	300.00	
100024000	400	400	400	0	0	10	1.0	STAIN	15.00	STAINLESS	400.00	400.00	
100025000	500	500	500	0	0	10	1.0	STAIN	15.00	STAINLESS	500.00	500.00	
100026000	600	600	600	0	0	10	1.0	STAIN	15.00	STAINLESS	600.00	600.00	
100027000	700	700	700	0	0	10	1.0	STAIN	15.00	STAINLESS	700.00	700.00	
100028000	800	800	800	0	0	10	1.0	STAIN	15.00	STAINLESS	800.00	800.00	
100029000	900	900	900	0	0	10	1.0	STAIN	15.00	STAINLESS	900.00	900.00	
100030000	1000	1000	1000	0	0	10	1.0	STAIN	15.00	STAINLESS	1000.00	1000.00	

continued on next page



# UNDERCUTTING END MILLS

270° Insert

Continued from previous page

CATALOG NUMBER	LENGTH OF SHANK	SHANK DIAMETER	SHANK LENGTH	TYPE	FLUTE	SHANK DIA.	CUT.	MATERIALS		MFG. QUANTITY		RECOMMENDED TOOLS	
								TYPE 1	TYPE 2	TYPE 1	TYPE 2	TYPE 1	TYPE 2
270	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
271	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10	W70-10	W60-10
272	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
273	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
274	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
275	100	100	100	1	2	10	2	W70	W60	W70-10	W60-10		
276	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
277	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
278	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
279	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
270	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
271	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
272	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
273	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
274	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
275	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
276	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
277	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
278	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
279	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
270	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
271	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
272	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
273	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
274	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
275	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
276	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
277	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
278	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
279	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
270	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
271	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
272	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
273	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
274	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
275	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
276	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
277	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
278	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
279	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
270	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
271	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
272	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
273	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
274	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
275	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
276	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
277	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
278	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		
279	100	100	100	1	2	10	1-1/2	W70	W60	W70-10	W60-10		

Continued on next page



# UNDERCUTTING END MILLS

270° (cont.)

continued from previous page

D-CUTTER NUMBER	LENGTH OF SHANK	NECK DIAMETER	SHANK DIAMETER	TYPE	RPM	LENGTH OF CUTTING FLUTE	DIN 5480	ISO 5034		ISO 5035		MATERIALS	
								TYPE 1	TYPE 2	TYPE 1	TYPE 2	STEEL	ALUMINUM
50030000	100	17	17	5	270	2	M2						
50030010	100	17	17	5	270	2	M2						
50030020	100	21	17	4	270	2	M2						
50030030	100	17	17	4	270	2	M2						
50030040	100	17	17	5	270	2	M2						
50030050	100	17	17	5	270	2	M2						
50030060	100	21	17	4	270	2	M2						
50030070	100	17	17	4	270	2	M2						
50030080	100	17	17	5	270	2	M2						
50030090	100	21	17	4	270	2	M2						
50030100	100	17	17	4	270	2	M2						
50030110	100	17	17	5	270	2	M2						
50030120	100	21	17	4	270	2	M2						
50030130	100	17	17	4	270	2	M2						
50030140	100	17	17	5	270	2	M2						
50030150	100	21	17	4	270	2	M2						
50030160	100	17	17	4	270	2	M2						
50030170	100	17	17	5	270	2	M2						
50030180	100	21	17	4	270	2	M2						
50030190	100	17	17	4	270	2	M2						
50030200	100	17	17	5	270	2	M2						
50030210	100	21	17	4	270	2	M2						
50030220	100	17	17	4	270	2	M2						
50030230	100	17	17	5	270	2	M2						
50030240	100	21	17	4	270	2	M2						
50030250	100	17	17	4	270	2	M2						
50030260	100	17	17	5	270	2	M2						
50030270	100	21	17	4	270	2	M2						
50030280	100	17	17	4	270	2	M2						
50030290	100	17	17	5	270	2	M2						
50030300	100	21	17	4	270	2	M2						
50030310	100	17	17	4	270	2	M2						
50030320	100	17	17	5	270	2	M2						
50030330	100	21	17	4	270	2	M2						
50030340	100	17	17	4	270	2	M2						
50030350	100	17	17	5	270	2	M2						
50030360	100	21	17	4	270	2	M2						
50030370	100	17	17	4	270	2	M2						
50030380	100	17	17	5	270	2	M2						
50030390	100	21	17	4	270	2	M2						
50030400	100	17	17	4	270	2	M2						
50030410	100	17	17	5	270	2	M2						
50030420	100	21	17	4	270	2	M2						
50030430	100	17	17	4	270	2	M2						
50030440	100	17	17	5	270	2	M2						
50030450	100	21	17	4	270	2	M2						
50030460	100	17	17	4	270	2	M2						
50030470	100	17	17	5	270	2	M2						
50030480	100	21	17	4	270	2	M2						
50030490	100	17	17	4	270	2	M2						
50030500	100	17	17	5	270	2	M2						
50030510	100	21	17	4	270	2	M2						
50030520	100	17	17	4	270	2	M2						
50030530	100	17	17	5	270	2	M2						
50030540	100	21	17	4	270	2	M2						
50030550	100	17	17	4	270	2	M2						
50030560	100	17	17	5	270	2	M2						
50030570	100	21	17	4	270	2	M2						
50030580	100	17	17	4	270	2	M2						
50030590	100	17	17	5	270	2	M2						
50030600	100	21	17	4	270	2	M2						
50030610	100	17	17	4	270	2	M2						
50030620	100	17	17	5	270	2	M2						
50030630	100	21	17	4	270	2	M2						
50030640	100	17	17	4	270	2	M2						
50030650	100	17	17	5	270	2	M2						
50030660	100	21	17	4	270	2	M2						
50030670	100	17	17	4	270	2	M2						
50030680	100	17	17	5	270	2	M2						
50030690	100	21	17	4	270	2	M2						
50030700	100	17	17	4	270	2	M2						
50030710	100	17	17	5	270	2	M2						
50030720	100	21	17	4	270	2	M2						
50030730	100	17	17	4	270	2	M2						
50030740	100	17	17	5	270	2	M2						
50030750	100	21	17	4	270	2	M2						
50030760	100	17	17	4	270	2	M2						
50030770	100	17	17	5	270	2	M2						
50030780	100	21	17	4	270	2	M2						
50030790	100	17	17	4	270	2	M2						
50030800	100	17	17	5	270	2	M2						
50030810	100	21	17	4	270	2	M2						
50030820	100	17	17	4	270	2	M2						
50030830	100	17	17	5	270	2	M2						
50030840	100	21	17	4	270	2	M2						
50030850	100	17	17	4	270	2	M2						
50030860	100	17	17	5	270	2	M2						
50030870	100	21	17	4	270	2	M2						
50030880	100	17	17	4	270	2	M2						
50030890	100	17	17	5	270	2	M2						
50030900	100	21	17	4	270	2	M2						

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# UNDERCUTTING END MILLS

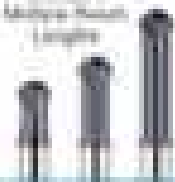
200\*



Good for  
Undercutting,  
Deburring,  
and Finishing



Good for  
Undercutting,  
Deburring,  
and Finishing



- \* 200\* approved ball
- \* Designed for undercutting, deburring, and multi-axis machining
- \* Center cutting = Best choice. \* 150\* approved for USA

CUTTER DIAMETER	LENGTH OF CUT	NECK DIAMETER	NECK LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	ISO CODE		ALN CODE	
							THIN W	THIN L	THIN W	THIN L
0.015	0.015	0.015	0.015	0	0.015	0.015	THIN W	THIN L	THIN W	THIN L
0.020	0.020	0.020	0.020	0	0.020	0.020	THIN W	THIN L	THIN W	THIN L
0.025	0.025	0.025	0.025	0	0.025	0.025	THIN W	THIN L	THIN W	THIN L
0.030	0.030	0.030	0.030	0	0.030	0.030	THIN W	THIN L	THIN W	THIN L
0.035	0.035	0.035	0.035	0	0.035	0.035	THIN W	THIN L	THIN W	THIN L
0.040	0.040	0.040	0.040	0	0.040	0.040	THIN W	THIN L	THIN W	THIN L
0.045	0.045	0.045	0.045	0	0.045	0.045	THIN W	THIN L	THIN W	THIN L
0.050	0.050	0.050	0.050	0	0.050	0.050	THIN W	THIN L	THIN W	THIN L
0.055	0.055	0.055	0.055	0	0.055	0.055	THIN W	THIN L	THIN W	THIN L
0.060	0.060	0.060	0.060	0	0.060	0.060	THIN W	THIN L	THIN W	THIN L
0.065	0.065	0.065	0.065	0	0.065	0.065	THIN W	THIN L	THIN W	THIN L
0.070	0.070	0.070	0.070	0	0.070	0.070	THIN W	THIN L	THIN W	THIN L
0.075	0.075	0.075	0.075	0	0.075	0.075	THIN W	THIN L	THIN W	THIN L
0.080	0.080	0.080	0.080	0	0.080	0.080	THIN W	THIN L	THIN W	THIN L
0.085	0.085	0.085	0.085	0	0.085	0.085	THIN W	THIN L	THIN W	THIN L
0.090	0.090	0.090	0.090	0	0.090	0.090	THIN W	THIN L	THIN W	THIN L
0.095	0.095	0.095	0.095	0	0.095	0.095	THIN W	THIN L	THIN W	THIN L
0.100	0.100	0.100	0.100	0	0.100	0.100	THIN W	THIN L	THIN W	THIN L
0.105	0.105	0.105	0.105	0	0.105	0.105	THIN W	THIN L	THIN W	THIN L
0.110	0.110	0.110	0.110	0	0.110	0.110	THIN W	THIN L	THIN W	THIN L
0.115	0.115	0.115	0.115	0	0.115	0.115	THIN W	THIN L	THIN W	THIN L
0.120	0.120	0.120	0.120	0	0.120	0.120	THIN W	THIN L	THIN W	THIN L
0.125	0.125	0.125	0.125	0	0.125	0.125	THIN W	THIN L	THIN W	THIN L
0.130	0.130	0.130	0.130	0	0.130	0.130	THIN W	THIN L	THIN W	THIN L
0.135	0.135	0.135	0.135	0	0.135	0.135	THIN W	THIN L	THIN W	THIN L
0.140	0.140	0.140	0.140	0	0.140	0.140	THIN W	THIN L	THIN W	THIN L
0.145	0.145	0.145	0.145	0	0.145	0.145	THIN W	THIN L	THIN W	THIN L
0.150	0.150	0.150	0.150	0	0.150	0.150	THIN W	THIN L	THIN W	THIN L
0.155	0.155	0.155	0.155	0	0.155	0.155	THIN W	THIN L	THIN W	THIN L
0.160	0.160	0.160	0.160	0	0.160	0.160	THIN W	THIN L	THIN W	THIN L
0.165	0.165	0.165	0.165	0	0.165	0.165	THIN W	THIN L	THIN W	THIN L
0.170	0.170	0.170	0.170	0	0.170	0.170	THIN W	THIN L	THIN W	THIN L
0.175	0.175	0.175	0.175	0	0.175	0.175	THIN W	THIN L	THIN W	THIN L
0.180	0.180	0.180	0.180	0	0.180	0.180	THIN W	THIN L	THIN W	THIN L
0.185	0.185	0.185	0.185	0	0.185	0.185	THIN W	THIN L	THIN W	THIN L
0.190	0.190	0.190	0.190	0	0.190	0.190	THIN W	THIN L	THIN W	THIN L
0.195	0.195	0.195	0.195	0	0.195	0.195	THIN W	THIN L	THIN W	THIN L
0.200	0.200	0.200	0.200	0	0.200	0.200	THIN W	THIN L	THIN W	THIN L

# UNDERCUTTING END MILLS

270° High Helix



High Helix  
for Improved  
Performance



270° Helical Ball

- 270° helix for faster chip removal and lower heat
- 270° tapered ball — Better cutting
- Designed for undercutting, slotting, and multi-axis machining
- Made in-house — 100% precision in the USA

COOPER S.A.	LENGTH OF CUT	RHS S.A.	RHS LENGTH	FLUTES	SHANK S.A.	L <sub>1</sub>	Material		CNC Machining		High Speed Steel	
							Tool #	MSL	Tool #	MSL	Tool #	MSL
1/2	10"	1/2	10"	2	1/2	110	81100	15.00	81100-02	15.00		
1/2	10"	1/2	10"	2	1/2	110	80800	15.00	80800-02	15.00		
5/8	10"	5/8	10"	2	5/8	110	81110	15.00	81110-02	15.00		
5/8	10"	5/8	10"	2	5/8	110	80810	15.00	80810-02	15.00		
3/4	10"	3/4	10"	2	3/4	110	81120	15.00	81120-02	15.00		
3/4	10"	3/4	10"	2	3/4	110	80820	15.00	80820-02	15.00		
1	10"	1	10"	2	1	110	81130	15.00	81130-02	15.00	81130-02	15.00
1	10"	1	10"	2	1	110	80830	15.00	80830-02	15.00	80830-02	15.00
1 1/4	10"	1 1/4	10"	2	1 1/4	110	81140	15.00	81140-02	15.00	81140-02	15.00
1 1/4	10"	1 1/4	10"	2	1 1/4	110	80840	15.00	80840-02	15.00	80840-02	15.00
1 1/2	10"	1 1/2	10"	2	1 1/2	110	81150	15.00	81150-02	15.00	81150-02	15.00
1 1/2	10"	1 1/2	10"	2	1 1/2	110	80850	15.00	80850-02	15.00	80850-02	15.00
1 3/4	10"	1 3/4	10"	2	1 3/4	110	81160	15.00	81160-02	15.00	81160-02	15.00
1 3/4	10"	1 3/4	10"	2	1 3/4	110	80860	15.00	80860-02	15.00	80860-02	15.00
2	10"	2	10"	2	2	110	81170	15.00	81170-02	15.00	81170-02	15.00
2	10"	2	10"	2	2	110	80870	15.00	80870-02	15.00	80870-02	15.00
2 1/4	10"	2 1/4	10"	2	2 1/4	110	81180	15.00	81180-02	15.00	81180-02	15.00
2 1/4	10"	2 1/4	10"	2	2 1/4	110	80880	15.00	80880-02	15.00	80880-02	15.00
2 1/2	10"	2 1/2	10"	2	2 1/2	110	81190	15.00	81190-02	15.00	81190-02	15.00
2 1/2	10"	2 1/2	10"	2	2 1/2	110	80890	15.00	80890-02	15.00	80890-02	15.00
2 3/4	10"	2 3/4	10"	2	2 3/4	110	81200	15.00	81200-02	15.00	81200-02	15.00
2 3/4	10"	2 3/4	10"	2	2 3/4	110	80900	15.00	80900-02	15.00	80900-02	15.00
3	10"	3	10"	2	3	110	81210	15.00	81210-02	15.00	81210-02	15.00
3	10"	3	10"	2	3	110	80910	15.00	80910-02	15.00	80910-02	15.00
3 1/4	10"	3 1/4	10"	2	3 1/4	110	81220	15.00	81220-02	15.00	81220-02	15.00
3 1/4	10"	3 1/4	10"	2	3 1/4	110	80920	15.00	80920-02	15.00	80920-02	15.00
3 1/2	10"	3 1/2	10"	2	3 1/2	110	81230	15.00	81230-02	15.00	81230-02	15.00
3 1/2	10"	3 1/2	10"	2	3 1/2	110	80930	15.00	80930-02	15.00	80930-02	15.00
3 3/4	10"	3 3/4	10"	2	3 3/4	110	81240	15.00	81240-02	15.00	81240-02	15.00
3 3/4	10"	3 3/4	10"	2	3 3/4	110	80940	15.00	80940-02	15.00	80940-02	15.00
4	10"	4	10"	2	4	110	81250	15.00	81250-02	15.00	81250-02	15.00
4	10"	4	10"	2	4	110	80950	15.00	80950-02	15.00	80950-02	15.00

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## UNDERCUTTING END MILLS

270° High Helix (cont.)

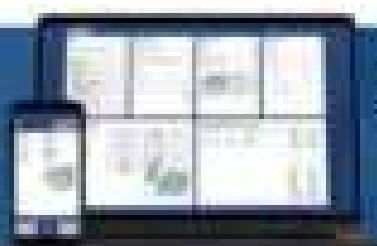
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CUTTER DIA.	LENGTH OF CUT	RACK DIA.	RACK APPROX. FLUTES	SHANK DIA.	SHANK LEN.	UNCOATED		WITH COATING		TEL. COATING		
						TOOL #	PKG. QTY.	TOOL #	PKG. QTY.	TOOL #	PKG. QTY.	
1/4	0.5	1/4	12	4	1/4	100	88714	100	88714-01	200	88714-02	500
1/4	0.5	1/4	12	4	1/4	200	88814	200	88814-01	400	88814-02	1000
1/4	0.5	1/4	12	4	1/4	300	88914	300	88914-01	600	88914-02	1500
1/4	0.5	1/4	12	4	1/4	400	89014	400	89014-01	800	89014-02	2000
1/4	0.5	1/4	12	4	1/4	500	89114	500	89114-01	1000	89114-02	2500
1/4	0.5	1/4	12	4	1/4	600	89214	600	89214-01	1200	89214-02	3000
1/4	0.5	1/4	12	4	1/4	700	89314	700	89314-01	1400	89314-02	3500
1/4	0.5	1/4	12	4	1/4	800	89414	800	89414-01	1600	89414-02	4000
1/4	0.5	1/4	12	4	1/4	900	89514	900	89514-01	1800	89514-02	4500
1/4	0.5	1/4	12	4	1/4	1000	89614	1000	89614-01	2000	89614-02	5000
1/4	0.5	1/4	12	4	1/4	1100	89714	1100	89714-01	2200	89714-02	5500
1/4	0.5	1/4	12	4	1/4	1200	89814	1200	89814-01	2400	89814-02	6000
1/4	0.5	1/4	12	4	1/4	1300	89914	1300	89914-01	2600	89914-02	6500
1/4	0.5	1/4	12	4	1/4	1400	90014	1400	90014-01	2800	90014-02	7000
1/4	0.5	1/4	12	4	1/4	1500	90114	1500	90114-01	3000	90114-02	7500
1/4	0.5	1/4	12	4	1/4	1600	90214	1600	90214-01	3200	90214-02	8000
1/4	0.5	1/4	12	4	1/4	1700	90314	1700	90314-01	3400	90314-02	8500
1/4	0.5	1/4	12	4	1/4	1800	90414	1800	90414-01	3600	90414-02	9000
1/4	0.5	1/4	12	4	1/4	1900	90514	1900	90514-01	3800	90514-02	9500
1/4	0.5	1/4	12	4	1/4	2000	90614	2000	90614-01	4000	90614-02	10000

CUTTING SPEEDS IN FEED/TOOTH

### REACTIVELY ADJUSTED PWD

IPW by position.  
More accuracy



### Customizable Running Parameters For Optimized Machining



[www.horn.com/ipw](http://www.horn.com/ipw)



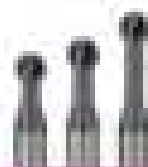
# UNDERCUTTING END MILLS

270° for Hardened Steels



- Designed for hardened steels 40-50 HRC
- Increased flute count for added strength and tool life
- Light generation with less loading effect compared to other end-mill geometries
- 270° geometrical
- Designed for undercutting, chamfering, and hole-end finishing
- Same cutting
- Hard coating:  $\pm 100\mu\text{m}$  ground in dry LAM

Available  
Multiple Flute  
Lengths



OUTER DIAMETER	LENGTH OF FLUTE	RUCR DIA.	RUCR LENGTH	FLUTE	SHAFT DIAMETER	TOTAL LENGTH	SPRAGUE CODES	
							ITEM #	PRICE
1/8"	1/2"	1/8"	3/4"	5	1/8"	1.12"	EM101-05	\$6.00
1/8"	3/4"	1/8"	1.12"	5	1/8"	1.20"	EM101-10	\$6.00
1/8"	1"	1/8"	1.44"	5	1/8"	1.52"	EM101-20	\$6.00
3/16"	3/4"	3/16"	1.12"	5	3/16"	1.20"	EM102-10	\$6.00
3/16"	1"	3/16"	1.44"	5	3/16"	1.52"	EM102-20	\$6.00
1/4"	1"	1/4"	1.88"	5	1/4"	2.00"	EM103-20	\$7.00
1/4"	1.25"	1/4"	2.20"	5	1/4"	2.30"	EM103-30	\$7.00
1/4"	1.5"	1/4"	2.52"	5	1/4"	2.62"	EM103-40	\$7.00
5/16"	1.25"	5/16"	1.88"	5	5/16"	2.00"	EM104-30	\$7.00
5/16"	1.5"	5/16"	2.20"	5	5/16"	2.30"	EM104-40	\$7.00
3/8"	1.5"	3/8"	2.64"	5	3/8"	2.72"	EM105-40	\$8.00
3/8"	1.75"	3/8"	3.00"	5	3/8"	3.08"	EM105-50	\$8.00
1/2"	1.75"	1/2"	3.50"	5	1/2"	3.68"	EM106-50	\$9.00
1/2"	2.0"	1/2"	3.86"	5	1/2"	4.04"	EM106-60	\$9.00
5/8"	2.0"	5/8"	4.36"	5	5/8"	4.54"	EM107-60	\$9.00
5/8"	2.25"	5/8"	4.72"	5	5/8"	4.90"	EM107-70	\$9.00
3/4"	2.25"	3/4"	5.18"	5	3/4"	5.36"	EM108-70	\$9.00
3/4"	2.5"	3/4"	5.54"	5	3/4"	5.72"	EM108-80	\$9.00
7/8"	2.5"	7/8"	6.04"	5	7/8"	6.22"	EM109-80	\$9.00
1"	2.5"	1"	6.50"	5	1"	6.68"	EM110-80	\$9.00
1"	2.75"	1"	6.86"	5	1"	7.04"	EM110-90	\$9.00
1 1/8"	2.75"	1 1/8"	7.36"	5	1 1/8"	7.54"	EM111-90	\$9.00
1 1/8"	3.0"	1 1/8"	7.72"	5	1 1/8"	7.90"	EM111-100	\$9.00



## UNDERCUTTING END MILLS

370° Deburring Undercut Tools

Continued from previous page

ITEM#	QTY	SIZE DIA.	SIZE LENGTH	RIGHT HAND TOOTH	LEFT HAND TOOTH	SHAFT DIA.	TAL.	DIMENSIONS		PRICE (EACH)	
								PKG.#	PKGS	750.0	750.0
281135	107	100	1.00	0	0	1.0	11.0	29175	28.20	281135-00	30.10
281136	107	100	1.07	0	0	1.0	11.0	29176	28.10	281136-00	30.00
281137	107	100	1.10	0	0	1.0	11.0	29177	28.00	281137-00	29.90
281138	107	100	1.17	0	0	1.0	11.0	29178	27.90	281138-00	29.80
281139	107	100	1.20	0	0	1.0	0	29179	28.00	281139-00	29.70
281140	107	100	1.25	0	0	1.0	0	29180	28.00	281140-00	29.60
281141	107	100	1.300	0	0	1.0	0	29181	28.00	281141-00	29.50
281142	100	175	2.00	0	0	2.00	0	29182	28.00	281142-00	29.00
281143	100	175	2.50	0	0	2.00	0	29183	27.00	281143-00	28.00
281144	100	187	1.00	0	0	2.00	0	29184	28.00	281144-00	28.00
281145	100	187	2.00	0	0	2.00	0	29185	27.00	281145-00	27.00
281146	100	187	2.75	0	0	2.00	0	29186	28.00	281146-00	27.00
281147	100	187	3.00	0	0	2.00	0	29187	27.00	281147-00	26.00
281148	100	187	3.50	0	0	2.00	0	29188	27.00	281148-00	25.00
281149	100	187	4.00	0	0	2.00	0	29189	27.00	281149-00	24.00
281150	100	187	4.50	0	0	2.00	0	29190	27.00	281150-00	23.00
281151	100	187	5.00	0	0	2.00	0	29191	26.00	281151-00	21.00
281152	100	187	5.50	0	0	2.00	0	29192	25.00	281152-00	19.00
281153	100	187	6.00	0	0	2.00	0	29193	24.00	281153-00	17.00
281154	100	187	6.50	0	0	2.00	0	29194	23.00	281154-00	15.00
281155	100	187	7.00	0	0	2.00	0	29195	22.00	281155-00	13.00
281156	100	187	7.50	0	0	2.00	0	29196	21.00	281156-00	11.00
281157	100	187	8.00	0	0	2.00	0	29197	20.00	281157-00	9.00
281158	100	187	8.50	0	0	2.00	0	29198	19.00	281158-00	7.00
281159	100	187	9.00	0	0	2.00	0	29199	18.00	281159-00	5.00
281160	100	187	9.50	0	0	2.00	0	29200	17.00	281160-00	3.00

## DRILL / END MILLS

### Helical Tip - 2 Flute

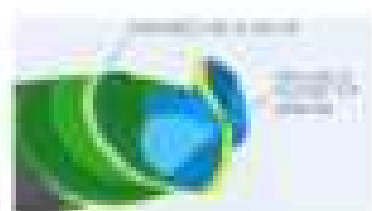


- Designed for chamfering, drilling, and ream operations
- Not recommended for cutting
- 2 Flute
- Specialized cutting tool designed for superior performance, better finish and chip evacuation
- Variable flute design on CD layers, 2F's reduce chatter and burr formation and increase material removal rates
- 2FM form design for superior performance in reams and difficult to machine materials
- This tooling for increasing performance in non ferrous materials due to its self-sharpening ability in ductile
- All diameters except for high pressure tool holders • Best quality • ISO produced in the USA



Engineering Principles

UNFINISHED ANAL	CUTTER QUANTITY	LENGTH INCHES	RPM RECOMMEND	FEED QUANTITY	CUTTING LENGTH	DRILL SPEED (RPM)		FED RATE (IPM)	
						1/2"	3/8"	1/4"	3/16"
80°	1/8"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
	1/4"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
	3/8"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
	1/2"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
	3/4"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
	1"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
	1 1/4"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
80°	1/8"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
	1/4"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
	3/8"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
	1/2"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
	3/4"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
	1"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
	1 1/4"	2.0	300	1/8"	1.12	2700-30	0.01	0.002-0.003	0.002
120°	1/8"	2.0	300	1/8"	1.12	4270-30	0.01	0.002-0.003	0.002
	1/4"	2.0	300	1/8"	1.12	4270-30	0.01	0.002-0.003	0.002
	3/8"	2.0	300	1/8"	1.12	4270-30	0.01	0.002-0.003	0.002
	1/2"	2.0	300	1/8"	1.12	4270-30	0.01	0.002-0.003	0.002
	3/4"	2.0	300	1/8"	1.12	4270-30	0.01	0.002-0.003	0.002



## DRILL / END MILLS

### Helical Tip - 4 Flute



Helical Tip  
Flute To Flute

#### RECOMMENDATION

##### Recommended Use

Drilling	Yes
G.U. Milling	Yes
Turning	No
Grinding	Light



- Designed for drilling, re-drill, and easy cutting operations
- Easy maintenance and drilling
- 4 Flute (Two Flute in cutting, two Flute on back)
- Remains heavily fluted tip design for superior performance, surface finish and chip evacuation
- Helical flute design (45° angle, 20°) reduces chatter and minimizes and decreases material removal rate
- Great generation of chip from cutting edge extends to throat and back (chatter)
- All sharp designed for high precision tool making
- Hard grade - 1-2M2 grade in the USA



Flute to Flute Fluted Design

FLUTE LENGTH	SHANK DIAMETER	FLUTE DIAMETER	W.D. TO CENTER	W.D. AT CENTER	OVERALL LENGTH	APPROXIMATE CUTTING SPEED	
						S.F.P.	M.F.P.
40°	1/8	1/8	1/8	1/8	1 1/2	8000-12	4000
	3/16	3/16	3/16	3/16	1 1/2	8000-12	4000
	1/4	1/4	1/4	1/4	1 1/2	8000-12	4000
	5/16	5/16	5/16	5/16	2 1/4	8000-12	4000
	3/8	3/8	3/8	3/8	2 1/2	8000-12	4000
	7/16	7/16	7/16	7/16	2 1/2	8000-12	4000
	1/2	1/2	1/2	1/2	3	8000-12	4000
52°	1/8	1/8	1/8	1/8	1 1/2	10000-12	4000
	3/16	3/16	3/16	3/16	2 1/4	10000-12	4000
	1/4	1/4	1/4	1/4	2 1/2	10000-12	4000
59°	1/8	1/8	1/8	1/8	1 1/2	8000-12	4000
	3/16	3/16	3/16	3/16	1 1/2	8000-12	4000
	1/4	1/4	1/4	1/4	1 1/2	8000-12	4000
	5/16	5/16	5/16	5/16	2 1/4	8000-12	4000
	3/8	3/8	3/8	3/8	2 1/2	8000-12	4000
	7/16	7/16	7/16	7/16	2 1/2	8000-12	4000
	1/2	1/2	1/2	1/2	3	8000-12	4000
	5/8	5/8	5/8	5/8	3 1/2	8000-12	4000
	3/4	3/4	3/4	3/4	4	8000-12	4000
	7/8	7/8	7/8	7/8	4 1/2	8000-12	4000
	1	1	1	1	5	8000-12	4000
	1 1/8	1 1/8	1 1/8	1 1/8	5 1/2	8000-12	4000
	1 1/4	1 1/4	1 1/4	1 1/4	6	8000-12	4000
	1 1/2	1 1/2	1 1/2	1 1/2	6 1/2	8000-12	4000
	1 3/4	1 3/4	1 3/4	1 3/4	7	8000-12	4000

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## DRILL / END MILLS

Metform Tip - 4 Flute (cont.)

continued from previous page

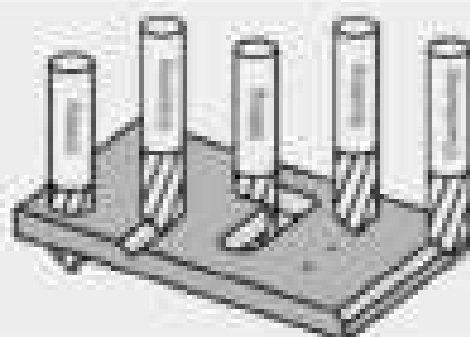
HORN ITEM #	CUTTER Diameter	LENGTH Overall	HORN ITEM #	CUTTER Diameter	LENGTH Overall	STOCKING UNIT	
						PK	NET WT
100	1/8	1.00	100	1/8	1.00	10000	2000
	1/4	1.00	100	1/4	1.00	10000	7000
	3/8	1.00	100	3/8	1.00	10000	9000
	1/2	1.00	100	1/2	1.00	10000	10000
100	1/8	1.50	100	1/8	1.50	10000	1000
	1/4	1.50	100	1/4	1.50	10000	3000
	3/8	1.50	100	3/8	1.50	10000	4000
	1/2	1.50	100	1/2	1.50	10000	5000

ITEM #

### Drill / End Mills

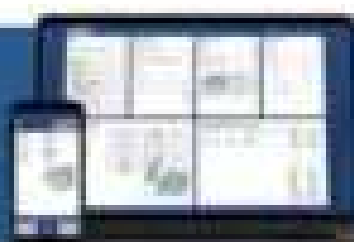
Get extensive offering of drill / end mills and available in multiple point angles. They allow you to:

- Reduce multiple operations with a single tool
- Free up space on your tool cabinet
- Increase your hole and bore tool change



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# DRILL / END MILLS

## MH Style - 2 Flute



### MH STYLE

Recommended for use in Mild Steel & Cast Iron

<b>Recommended For:</b>	<b>Included Angle:</b>	
Materials:	Mild Steel	
CUT Speed:	Cast Iron	
Depth:	Non-ferrous	
Length:	Stainless	



Based on 1.25 Flute Length

- Designed for drilling, reaming, and some tapping applications
- Not recommended for cutting steel
- $\Phi$  Shank,  $\pm$  Total tolerance  $\pm$  C/D ground in the job.

Consulting to  
Customer

DRILL DIAMETER	CUTTING EDGE LENGTH	LENGTH OF JOB	SPR REVERSE IN SHANK	GRADE OF SHANK	TOTAL LENGTH	REVERSE		SHANK DIAMETER		% TOLERANCE	
						1.25	1.50	1.25	1.50	1.25	1.50
1/8"	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
1/4"	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
3/8"	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		
	1.00	1.75	0.00	1.0	1.75	0.000	0.000	0.000	0.000		

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## DRILL / END MILLS

Mil Style - 2 Flute (cont.)

Continued from previous page

Product Model	Length of Mill (in)		DIN Reference	DIN Standard	Overall Length	Overall Dia.		Cutting Dia.		Flute Dia.	
	Min.	Max.				Min.	Max.	Min.	Max.	Min.	Max.
50	1/8	1/4	508	18	1.12	0.125	0.125	0.125	0.125	0.125	0.125
	3/16	3/8	508	18	1.12	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
	1/4	1/2	508	18	1.12	0.25	0.25	0.25	0.25	0.25	0.25
	5/16	5/8	508	18	1.12	0.3125	0.3125	0.3125	0.3125	0.3125	0.3125
	3/8	3/4	508	18	1.12	0.375	0.375	0.375	0.375	0.375	0.375
	7/16	7/8	508	18	1.12	0.4375	0.4375	0.4375	0.4375	0.4375	0.4375
	1/2	1	508	18	1.12	0.5	0.5	0.5	0.5	0.5	0.5
	5/8	1 1/4	508	18	1.12	0.625	0.625	0.625	0.625	0.625	0.625
	3/4	1 1/2	508	18	1.12	0.75	0.75	0.75	0.75	0.75	0.75
	7/8	1 3/4	508	18	1.12	0.875	0.875	0.875	0.875	0.875	0.875
	1	2	508	18	1.12	1.0	1.0	1.0	1.0	1.0	1.0
	1 1/8	2 1/4	508	18	1.12	1.125	1.125	1.125	1.125	1.125	1.125
50P	1/8	1/4	508	18	1.12	0.125	0.125	0.125	0.125	0.125	0.125
	3/16	3/8	508	18	1.12	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
	1/4	1/2	508	18	1.12	0.25	0.25	0.25	0.25	0.25	0.25
	5/16	5/8	508	18	1.12	0.3125	0.3125	0.3125	0.3125	0.3125	0.3125
	3/8	3/4	508	18	1.12	0.375	0.375	0.375	0.375	0.375	0.375
	7/16	7/8	508	18	1.12	0.4375	0.4375	0.4375	0.4375	0.4375	0.4375
	1/2	1	508	18	1.12	0.5	0.5	0.5	0.5	0.5	0.5
100P	1/8	1/4	508	18	1.12	0.125	0.125	0.125	0.125	0.125	0.125
	3/16	3/8	508	18	1.12	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
	1/4	1/2	508	18	1.12	0.25	0.25	0.25	0.25	0.25	0.25
	5/16	5/8	508	18	1.12	0.3125	0.3125	0.3125	0.3125	0.3125	0.3125
	3/8	3/4	508	18	1.12	0.375	0.375	0.375	0.375	0.375	0.375
	7/16	7/8	508	18	1.12	0.4375	0.4375	0.4375	0.4375	0.4375	0.4375
	1/2	1	508	18	1.12	0.5	0.5	0.5	0.5	0.5	0.5
	5/8	1 1/4	508	18	1.12	0.625	0.625	0.625	0.625	0.625	0.625

ITEMS 1-12



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## DRILL / END MILLS

### MH Style - 3 Flute



Illustration of MH Style 3-Flute Drill / End Mill

- Designed for drilling, reaming, and some grinding operations
- Not recommended for cutting
- 3 Flutes in design
- Heat-treated
- OSG ground to the edge

#### MH STYLE

Recommended for Drilling, Reaming, and some grinding operations

Recommended For:	Recommended Range:
Drilling	Drill, Ream, Bore, Tap
Reaming	Drill, Ream, Bore, Tap
Grinding	Drill, Ream, Bore, Tap
Turning	Drill, Ream, Bore, Tap



FLUTE ANGLE	LENGTH OF CUT (mm)	LENGTH OF CUT (in)	NUMBER OF FLUTES	FLUTE LENGTH (mm)	RECOMMENDED		SPEED (RPM)	
					SFE (mm/min)	SFE (in/min)	SFM (m/min)	SFM (ft/min)
60°	1.0	0.039	3	0.10	1000	1000	1000	1000
	1.5	0.059	3	0.15	1000	1000	1000	1000
	2.0	0.079	3	0.20	1000	1000	1000	1000
80°	1.0	0.039	3	0.10	1000	1000	1000	1000
	1.5	0.059	3	0.15	1000	1000	1000	1000
	2.0	0.079	3	0.20	1000	1000	1000	1000
90°	0.5	0.019	3	0.05	1000	1000	1000	1000
	0.75	0.029	3	0.075	1000	1000	1000	1000
	1.0	0.039	3	0.10	1000	1000	1000	1000
	1.5	0.059	3	0.15	1000	1000	1000	1000
	2.0	0.079	3	0.20	1000	1000	1000	1000
	2.5	0.099	3	0.25	1000	1000	1000	1000
	3.0	0.119	3	0.30	1000	1000	1000	1000
	3.5	0.139	3	0.35	1000	1000	1000	1000
	4.0	0.159	3	0.40	1000	1000	1000	1000
110°	1.0	0.039	3	0.10	1000	1000	1000	1000
	1.5	0.059	3	0.15	1000	1000	1000	1000
	2.0	0.079	3	0.20	1000	1000	1000	1000



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## DRILL / END MILLS

MQL Style - 4 Flute



DRILL BIT END

Recommended for use with MQL

- Designed for drilling, re-drilling, and easy spotting applications.
- Spig recommended for drilling steel.
- 4 Flute (new design) for better chip forming and better chip evacuation.
- Substrates: - MQL grade of HSS.

Recommended For	Material Grade
Steel	AISI 1018, 1020, 1045, 1141
Aluminum	6061, 7075, 2024
Brass	360, 360A, 360B
CNC Machining	Aluminum, Steel
Drilling	Aluminum



Fluted to Interlocked Edge

DRILL BIT ANGLE	DRILL BIT DIAMETER		LENGTH OF CUT		DRILL FLUTE LENGTH	DRILL FLUTE ANGLE	DRILL FLUTE WIDTH	DRILL BIT LENGTH		DRILL BIT DIAMETER	
	IN	MM	IN	MM				IN	MM	IN	MM
60°	0.05	1.27	0.05	1.27	0.05	1.27	0.05	1.27	0.05	1.27	
	0.075	1.90	0.075	1.90	0.075	1.90	0.075	1.90	0.075	1.90	
	0.10	2.54	0.10	2.54	0.10	2.54	0.10	2.54	0.10	2.54	
	0.125	3.18	0.125	3.18	0.125	3.18	0.125	3.18	0.125	3.18	
	0.15	3.81	0.15	3.81	0.15	3.81	0.15	3.81	0.15	3.81	
	0.175	4.45	0.175	4.45	0.175	4.45	0.175	4.45	0.175	4.45	
	0.20	5.08	0.20	5.08	0.20	5.08	0.20	5.08	0.20	5.08	
	0.225	5.72	0.225	5.72	0.225	5.72	0.225	5.72	0.225	5.72	
	0.25	6.35	0.25	6.35	0.25	6.35	0.25	6.35	0.25	6.35	
	0.275	7.00	0.275	7.00	0.275	7.00	0.275	7.00	0.275	7.00	
	0.30	7.62	0.30	7.62	0.30	7.62	0.30	7.62	0.30	7.62	
	0.325	8.27	0.325	8.27	0.325	8.27	0.325	8.27	0.325	8.27	
	0.35	8.91	0.35	8.91	0.35	8.91	0.35	8.91	0.35	8.91	
	0.375	9.53	0.375	9.53	0.375	9.53	0.375	9.53	0.375	9.53	
	0.40	10.17	0.40	10.17	0.40	10.17	0.40	10.17	0.40	10.17	
	70°	0.05	1.27	0.05	1.27	0.05	1.27	0.05	1.27	0.05	1.27
0.075		1.90	0.075	1.90	0.075	1.90	0.075	1.90	0.075	1.90	
0.10		2.54	0.10	2.54	0.10	2.54	0.10	2.54	0.10	2.54	
0.125		3.18	0.125	3.18	0.125	3.18	0.125	3.18	0.125	3.18	

(continued on next page)

# DRILL / END MILLS

## Mil Style - 4 Flute Series

continued from previous page

MILLING RANGE	CUTTER NUMBER	LENGTH OF CUT	DIN STANDARD	SHANK DIAMETER	TOTAL LENGTH	LENGTH		SHANK		DIA/CHUCK	
						IN	MM	IN	MM	IN	MM
1/8"	102	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	114	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	126	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	138	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	150	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	162	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	174	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	186	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	198	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	210	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	222	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	234	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	246	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	258	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	270	0.75	002	0.125	2.12	0.882	22.75			0.882	22.50
	3/16"	282	0.75	002	0.1875	2.12	0.937	23.75			0.937
294		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
306		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
318		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
330		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
342		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
354		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
366		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
378		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
390		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
402		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
414		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
426		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
438		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
450		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
462		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
474		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
486		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
498		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
510		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
522		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
534		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
546		0.75	002	0.1875	2.12	0.937	23.75			0.937	23.75
1/4"		558	0.75	002	0.250	2.12	0.984	24.75			0.984
	570	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	582	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	594	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	606	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	618	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	630	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	642	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	654	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	666	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	678	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	690	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	702	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	714	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	726	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	738	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	750	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	762	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75
	774	0.75	002	0.250	2.12	0.984	24.75			0.984	24.75

continued on next page

## DRILL / END MILLS

Mil Style - 4 Flute (cont.)

continues from previous page

PROCESS CODE	PARTS AVAILABLE	LENGTH OF CUT	DRILL REVERSE	FLUTE REVERSE	LENGTH OF FLUTE	REVERSE		DRILL		END MILLS	
						1.0	2.0	1.0	2.0	1.0	2.0
100	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	100	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	100	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
100	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
100	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
100	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0
	10	1.0	00	00	1.0	1.0	1.0	1.0	1.0	1.0	1.0

STANDARD TOOL

## DRILL / END MILLS

### DH8 Style - 2 Flute



- Designed for drilling and mixing applications
- 2 Flute
- HSS-Coated
- OSG ground to the point



Designed by OSG America, Inc.

#### DRILL STYLE

Designed for drilling and mixing applications

Flute Length

#### Recommended Fit

Shank Dia. H7/h8

O.S. Dia. H7

Shank H7

Shank H7



Overall Length mm	Length of Shank		Shank Dia. mm	Shank Dia. mm	Overall Length mm	Overall Length		Length of Shank		Overall Length	
	mm	mm				mm	mm	mm	mm	mm	mm
100	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100	100	100
	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100	100	100
	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100		
	100	100	100	10	110	100	100	100	100		
	150	150	150	150	10	160	150	150	150	150	
150		150	150	10	160	150	150	150	150		
150		150	150	10	160	150	150	150	150	150	150

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## DRILL / END MILLS

Drill Style - 2 Flute (cont.)

Continued from previous page

DRILL SIZE	DRILL DIAMETER	LENGTH OF CUT	MIN. DRILLER DIAMETER	DRILL DIAMETER	DRILL LENGTH	RECOMMENDED		MAX. RECOMM.		TYP. RECOMM.	
						SFM	FEED	SFM	FEED	SFM	FEED
1/8"	1/8"	1.00	.05	1/8"	1.00	2000	.004	2000-30	.004		
	1/8"	1.25	.05	1/8"	1.25	2000	.004	2000-30	.004		
	1/8"	1.50	.05	1/8"	1.50	2000	.004	2000-30	.004		
	1/8"	1.75	.05	1/8"	1.75	2000	.004	2000-30	.004		
	1/8"	2.00	.05	1/8"	2.00	2000	.004	2000-30	.004		
	1/8"	2.25	.05	1/8"	2.25	2000	.004	2000-30	.004		
	1/8"	2.50	.05	1/8"	2.50	2000	.004	2000-30	.004		
	1/8"	2.75	.05	1/8"	2.75	2000	.004	2000-30	.004		
	1/8"	3.00	.05	1/8"	3.00	2000	.004	2000-30	.004		
	1/8"	3.25	.05	1/8"	3.25	2000	.004	2000-30	.004		
	1/8"	3.50	.05	1/8"	3.50	2000	.004	2000-30	.004		
	1/8"	3.75	.05	1/8"	3.75	2000	.004	2000-30	.004		
	1/8"	4.00	.05	1/8"	4.00	2000	.004	2000-30	.004		
	1/8"	4.25	.05	1/8"	4.25	2000	.004	2000-30	.004		
	1/8"	4.50	.05	1/8"	4.50	2000	.004	2000-30	.004		
	1/8"	4.75	.05	1/8"	4.75	2000	.004	2000-30	.004		
	1/8"	5.00	.05	1/8"	5.00	2000	.004	2000-30	.004		
	1/8"	5.25	.05	1/8"	5.25	2000	.004	2000-30	.004		
	1/8"	5.50	.05	1/8"	5.50	2000	.004	2000-30	.004		
	1/8"	5.75	.05	1/8"	5.75	2000	.004	2000-30	.004		
1/4"	1/4"	1.00	.05	1/4"	1.00	2000	.004	2000-30	.004		
	1/4"	1.25	.05	1/4"	1.25	2000	.004	2000-30	.004		
	1/4"	1.50	.05	1/4"	1.50	2000	.004	2000-30	.004		
	1/4"	1.75	.05	1/4"	1.75	2000	.004	2000-30	.004		
	1/4"	2.00	.05	1/4"	2.00	2000	.004	2000-30	.004		
	1/4"	2.25	.05	1/4"	2.25	2000	.004	2000-30	.004		
	1/4"	2.50	.05	1/4"	2.50	2000	.004	2000-30	.004		
	1/4"	2.75	.05	1/4"	2.75	2000	.004	2000-30	.004		
	1/4"	3.00	.05	1/4"	3.00	2000	.004	2000-30	.004		
	1/4"	3.25	.05	1/4"	3.25	2000	.004	2000-30	.004		
	1/4"	3.50	.05	1/4"	3.50	2000	.004	2000-30	.004		
	1/4"	3.75	.05	1/4"	3.75	2000	.004	2000-30	.004		

SHEET 2 OF 2



Download Speeds & Feeds Charts  
For Every Harvey Tool End Mill

Harvey Tool offers a convenient & specific benefit

## DRILL / END MILLS

Cobalt - MIT Style - 2 & 4 Flute



- 100% Cobalt (C7) inserts
- 8° included angle point
- Standard 1/2" Shank
- 20° ground to the end



### MIT STYLE

#### Recommendations

Material	Al
Feed Rate	0.005 - 0.010
Speed	1000 - 1500
Length	1.00 - 1.50

DRILL SIZE (INCH)	LENGTH TO POINT (INCH)	LENGTH TO POINT (MM)	FLUTES	GRADE OF INSERTS	DRILLING LENGTH (INCH)	RECOMMENDATION	
						Feed Rate	SPM
1/8"	1.00	25.4	2	10	0.010	1000	0.005
	1.25	31.75	2	10	0.010	1000	0.005
	1.50	38.1	4	10	0.010	1000	0.005
	1.75	44.45	2	10	0.010	1000	0.005
	2.00	50.8	2	10	0.010	1000	0.005
	2.25	57.15	2	10	0.010	1000	0.005
	2.50	63.5	2	10	0.010	1000	0.005
	2.75	69.85	2	10	0.010	1000	0.005
	3.00	76.2	2	10	0.010	1000	0.005
	3.25	82.55	4	10	0.010	1000	0.005
	3.50	88.9	2	10	0.010	1000	0.005
	3.75	95.25	2	10	0.010	1000	0.005
	4.00	101.6	2	10	0.010	1000	0.005
	4.25	107.95	2	10	0.010	1000	0.005
4.50	114.3	2	10	0.010	1000	0.005	

\*All data shown here is based on a standard 1/2" diameter shank. Please refer to our website for more information.



### Check Out Our New CNC Show!

Join The Performance Company National Applications Engineer, Dan Goodell as he discusses and presents cutting tool issues, answering the questions machinists will have, to help you accomplish more in the shop.

[youtube.com/inttheloupeTV](http://youtube.com/inttheloupeTV)



## CHAMFER CUTTERS

Pointed & Flat End



Available in  
2, 3, 4 & 6 Flutes

**Choose from three types:**

- Standard (Type I):** Used for chamfering and sharpening to various geometries, slots, slots and grooves.
  - Flat End (Type II):** Used for cutting multi-flute design tapered tool for use from an existing work chamfering larger diameters.
  - End Cutting (Type III):** A three-flute cutting geometry for bored hole tool and a chamfered end in a single pass.
- Good results • 100% ground to the size



Marked in 1/16" Increments For Size Changing from 1/2" to 1"

Overall Length L (mm)	D1	Type I		Type II		D2	Standard		Flat End		End Cutting	
		Flutes	Flutes	Flutes	Flutes		Flutes	Flutes	Flutes	Flutes		
100	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00
	18	2	2	2	2	1.5	18.00	18.00	18.00	18.00	18.00	18.00

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**TYPE I - POINTED**  
Flat end ground to taper, creating a conical end at the tip

**TYPE II - FLAT END**  
Flat end ground to a plain end creating flat face

**TYPE III - END CUTTING**  
Flat end ground to an end cutting flat diameter

## CHAMFER CUTTERS

(Pointed & Flat End uses)

(continued from previous page)

ANGLED MODEL	Dia.	Length	SP.	TYP.	USE	Dia.	HSS-ERL		HSS-COATED		TA-MINTEL	
							303 A	303 B	303 A	303 B	303 A	303 B
10°	14	2	100	1	00	1	8000	8000	8000	8000		
	16	2	100	2	00	100	8000	8000	8000	8000		
	18	2	100	2	00	100	8000	8000	8000	8000		
	20	2	100	2	100	100	8000	8000	8000	8000		
	24	2	100	2	100	100	8000	8000	8000	8000		
12.5°	14	2	100	1	00	100	8000	8000	8000	8000		
	16	2	100	1	00	100	8000	8000	8000	8000		
	18	2	100	2	00	100	8000	8000	8000	8000		
	20	2	100	2	00	100	8000	8000	8000	8000		
	24	2	100	2	00	100	8000	8000	8000	8000		
20°	14	2	100	1	00	100	8000	8000	8000	8000	8000	8000
	16	2	100	1	00	1	8000	8000	8000	8000		
	18	2	100	2	00	100	8000	8000	8000	8000		
	20	2	100	2	100	100	8000	8000	8000	8000		
	24	2	100	1	00	1	8000	8000	8000	8000	8000	8000
	28	2	100	1	00	4	8000	8000	8000	8000		
	32	2	100	2	00	4	8000	8000	8000	8000		
	36	2	100	2	00	4	8000	8000	8000	8000		
	40	2	100	2	00	4	8000	8000	8000	8000		
	44	2	100	2	00	4	8000	8000	8000	8000		
	48	2	100	2	00	4	8000	8000	8000	8000		
	52	2	100	2	00	4	8000	8000	8000	8000		
	56	2	100	2	00	4	8000	8000	8000	8000		
	60	2	100	2	00	4	8000	8000	8000	8000		
	64	2	100	2	00	4	8000	8000	8000	8000		
	68	2	100	2	00	4	8000	8000	8000	8000		
	72	2	100	2	00	4	8000	8000	8000	8000		
	76	2	100	2	00	4	8000	8000	8000	8000		
	80	2	100	2	00	4	8000	8000	8000	8000		
	30°	14	2	100	1	00	100	8000	8000	8000	8000	8000
16		2	100	2	00	100	8000	8000	8000	8000		
20		2	100	1	00	1	8000	8000	8000	8000		
24		2	100	2	00	4	8000	8000	8000	8000		
28		2	100	2	00	4	8000	8000	8000	8000		
32		2	100	2	00	4	8000	8000	8000	8000		
36		2	100	2	00	4	8000	8000	8000	8000		
40		2	100	2	00	4	8000	8000	8000	8000		
44		2	100	2	00	4	8000	8000	8000	8000		
48		2	100	2	00	4	8000	8000	8000	8000		

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# CHAMFER CUTTERS

Standard & Flat End (cont.)

CONTINUED FROM PREVIOUS PAGE

ITEM #	ITEM DESCRIPTION							ITEM #		ITEM #	
	QTY	UNIT	QTY	UNIT	QTY	UNIT	QTY	UNIT	QTY	UNIT	
20'	10	2	100	1	100		110	1000	1000	1000	1000
	15	2	100	2	100	100	110	1000	1000	1000	1000
	20	2	100	1	100		110	1000	1000	1000	1000
	25	2	100	2	100	100	110	1000	1000	1000	1000
	30	2	100	1	100		110	1000	1000	1000	1000
	35	2	100	2	100	100	110	1000	1000	1000	1000
	40	2	100	1	100		110	1000	1000	1000	1000
	45	2	100	2	100	100	110	1000	1000	1000	1000
	50	2	100	1	100		110	1000	1000	1000	1000
	55	2	100	2	100	100	110	1000	1000	1000	1000
27.5'	10	2	100	1	100		110	1000	1000	1000	1000
	15	2	100	1	100		110	1000	1000	1000	1000
	20	2	100	2	100	100	110	1000	1000	1000	1000
	25	2	100	1	100		110	1000	1000	1000	1000
	30	2	100	2	100	100	110	1000	1000	1000	1000
30'	10	2	1000	1	1000		110	1000	1000	1000	1000
	15	2	100	1	100		110	1000	1000	1000	1000
	20	2	100	1	100		110	1000	1000	1000	1000
	25	2	100	2	100	100	110	1000	1000	1000	1000
	30	2	100	1	100		110	1000	1000	1000	1000
	35	2	100	2	100	100	110	1000	1000	1000	1000
	40	2	100	1	100		110	1000	1000	1000	1000
	45	2	100	2	100	100	110	1000	1000	1000	1000
	50	2	100	1	100		110	1000	1000	1000	1000
	55	2	100	2	100	100	110	1000	1000	1000	1000
	60	2	100	1	100		110	1000	1000	1000	1000
	65	2	100	2	100	100	110	1000	1000	1000	1000
	70	2	100	1	100		110	1000	1000	1000	1000
	75	2	100	2	100	100	110	1000	1000	1000	1000
	80	2	100	1	100		110	1000	1000	1000	1000
	85	2	100	2	100	100	110	1000	1000	1000	1000
	90	2	100	1	100		110	1000	1000	1000	1000
	95	2	100	2	100	100	110	1000	1000	1000	1000
	100	2	100	1	100		110	1000	1000	1000	1000

continued on next page

# CHAMFER CUTTERS

(Pointed & Flat End uses)

(continued from previous page)

ANGLE REFERENCE	DIA. RANGE			L&L			LENGTH		TOOTH PROFILE		FIN. PROFILE	
	D1	Tmax	L1	D2	Tmax	L1	TYPE A	TYPE B	TYPE A	TYPE B	TYPE A	TYPE B
30°	10	2	100	1	100	110	312	10.00	312/312	312		
	15	3	100	2	100	120	312	11.00	312/312	312		
	20	4	100	3	100	130	312	12.00	312/312	312		
30°	25	5	100	4	100	140	312	13.00	312/312	312		
	30	6	100	5	100	150	312	14.00	312/312	312		
	35	7	100	6	100	160	312	15.00	312/312	312		
	40	8	100	7	100	170	312	16.00	312/312	312		
	45	9	100	8	100	180	312	17.00	312/312	312		
	50	10	100	9	100	190	312	18.00	312/312	312		
	55	11	100	10	100	200	312	19.00	312/312	312		
	60	12	100	11	100	210	312	20.00	312/312	312		
	65	13	100	12	100	220	312	21.00	312/312	312		
	70	14	100	13	100	230	312	22.00	312/312	312		
37.5°	10	2	100	1	100	110	312	10.00	312/312	312		
	15	3	100	2	100	120	312	11.00	312/312	312		
	20	4	100	3	100	130	312	12.00	312/312	312		
45°	25	5	100	4	100	140	312	13.00	312/312	312		
	30	6	100	5	100	150	312	14.00	312/312	312		
	35	7	100	6	100	160	312	15.00	312/312	312		
	40	8	100	7	100	170	312	16.00	312/312	312		
	45	9	100	8	100	180	312	17.00	312/312	312		
	50	10	100	9	100	190	312	18.00	312/312	312		
	55	11	100	10	100	200	312	19.00	312/312	312		
	60	12	100	11	100	210	312	20.00	312/312	312		
	65	13	100	12	100	220	312	21.00	312/312	312		
	70	14	100	13	100	230	312	22.00	312/312	312		
51°	10	2	100	1	100	110	312	10.00	312/312	312	10.00	31.00
	15	3	100	2	100	120	312	11.00	312/312	312		
	20	4	100	3	100	130	312	12.00	312/312	312		
	25	5	100	4	100	140	312	13.00	312/312	312		
	30	6	100	5	100	150	312	14.00	312/312	312		
	35	7	100	6	100	160	312	15.00	312/312	312		
	40	8	100	7	100	170	312	16.00	312/312	312		
	45	9	100	8	100	180	312	17.00	312/312	312		
	50	10	100	9	100	190	312	18.00	312/312	312		
	55	11	100	10	100	200	312	19.00	312/312	312		
60°	10	2	100	1	100	110	312	10.00	312/312	312		
	15	3	100	2	100	120	312	11.00	312/312	312		
	20	4	100	3	100	130	312	12.00	312/312	312		

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## CHAMFER CUTTERS

Pointed & Flat End (cont.)

(continued from previous page)

ITEM #	DIA.	LENGTH	CUTTING EDGE	CUTTING EDGE	CUTTING EDGE	CUTTING EDGE	WEIGHT		ITEM QUANT.		CASE QUANT.	
							POUNDS	GRAMS	PKT.	PKT.	PKT.	PKT.
60°	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100		
90°	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100		
60°	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	
	1/8"	3"	1.5000	0	1.5000	1.5000	1.5000	0.0150	0.0150	100	100	

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## CHAMFER CUTTERS

Pointed & Flat End (cont.)

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Series	Part Number	Diameter	Length	Width	Material	Finish	Dimensions		Part Number		Availability		
							Overall Length	Chamfer Length	Part No.	Part No.	Stock	Lead	
60°	1040	1/2	1 1/2	1/2	SAE 52100	SAE 52100	1 1/2	1/2	1040-1/2	1040-1/2			
	1042	3/4	2	3/4	SAE 52100	SAE 52100	2	3/4	1042-3/4	1042-3/4	Stock	Lead	
	1044	1	2 1/2	1	SAE 52100	SAE 52100	2 1/2	1	1044-1	1044-1			
	1046	1 1/4	3	1 1/4	SAE 52100	SAE 52100	3	1 1/4	1046-1 1/4	1046-1 1/4			
	1048	1 1/2	3 1/2	1 1/2	SAE 52100	SAE 52100	3 1/2	1 1/2	1048-1 1/2	1048-1 1/2			
	1050	1 3/4	4	1 3/4	SAE 52100	SAE 52100	4	1 3/4	1050-1 3/4	1050-1 3/4			
	1052	2	5	2	SAE 52100	SAE 52100	5	2	1052-2	1052-2			
	1054	2 1/4	6	2 1/4	SAE 52100	SAE 52100	6	2 1/4	1054-2 1/4	1054-2 1/4			
	1056	2 1/2	6 1/2	2 1/2	SAE 52100	SAE 52100	6 1/2	2 1/2	1056-2 1/2	1056-2 1/2			
	1058	2 3/4	7	2 3/4	SAE 52100	SAE 52100	7	2 3/4	1058-2 3/4	1058-2 3/4			
	1060	3	8	3	SAE 52100	SAE 52100	8	3	1060-3	1060-3			
	1062	3 1/4	9	3 1/4	SAE 52100	SAE 52100	9	3 1/4	1062-3 1/4	1062-3 1/4			
	1064	3 1/2	9 1/2	3 1/2	SAE 52100	SAE 52100	9 1/2	3 1/2	1064-3 1/2	1064-3 1/2			
	1066	3 3/4	10	3 3/4	SAE 52100	SAE 52100	10	3 3/4	1066-3 3/4	1066-3 3/4			
	1068	4	11	4	SAE 52100	SAE 52100	11	4	1068-4	1068-4			
	1070	4 1/4	12	4 1/4	SAE 52100	SAE 52100	12	4 1/4	1070-4 1/4	1070-4 1/4			
	80°	1072	1/2	1 1/2	1/2	SAE 52100	SAE 52100	1 1/2	1/2	1072-1/2	1072-1/2		
		1074	3/4	2	3/4	SAE 52100	SAE 52100	2	3/4	1074-3/4	1074-3/4		
1076		1	2 1/2	1	SAE 52100	SAE 52100	2 1/2	1	1076-1	1076-1			
1078		1 1/4	3	1 1/4	SAE 52100	SAE 52100	3	1 1/4	1078-1 1/4	1078-1 1/4			
1080		1 1/2	3 1/2	1 1/2	SAE 52100	SAE 52100	3 1/2	1 1/2	1080-1 1/2	1080-1 1/2			
1082		1 3/4	4	1 3/4	SAE 52100	SAE 52100	4	1 3/4	1082-1 3/4	1082-1 3/4			
90°	1084	1/2	1 1/2	1/2	SAE 52100	SAE 52100	1 1/2	1/2	1084-1/2	1084-1/2			
	1086	3/4	2	3/4	SAE 52100	SAE 52100	2	3/4	1086-3/4	1086-3/4			
	1088	1	2 1/2	1	SAE 52100	SAE 52100	2 1/2	1	1088-1	1088-1			
	1090	1 1/4	3	1 1/4	SAE 52100	SAE 52100	3	1 1/4	1090-1 1/4	1090-1 1/4			
	1092	1 1/2	3 1/2	1 1/2	SAE 52100	SAE 52100	3 1/2	1 1/2	1092-1 1/2	1092-1 1/2			
	1094	1 3/4	4	1 3/4	SAE 52100	SAE 52100	4	1 3/4	1094-1 3/4	1094-1 3/4			
110°	1096	1/2	1 1/2	1/2	SAE 52100	SAE 52100	1 1/2	1/2	1096-1/2	1096-1/2			
	1098	3/4	2	3/4	SAE 52100	SAE 52100	2	3/4	1098-3/4	1098-3/4			
	1100	1	2 1/2	1	SAE 52100	SAE 52100	2 1/2	1	1100-1	1100-1			
	1102	1 1/4	3	1 1/4	SAE 52100	SAE 52100	3	1 1/4	1102-1 1/4	1102-1 1/4			
	1104	1 1/2	3 1/2	1 1/2	SAE 52100	SAE 52100	3 1/2	1 1/2	1104-1 1/2	1104-1 1/2			
	1106	1 3/4	4	1 3/4	SAE 52100	SAE 52100	4	1 3/4	1106-1 3/4	1106-1 3/4			
	1108	2	5	2	SAE 52100	SAE 52100	5	2	1108-2	1108-2			
	1110	2 1/4	6	2 1/4	SAE 52100	SAE 52100	6	2 1/4	1110-2 1/4	1110-2 1/4			
	1112	2 1/2	6 1/2	2 1/2	SAE 52100	SAE 52100	6 1/2	2 1/2	1112-2 1/2	1112-2 1/2			
	1114	2 3/4	7	2 3/4	SAE 52100	SAE 52100	7	2 3/4	1114-2 3/4	1114-2 3/4			
120°	1116	1/2	1 1/2	1/2	SAE 52100	SAE 52100	1 1/2	1/2	1116-1/2	1116-1/2			
	1118	3/4	2	3/4	SAE 52100	SAE 52100	2	3/4	1118-3/4	1118-3/4			
	1120	1	2 1/2	1	SAE 52100	SAE 52100	2 1/2	1	1120-1	1120-1			

Technical Products Engineering Division

## CHAMFER CUTTERS

Pointed & Flat End - Double-Ended



- Double-ended
- Choose from three types
  - **Type I (Flat End)** - 2 face chamfer for deburring and chamfering of turning operations, slots, and axial holes
  - **Type II (Flat End)** - 2 face chamfer with face chamfer in process for the chamfer for grinding and chamfering larger features
  - **Type III (Flat End)** - 2 face chamfer cutting geometry for thread the hole and pre-ground end in a single pass
- End chamfer - 0.001 ground to the end

ANGLE APPLICABLE	DIAMETER	FLUTES	OD	ID	LENGTH (IN/OUT)		TOTAL LENGTH	MATERIAL		RECOMMEND	
					L <sub>1</sub>	L <sub>2</sub>		TYPE A	TYPE B	TYPE A	TYPE B
15°	1.0	2	1.00	0	0.20		0.10	SKH9	2020	SKH9/20	40/20
	1.4	2	1.40	0	0.27		0.14	SKH9	2120	SKH9/20	41/20
	1.8	2	1.80	0	0.35	0.10	0.14	SKH9	2220	SKH9/20	42/20
	2.2	2	2.20	0	0.43		0.17	SKH9	2320	SKH9/20	43/20
	2.6	2	2.60	0	0.51	0.10	0.14	SKH9	2420	SKH9/20	44/20
	3.0	2	3.00	0	0.59	0.10	0.17	SKH9	2520	SKH9/20	45/20
20°	1.0	2	1.00	0	0.20		0.10	SKH9	2020	SKH9/20	40/20
	1.4	2	1.40	0	0.28		0.14	SKH9	2120	SKH9/20	41/20
	1.8	2	1.80	0	0.37	0.10	0.14	SKH9	2220	SKH9/20	42/20
	2.2	2	2.20	0	0.46		0.17	SKH9	2320	SKH9/20	43/20
	2.6	2	2.60	0	0.55	0.10	0.14	SKH9	2420	SKH9/20	44/20
	3.0	2	3.00	0	0.64	0.10	0.17	SKH9	2520	SKH9/20	45/20
30°	1.0	2	1.00	0	0.20		0.10	SKH9	2020	SKH9/20	40/20
	0.75	2	0.75	0	0.15		0.07	SKH9	1820	SKH9/20	38/20
	0.50	2	0.50	0	0.10	0.05	0.07	SKH9	1620	SKH9/20	36/20
	0.25	2	0.25	0	0.05		0.04	SKH9	1420	SKH9/20	34/20
	0.10	2	0.10	0	0.02		0.02	SKH9	1220	SKH9/20	32/20
	0.05	2	0.05	0	0.01		0.01	SKH9	1020	SKH9/20	30/20
	0.02	2	0.02	0	0.00		0.00	SKH9	820	SKH9/20	28/20
	0.01	2	0.01	0	0.00		0.00	SKH9	620	SKH9/20	26/20
	0.005	2	0.005	0	0.00		0.00	SKH9	420	SKH9/20	24/20
	0.002	2	0.002	0	0.00		0.00	SKH9	220	SKH9/20	22/20

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### TYPE I - POINTED

Flat end ground to center  
pointing to inner diameter (ID)



### TYPE II - FLAT END

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



### TYPE III - END CUTTING

Flat end ground to an end  
cutting flat geometry (T), also  
fluted to center





### CHAMFER CUTTERS

Pointed & Flat End - Double Ended (cont.)

Continued from previous page

ITEM NO.	ITEM DESCRIPTION	ITEM QTY	ITEM DIMENSIONS		ITEM WEIGHT		ITEM PRICE		ITEM TOTAL		
			DI	DL	WT	WT	UNIT PRICE	TOTAL PRICE	UNIT PRICE	TOTAL PRICE	
017	1/2	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
018	3/8	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
019	1/2	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
021	1/2	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	3/8	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	1/4	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	3/16	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	5/16	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	7/16	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	9/16	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	1 1/8	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	1 1/4	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	1 3/8	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	1 1/2	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	1 3/4	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	2	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	2 1/4	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	2 1/2	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	2 3/4	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	3	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	3 1/4	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	022	1/2	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10
		3/8	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10
1/4		1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
3/16		1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
5/16		1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
7/16		1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
023	1/2	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	3/8	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	1/4	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	3/16	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	5/16	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	
	7/16	1	1.00	1.00	1.00	1.00	1.10	1.10	1.10	1.10	

ITEM NO. 021

## CHAMFER CUTTERS

Pointed & Flat End - Helical Flutes



High-Speed Steels  
for Titanium  
Surface Finishes

- Specialized helical flute design for superior performance
- Fine cutting action provides excellent surface finish with chip evacuation
- Choose from three types:

- **Pointed (Type I):** Ideal for finishing and chamfering to narrow grooves, slots and small holes
- **Flat End (Type II):** Fine cutting, improves tool life by profiling and chamfering larger features
- **End Cutting (Type III):** Great cutting geometry to finish the face and a chamfered end in a single pass



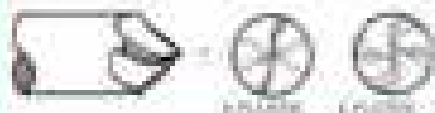
- All sizes available for high-pressure coolers: • Hard coatings • CBN ground to the USA

DIA mm (in)	DIA mm	LENGTH mm (in)	DIA mm (in)	DIA mm (in)	LENGTH mm (in)	DIA mm (in)	MATERIAL		FINISH (RMS)		
							TYPE I	TYPE II	TYPE I	TYPE II	
100	100	0	100	0	100	100	1.10	SS304	16.00	12.00-25.00	32.00
	110	0	100	0	100	110	1.10	SS304	17.00	12.00-25.00	32.00
	120	0	100	0	100	120	1.10	SS304	18.00	12.00-25.00	32.00
	130	0	100	0	100	130	1.10	SS304	19.00	12.00-25.00	32.00
	140	0	100	0	100	140	1.10	SS304	20.00	12.00-25.00	32.00
	150	0	100	0	100	150	1.10	SS304	21.00	12.00-25.00	32.00
	160	0	100	0	100	160	1.10	SS304	22.00	12.00-25.00	32.00
200	200	0	100	0	100	200	1.10	SS304	17.00	12.00-25.00	32.00
	210	0	100	0	100	210	1.10	SS304	18.00	12.00-25.00	32.00
	220	0	100	0	100	220	1.10	SS304	19.00	12.00-25.00	32.00
	230	0	100	0	100	230	1.10	SS304	20.00	12.00-25.00	32.00
	240	0	100	0	100	240	1.10	SS304	21.00	12.00-25.00	32.00
	250	0	100	0	100	250	1.10	SS304	22.00	12.00-25.00	32.00
	260	0	100	0	100	260	1.10	SS304	23.00	12.00-25.00	32.00

Standard length: 100mm (4") - 150mm (6") - 200mm (8") - 250mm (10") - 300mm (12")

continued on next page

**TYPE I - POINTED** - For most general cutting, grinding and chamfering for (I)



**TYPE II - FLAT END** - For most general grinding and cutting for (II)



**TYPE III - END CUTTING**

For most grinding and cutting for chamfers (II), also able to center



# CHAMFER CUTTERS

Pointed & Flat End - Helical Flutes (cont.)

continued from previous page

MATERIAL	CHAMFER	FLUTES	CB	CBH	LENGTH OF CUT	RPM	FEED	CUTTING SPEED		LIFE (MINUTES)		
								TKM - 1	TKM - 2	TKM - 1	TKM - 2	
6061	0.5	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
	0.5	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
	0.5	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
	1.0	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
	1.0	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
	2.0	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
	2.0	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
	3.0	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
	3.0	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
	4.0	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
	4.0	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
	5.0	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
	5.0	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
	6.0	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
	6.0	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
	8.0	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
	8.0	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
	10.0	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
	10.0	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
	12.0	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
	12.0	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
	15.0	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
	15.0	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
	18.0	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
	18.0	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
	6051	0.5	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00
		0.5	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00
		0.5	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00
	6041	0.5	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00
		0.5	2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00
		0.5	2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00
1.0		2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
1.0		2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
1.0		2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
1.0		2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
2.0		2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
2.0		2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
2.0		2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
2.0		2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
3.0		2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
3.0		2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
4.0		2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
4.0		2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
5.0		2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
5.0		2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	
6.0		2	0.005	0	120	3000	0.05	5000	15.00	50000.00	50.00	
6.0		2	0.005	0	180	3000	0.05	5000	15.00	50000.00	50.00	

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# CHAMFER CUTTERS

Pointed & Flat End - Helical Flutes (cont.)

(continued from previous page)

ITEM NO. (IN)	DIAMETER (IN)	LENGTH (IN)	RFL	TYPE	LENGTH OF CUT (IN)	RPM	FEED (IN/REV)	RECOMMENDED		MFG PART NO.	
								TOOL #	PRICE	TOOL #	PRICE
60°	0.0625	1	0.005	0	0.0625	600	0.002	60000	25.00	60000-01	25.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	30.00	60000-02	30.00
	0.0625	1	0.005	1	0.0625	600	0.002	60000	35.00	60000-03	35.00
	0.0625	1	0.005	2	0.0625	600	0.002	60000	40.00	60000-04	40.00
	0.0625	1	0.005	3	0.0625	600	0.002	60000	45.00	60000-05	45.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	50.00	60000-06	50.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	55.00	60000-07	55.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	60.00	60000-08	60.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	65.00	60000-09	65.00
	0.0625	1	0.005	1	0.0625	600	0	60000	70.00	60000-10	70.00
	0.0625	1	0.005	2	0.0625	600	0	60000	75.00	60000-11	75.00
	0.0625	1	0.005	3	0.0625	600	0	60000	80.00	60000-12	80.00
	0.0625	1	0.005	0	0.0625	600	0	60000	85.00	60000-13	85.00
	0.0625	1	0.005	0	0.0625	600	0	60000	90.00	60000-14	90.00
	0.0625	1	0.005	0	0.0625	600	0	60000	95.00	60000-15	95.00
	60°	0.0625	1	0.005	0	0.0625	600	0.002	60000	100.00	60000-16
0.0625		1	0.005	0	0.0625	600	0.002	60000	105.00	60000-17	105.00
0.0625		1	0.005	0	0.0625	600	0.002	60000	110.00	60000-18	110.00
0.0625		1	0.005	0	0.0625	600	0.002	60000	115.00	60000-19	115.00
0.0625		1	0.005	0	0.0625	600	0	60000	120.00	60000-20	120.00
0.0625		1	0.005	0	0.0625	600	0	60000	125.00	60000-21	125.00
60°	0.0625	1	0.005	1	0.0625	600	0.002	60000	130.00	60000-22	130.00
	0.0625	1	0.005	1	0.0625	600	0.002	60000	135.00	60000-23	135.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	140.00	60000-24	140.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	145.00	60000-25	145.00
	0.0625	1	0.005	0	0.0625	600	0	60000	150.00	60000-26	150.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	155.00	60000-27	155.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	160.00	60000-28	160.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	165.00	60000-29	165.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	170.00	60000-30	170.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	175.00	60000-31	175.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	180.00	60000-32	180.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	185.00	60000-33	185.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	190.00	60000-34	190.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	195.00	60000-35	195.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	200.00	60000-36	200.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	205.00	60000-37	205.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	210.00	60000-38	210.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	215.00	60000-39	215.00
	0.0625	1	0.005	0	0.0625	600	0.002	60000	220.00	60000-40	220.00

† Standard Tool No. 6001-001, 6002-001, 6003-001 and 6004-001.

## CHAMFER CUTTERS

Pointed & Flat End - Helical Flutes - Double-Fluted



Flute Cutting Action  
for Excellent  
Surface Finish

- Specialized helical flute design for superior performance
- Double-fluted
- Free cutting design provides excellent surface finish and chip evacuation
- Effective in deep pockets and flaps of flat and non-cutting angles
- A and B flute designs
- All sizes designed for high precision tool making
- Hard coatings
- CNC ground in the USA

ANSI MFG SIZE	DIAMETER (INCHES)	FLUTE TYPE	FLUTE COUNT	LENGTH OF CUT (IN)	LENGTH OF SHANK (IN)	TYPICAL CUTTING SPEED	UNFINISHED		FINISHED	
							TYPE A	TYPE B	TYPE A	TYPE B
40	1/2	A	100	1	100	0.12	0.0005	0.0005	0.0005	0.0005
	3/4	B	100	2	100	0.15	0.0005	0.0005	0.0005	0.0005
	1	A	100	1	100	0.15	0.0005	0.0005	0.0005	0.0005
	1 1/4	B	100	2	100	0.15	0.0005	0.0005	0.0005	0.0005
	1 1/2	A	100	1	100	0	0.0005	0.0005	0.0005	0.0005
	1 3/4	B	100	2	100	0.15	0.0005	0.0005	0.0005	0.0005

\* Maximum Speed (4-11000 RPM) \* Maximum Length (4-11000 RPM) \* 100'

**TYPE I - POINTED** Flute ends ground to a point, providing a zero thickness of top flut.



**TYPE II - FLAT END** Flute ends ground to a flat end cutting flat top flut.



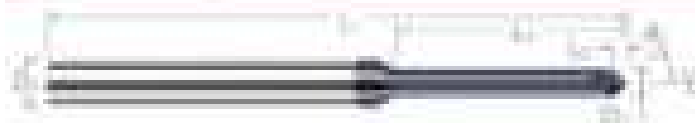
### The Multiple Uses of a Chamfer Mill

Did you know that a Chamfer Mill or Chamfer Mill, is one of the most versatile tools you can have in your arsenal? Learn how this specialized tool performs several different machining operations in our "In the Field" blog post: [The Multiple Uses of a Chamfer Mill](#).

Head over to [harsco.com/resources](#) and let us know!

## CHAMFER CUTTERS

### Pointed - Long Reach



- Reduced diameter for clearance along walls and in small features
- Type 1 pointed style ground to a point, yielding wide chamfers on part (1)
- Available in multiple coated and coated versions
- 2 Flutes
- Solid carbide
- CNC ground to the edge



Worked in Turn Shop Per Line

SPINDLE SIZE	SHANK DIAMETER	TOTAL LENGTH	LENGTH OF CUT	R	SHANK LENGTH	FLUTE LENGTH	CUTTING SPEED		FEED RATE	
							V <sub>C</sub>	MMP	F <sub>z</sub>	mm/min
1/2"	1/2"	100	50	0.05	50	25	2000	300	0.1	1000
	1/2"	125	75	0.05	75	37	2000	300	0.1	1000
	1/2"	150	100	0.05	100	50	2000	300	0.1	1000
	1/2"	175	125	0.05	125	62	2000	300	0.1	1000
	1/2"	200	150	0.05	150	75	2000	300	0.1	1000
	1/2"	225	175	0.05	175	87	2000	300	0.1	1000
3/4"	3/4"	100	50	0.05	50	25	2000	300	0.1	1000
	3/4"	125	75	0.05	75	37	2000	300	0.1	1000
	3/4"	150	100	0.05	100	50	2000	300	0.1	1000
	3/4"	175	125	0.05	125	62	2000	300	0.1	1000
	3/4"	200	150	0.05	150	75	2000	300	0.1	1000
	3/4"	225	175	0.05	175	87	2000	300	0.1	1000
	3/4"	250	200	0.05	200	100	2000	300	0.1	1000
	3/4"	275	225	0.05	225	112	2000	300	0.1	1000
	3/4"	300	250	0.05	250	125	2000	300	0.1	1000
	3/4"	325	275	0.05	275	137	2000	300	0.1	1000
	3/4"	350	300	0.05	300	150	2000	300	0.1	1000
	3/4"	375	325	0.05	325	162	2000	300	0.1	1000
1"	1"	100	50	0.05	50	25	2000	300	0.1	1000
	1"	125	75	0.05	75	37	2000	300	0.1	1000
	1"	150	100	0.05	100	50	2000	300	0.1	1000
	1"	175	125	0.05	125	62	2000	300	0.1	1000
	1"	200	150	0.05	150	75	2000	300	0.1	1000
	1"	225	175	0.05	175	87	2000	300	0.1	1000
	1"	250	200	0.05	200	100	2000	300	0.1	1000
	1"	275	225	0.05	225	112	2000	300	0.1	1000
	1"	300	250	0.05	250	125	2000	300	0.1	1000
	1"	325	275	0.05	275	137	2000	300	0.1	1000
	1"	350	300	0.05	300	150	2000	300	0.1	1000
	1"	375	325	0.05	325	162	2000	300	0.1	1000
	1"	400	350	0.05	350	175	2000	300	0.1	1000
	1"	425	375	0.05	375	187	2000	300	0.1	1000
	1"	450	400	0.05	400	200	2000	300	0.1	1000
	1"	475	425	0.05	425	212	2000	300	0.1	1000
	1"	500	450	0.05	450	225	2000	300	0.1	1000

Continued on next page

## CHAMFER CUTTERS

(Pointed Long Reach) (cont.)

(continued from previous page)

ITEM NO.	ITEM DESCRIPTION	ITEM PRICE	LENGTH OF CUT	Ø	MAX. DEPTH OF CUT	ITEM WEIGHT	DIMENSIONS		MATERIAL	
							Ø	ITEM WEIGHT	ITEM PRICE	ITEM WEIGHT
6"	601	200.00	100	600	10	0.10	60000	600	6000000	6000
	601-0001	140.00	100	600	10	0.10	61000	610	6100000	6100
	602-0001	160.00	100	600	10	0.10	62000	620	6200000	6200
	603-0001	200.00	100	600	10	0.10	63000	630	6300000	6300
	604-0001	200.00	100	600	10	0.10	64000	640	6400000	6400
	605-0001	200.00	100	600	10	0.10	65000	650	6500000	6500
	606-0001	200.00	100	600	10	0.10	66000	660	6600000	6600
	607-0001	200.00	100	600	10	0.10	67000	670	6700000	6700
	608	200.00	100	600	10	0.10	68000	680	6800000	6800
	609	200.00	100	600	10	0.10	69000	690	6900000	6900
	610-0001	200.00	100	600	10	0.10	70000	700	7000000	7000
	611-0001	200.00	100	600	10	0.10	71000	710	7100000	7100
	612-0001	200.00	100	600	10	0.10	72000	720	7200000	7200
	613-0001	200.00	100	600	10	0.10	73000	730	7300000	7300
	614	200.00	100	600	10	0.10	74000	740	7400000	7400
	615-0001	200.00	100	600	10	0.10	75000	750	7500000	7500
	616-0001	200.00	100	600	10	0.10	76000	760	7600000	7600
	617-0001	200.00	100	600	10	0.10	77000	770	7700000	7700
	618-0001	200.00	100	600	10	0.10	78000	780	7800000	7800
	619-0001	200.00	100	600	10	0.10	79000	790	7900000	7900
	620-0001	200.00	100	600	10	0.10	80000	800	8000000	8000
	621-0001	200.00	100	600	10	0.10	81000	810	8100000	8100
	622-0001	200.00	100	600	10	0.10	82000	820	8200000	8200
	623-0001	200.00	100	600	10	0.10	83000	830	8300000	8300
	624-0001	200.00	100	600	10	0.10	84000	840	8400000	8400
	625-0001	200.00	100	600	10	0.10	85000	850	8500000	8500
	626-0001	200.00	100	600	10	0.10	86000	860	8600000	8600
	627-0001	200.00	100	600	10	0.10	87000	870	8700000	8700
628	200.00	100	600	10	0.10	88000	880	8800000	8800	
629	200.00	100	600	10	0.10	89000	890	8900000	8900	
8"	801-0001	200.00	100	800	10	0.10	90000	900	9000000	9000
	802-0001	200.00	100	800	10	0.10	91000	910	9100000	9100
	803-0001	200.00	100	800	10	0.10	92000	920	9200000	9200
	804-0001	200.00	100	800	10	0.10	93000	930	9300000	9300
	805-0001	200.00	100	800	10	0.10	94000	940	9400000	9400

## CHAMFER CUTTERS

### Back Chamfer Cutters



- Saw profile design and greater radial pressure ideal for generating chamfered features on the backside of small holes or slots
- Decreases cutting forces resulting in longer life and set-up
- Slightly compressed to fit in cut and free zone
- 80° included angle, cutting on tangency
- Left hand steel (FL) / right hand cut (RH) / double end (DE)
- Material choice for improved finish:
  - S105 carbide
  - C102 ground to fine finish



Left Hand Steel Flute & Right Hand Cut Chamfer Cutter  
From Above (From Flute)

BACK CHAMFER CUTTER	TOTAL CUT	BACK CHAMFER	CUTTING DIAMETER	FLUTE LENGTH	FLUTE ANGLE	SHANK DIAMETER	LENGTH	MATERIAL		FINISH	
								ITEM #	ITEM #	ITEM #	ITEM #
$\frac{1}{16}$ 30°	$\frac{1}{16}$	0	$\frac{1}{16}$ (0.0625)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{1}{8}$ 30°	$\frac{1}{8}$	0	$\frac{1}{8}$ (0.125)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{3}{16}$ 30°	$\frac{3}{16}$	0	$\frac{3}{16}$ (0.1875)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{1}{4}$ 30°	$\frac{1}{4}$	0	$\frac{1}{4}$ (0.25)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{5}{16}$ 30°	$\frac{5}{16}$	0	$\frac{5}{16}$ (0.3125)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{3}{8}$ 30°	$\frac{3}{8}$	0	$\frac{3}{8}$ (0.375)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{7}{16}$ 30°	$\frac{7}{16}$	0	$\frac{7}{16}$ (0.4375)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{1}{2}$ 30°	$\frac{1}{2}$	0	$\frac{1}{2}$ (0.5)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{9}{16}$ 30°	$\frac{9}{16}$	0	$\frac{9}{16}$ (0.5625)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{5}{8}$ 30°	$\frac{5}{8}$	0	$\frac{5}{8}$ (0.625)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{11}{16}$ 30°	$\frac{11}{16}$	0	$\frac{11}{16}$ (0.6875)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{3}{4}$ 30°	$\frac{3}{4}$	0	$\frac{3}{4}$ (0.75)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{7}{8}$ 30°	$\frac{7}{8}$	0	$\frac{7}{8}$ (0.875)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$1$ 30°	$1$	0	$1$ (1.0)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{1}{16}$ 45°	$\frac{1}{16}$	0	$\frac{1}{16}$ (0.0625)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{1}{8}$ 45°	$\frac{1}{8}$	0	$\frac{1}{8}$ (0.125)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{3}{16}$ 45°	$\frac{3}{16}$	0	$\frac{3}{16}$ (0.1875)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{1}{4}$ 45°	$\frac{1}{4}$	0	$\frac{1}{4}$ (0.25)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{5}{16}$ 45°	$\frac{5}{16}$	0	$\frac{5}{16}$ (0.3125)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{3}{8}$ 45°	$\frac{3}{8}$	0	$\frac{3}{8}$ (0.375)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{7}{16}$ 45°	$\frac{7}{16}$	0	$\frac{7}{16}$ (0.4375)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{1}{2}$ 45°	$\frac{1}{2}$	0	$\frac{1}{2}$ (0.5)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{9}{16}$ 45°	$\frac{9}{16}$	0	$\frac{9}{16}$ (0.5625)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{5}{8}$ 45°	$\frac{5}{8}$	0	$\frac{5}{8}$ (0.625)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{11}{16}$ 45°	$\frac{11}{16}$	0	$\frac{11}{16}$ (0.6875)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{3}{4}$ 45°	$\frac{3}{4}$	0	$\frac{3}{4}$ (0.75)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$\frac{7}{8}$ 45°	$\frac{7}{8}$	0	$\frac{7}{8}$ (0.875)	0.125	0	0.125	1.125	10000	10000	1000000	10000
$1$ 45°	$1$	0	$1$ (1.0)	0.125	0	0.125	1.125	10000	10000	1000000	10000

(continued on next page)



## CHAMFER CUTTERS

Back Chamfer Cutters (cont.)

continued from previous page

ITEM NUMBER	ITEM SIZE	ITEM QUANTITY	ITEM WEIGHT	ITEM FLUTES	ITEM MATERIAL	ITEM LENGTH	ITEM PRICE		
							ITEM #	ITEM PRICE	
110	1/2"	10	28.1	11.00	S	11.0	2.10	200010	100.00
111	3/8"	10	36.0	10.0	S	11.0	2.10	200011	100.00
112	5/8"	10	1,060	10.0	S	11.0	2.10	200012	100.00
113	1"	10	1,060	10.0	S	11.0	2.10	200013	100.00
114	1 1/8"	10	270	11.0	S	11.0	2.10	200014	100.00
115	1 1/2"	10	100	10.0	S	11.0	2.10	200015	100.00
116	1 3/4"	10	1,000	10.0	S	11.0	2.10	200016	100.00
117	2"	10	1,400	10.0	S	11.0	2.10	200017	100.00
118	2 1/2"	10	800	11.0	S	11.0	2.10	200018	100.00
119	3"	10	1,000	10.0	S	11.0	2.10	200019	100.00
120	3 1/2"	10	2,000	10.0	S	11.0	2.10	200020	100.00
121	4"	10	2,000	10.0	S	11.0	2.10	200021	100.00



Check Out All of Our Chamfering Solutions!

## CHAMFER CUTTERS

### Deburring Chamfer Cutters



#### End Mill Followers with Bar-Style Geometry

- Reduce or prevent end mill chatter with these high precision bar style end mill followers
- High precision cylindrical parts with a chamfered square shank
- High flute count allows for increased feeds which reduces cycle times
- Reduced chatter leads to more cutting tool life
- Tight and well fabricated shank, use of advanced programming, and tool paths
- Conventional bars are effective in removing burrs and in getting a smooth chamfered edge finish with superior tool
- Improved tool force control
- Solid carbide
- ISO grades in the ISO 1



Standard in **ISO Grades** For Steel

### Single-Ended

ANGLE DEGREE	L1	RIGHT HAND FLUTE		LEFT HAND FLUTE		SHANK DIA	SHANK L1	TOLERANCES		CHAMFER TOLERANCE		ADDITIONAL TOLERANCE	
		FLUTE DIA	FLUTE L1	FLUTE DIA	FLUTE L1			FLUTE DIA	FLUTE L1	FLUTE DIA	FLUTE L1		
10°	100	10	0	0	0	0.0004	10	0.001	0.001	0.001	0.001	0.001	
	200	10	0	0	0	0.0004	10	0.001	0.001	0.001	0.001	0.001	
45°	100	10	0	0	0	0.0004	10	0.001	0.001	0.001	0.001	0.001	0.001
	100	10	0	0	0	0.0004	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	100	10	0	0	0	0.0004	10	0.001	0.001	0.001	0.001	0.001	0.001
	100	10	1	0	0	0.0004	0.001	0.001	0.001	0.001	0.001	0.001	0.001
60°	100	10	0	0	0.0004	10	0.001	0.001	0.001	0.001	0.001	0.001	



Standard in **ISO Grades** For Steel

### Double-Ended

ANGLE DEGREE	LENGTH OF CUT L2	RIGHT HAND FLUTE		LEFT HAND FLUTE		SHANK DIA	SHANK L1	TOLERANCES		CHAMFER TOLERANCE		ADDITIONAL TOLERANCE	
		FLUTE DIA	FLUTE L1	FLUTE DIA	FLUTE L1			FLUTE DIA	FLUTE L1	FLUTE DIA	FLUTE L1		
10°	100	10	0	0	0	0.0004	10	0.001	0.001	0.001	0.001	0.001	
	200	10	0	0	0	0.0004	10	0.001	0.001	0.001	0.001	0.001	
45°	100	10	0	0	0	0.0004	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	100	10	0	0	0	0.0004	10	0.001	0.001	0.001	0.001	0.001	0.001
	100	10	1	0	0	0.0004	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	100	10	1	0	0	0.0004	10	0.001	0.001	0.001	0.001	0.001	0.001

## CHAMFER CUTTERS

Cobalt - Pointed



- 4 Flute (2 Flute to center)
- 60 deg chamfer angle
- Type 7 powdered steel provides a clean, cutting and finishing of 30/20
- 100% ground in the USA

Overall Length (in)	Length to End of Chamfer (in)	OD	Length to End of OD (in)	Chamfer Length (in)	Weight (lb)	
					1/2	1/4
30"	21.7	3/8"	14"	1/2"	18.70	18.70
	20"	3/8"	12"	1/2"	17.10	17.10
	18"	3/8"	10"	1/2"	15.50	15.50
40"	28"	3/8"	18"	1/2"	24.50	24.50
	26"	3/8"	16"	1/2"	22.90	22.90
	24"	3/8"	14"	1/2"	21.30	21.30

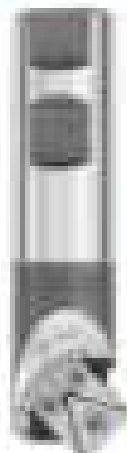


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## CHAMFER CUTTERS

### Adjustable Chamfer Cutters



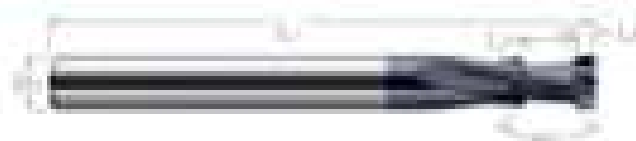
- Wide angle range from 15° to 45°
- Change inserts angle with side adjustment
- TYP 021 includes insert (T8 coated) and wrench included
- TYP 021-45 includes insert (T8 coated) for additional performance in hardened steel work

ITEM # (Standard)	ITEM # (Special)	TYPE #	ANG °
021	021	020	015°
021	021	020	030°
ITEM # (Special)		TYPE #	ANG °
<b>TYP 021-45 (Special) (Hardening)</b>			
021-45	021-45	020	045°
*Wide angle 45 degree chamfer inserts available			
021-45	021-45	020	045°
021-45	021-45	020	045°
021-45	021-45	020	045°
021-45	021-45	020	045°

ITEM # ITEM # Adjusting Chamfer Cutter					
MATERIAL	ITEM # / ANG	ITEM # / ANG	ITEM # / ANG		
ITEM # / ANG	ITEM # / ANG	ITEM # / ANG	ITEM # / ANG	ITEM # / ANG	ITEM # / ANG
	021 / 15°	021 / 15°	020 / 15°	020 / 15°	020 / 15°
	021 / 30°	021 / 30°	020 / 30°	020 / 30°	020 / 30°
	021 / 45°	021 / 45°	020 / 45°	020 / 45°	020 / 45°
	021-45 / 45°	021-45 / 45°	020 / 45°	020 / 45°	020 / 45°
	021 / 15°	021 / 15°	020 / 15°	020 / 15°	020 / 15°
	021 / 30°	021 / 30°	020 / 30°	020 / 30°	020 / 30°
	021 / 45°	021 / 45°	020 / 45°	020 / 45°	020 / 45°
	021-45 / 45°	021-45 / 45°	020 / 45°	020 / 45°	020 / 45°
	021 / 15°	021 / 15°	020 / 15°	020 / 15°	020 / 15°
	021 / 30°	021 / 30°	020 / 30°	020 / 30°	020 / 30°
	021 / 45°	021 / 45°	020 / 45°	020 / 45°	020 / 45°
	021-45 / 45°	021-45 / 45°	020 / 45°	020 / 45°	020 / 45°
	021 / 15°	021 / 15°	020 / 15°	020 / 15°	020 / 15°
	021 / 30°	021 / 30°	020 / 30°	020 / 30°	020 / 30°
	021 / 45°	021 / 45°	020 / 45°	020 / 45°	020 / 45°
	021-45 / 45°	021-45 / 45°	020 / 45°	020 / 45°	020 / 45°
	021 / 15°	021 / 15°	020 / 15°	020 / 15°	020 / 15°
	021 / 30°	021 / 30°	020 / 30°	020 / 30°	020 / 30°
	021 / 45°	021 / 45°	020 / 45°	020 / 45°	020 / 45°
	021-45 / 45°	021-45 / 45°	020 / 45°	020 / 45°	020 / 45°

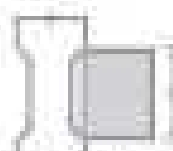
## CHAMFER CUTTERS

### Plate Chamfer Cutters



Cutting Edge Details of Chamfer Cutter

- Tool designed to chamfer flat end surfaces in a single pass
- Fluting along length of handle form 1/2" only
- Blank diameter (D) required for tight cutting and finishing edges
- 40° angle
- 4 Flutes
- Hardness: HRC 62-64
- ISO grade: G10-K10



Formed Plate Thickness



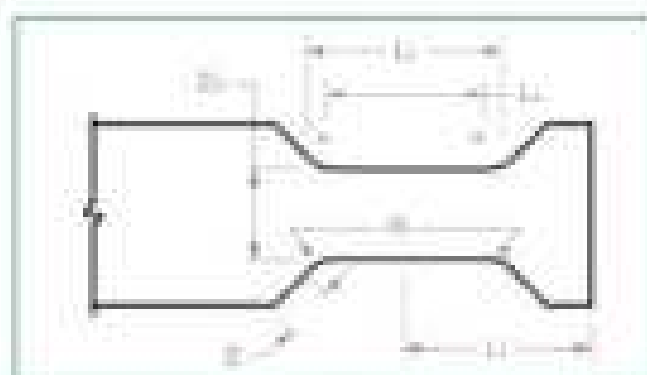
Stages of Performing Flat End Chamfering  
Left Fluting & Edge Trimming

DIA. OF CUTTING EDGE	DIA. OF HANDLE SECTION	CHAMFER BEVEL LENGTH		BEVEL DIA. LENGTH	DIA. OF HANDLE	DIA. OF HANDLE	DIA. OF HANDLE	DIA. OF HANDLE	DIA. OF HANDLE	DIA. OF HANDLE	DIA. OF HANDLE	DIA. OF HANDLE	CHAMFER ANGLE		DIA. OF HANDLE	
		L	L1										DIA.	DIA.		
1/2"	1/2"	0.18"	0.18"	0.18"	0.18"	0.18"	0.18"	0.18"	0.18"	0.18"	0.18"	0.18"	40°	40°	0.18"	0.18"
3/8"	3/8"	0.12"	0.12"	0.12"	0.12"	0.12"	0.12"	0.12"	0.12"	0.12"	0.12"	0.12"	40°	40°	0.12"	0.12"
1/4"	1/4"	0.08"	0.08"	0.08"	0.08"	0.08"	0.08"	0.08"	0.08"	0.08"	0.08"	0.08"	40°	40°	0.08"	0.08"
3/16"	3/16"	0.06"	0.06"	0.06"	0.06"	0.06"	0.06"	0.06"	0.06"	0.06"	0.06"	0.06"	40°	40°	0.06"	0.06"
1/8"	1/8"	0.04"	0.04"	0.04"	0.04"	0.04"	0.04"	0.04"	0.04"	0.04"	0.04"	0.04"	40°	40°	0.04"	0.04"
3/32"	3/32"	0.03"	0.03"	0.03"	0.03"	0.03"	0.03"	0.03"	0.03"	0.03"	0.03"	0.03"	40°	40°	0.03"	0.03"
1/16"	1/16"	0.02"	0.02"	0.02"	0.02"	0.02"	0.02"	0.02"	0.02"	0.02"	0.02"	0.02"	40°	40°	0.02"	0.02"
3/64"	3/64"	0.015"	0.015"	0.015"	0.015"	0.015"	0.015"	0.015"	0.015"	0.015"	0.015"	0.015"	40°	40°	0.015"	0.015"
1/32"	1/32"	0.01"	0.01"	0.01"	0.01"	0.01"	0.01"	0.01"	0.01"	0.01"	0.01"	0.01"	40°	40°	0.01"	0.01"
1/64"	1/64"	0.005"	0.005"	0.005"	0.005"	0.005"	0.005"	0.005"	0.005"	0.005"	0.005"	0.005"	40°	40°	0.005"	0.005"
3/128"	3/128"	0.003"	0.003"	0.003"	0.003"	0.003"	0.003"	0.003"	0.003"	0.003"	0.003"	0.003"	40°	40°	0.003"	0.003"
1/128"	1/128"	0.002"	0.002"	0.002"	0.002"	0.002"	0.002"	0.002"	0.002"	0.002"	0.002"	0.002"	40°	40°	0.002"	0.002"

Formed Plate Thicknesses are based on 1/2" dia. chamfering section (shown)



For additional tool information, visit the TAP web site at [www.harsco.com](http://www.harsco.com)



## PICATINNY FORM CUTTERS

### Picatinny Rail Form Cutters



- Designed to the MIL-STD-1913 specifications
- Cut the entire Picatinny Rail in a single pass without tool change
- Diameter from 0.50" (12.70mm)
  - Small: Right hand cut to end of full length (L<sub>1</sub>)
  - Small: Left hand reverse chamfer to angle and full length (L<sub>2</sub>)
- Making an inventory of various form and cut tool is not
- A better choice than for better cutting action
- 0.001" lead cut for all standard threads
- A hand variable = 0.001" ground to the USA

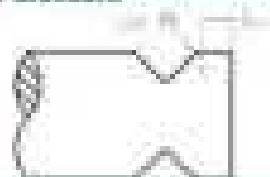
According to Standard

CUTTING DIAMETER	LENGTH OF CUT	MINIMUM DIAMETER	MINIMUM LENGTH (L <sub>1</sub> )	MAX. LENGTH (L <sub>2</sub> )	TYP. LENGTH	TYP. SPEED (RPM)	TYPICAL FEED (IPM)	STANDARD		THE COMPANY	
								4-7%	10-15%	4-7%	10-15%
0.50 (12.70)	0.75	0.50	0.75	1.00	1	100	0	4-7%	10-15%	4-7%	10-15%
0.625 (15.88)	0.75	0.625	0.75	1.00	0	100	0	4-7%	10-15%	4-7%	10-15%
0.75 (19.05)	0.75	0.75	0.75	1.00	1	100	0.10	4-7%	10-15%	4-7%	10-15%
0.875 (22.23)	0.75	0.875	0.75	1.00	0	100	0.10	4-7%	10-15%	4-7%	10-15%

Type I - Picatinny Rail Form  
1913 Standard



Type II - Picatinny Rail Form  
1913 Standard



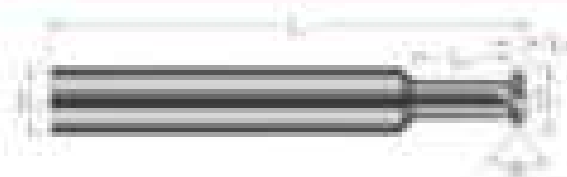
### Multi-Functional Tools Every Shop Should Have

Is your shop going to become more efficient when shop work is done how these 7 tools will do a lot of work without reducing your work time and handling your shop's daily output to get "in the shop" they are Multi-Functional Tools Every Shop Should Have

Read more on [www.performanceusa.com](http://www.performanceusa.com) in the image

## PICATINNY FORM CUTTERS

### Picatinny Attachment Cutters



- Mill the groove form for the Picatinny Rail used for attachment
- Cutting an variety of angles and flat
- Short lengths for increased strength
- 3 Flute — 3 Flute Version — CNC ground in the USA

Substituting in Material

OVERALL LENGTH	CUTTER DIAMETER	YR FLAT	CUTTER LENGTH	SHANK DIAMETER	SHANK LENGTH	SHANK FLAUGHT	OVERALL LENGTH	MATERIAL		P/N NUMBER	
								414	416-4	414	416-4
1.00"	0.1250"	0.0000"	0.1250"	0.1250"	0.1250"	0.1250"	0.1250"	414-010	416-010	414-010-01	416-010-01
1.50"	0.1250"	0.0000"	0.1250"	0.1250"	0.1250"	0.1250"	0.1250"	414-015	416-015	414-015-01	416-015-01

## PICATINNY FORM CUTTERS

### Picatinny Recess Groove End Mills



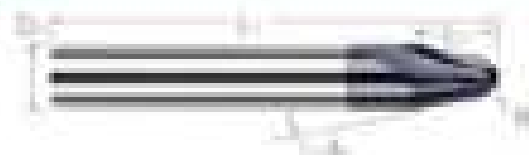
Flaked to sharp corner, 300° or 45° corner radius

- Optimized for the groove across the Picatinny Rail
- Diameter allows for a slight cut to create the groove
- Short flute length for increased strength
- Cutting an recesses for slots for depth when used at top of groove
- Edge breaks and upper case problems for increased performance
- 3 Flute — Special cutting
- 3 Flute Version — CNC ground in the USA

Substituting in Material

CUTTER DIAMETER	CUTTER RADIUS	LENGTH OF CUT	SHANK DIAMETER	OVERALL LENGTH	MATERIAL		P/N NUMBER	
0.1250"	0.1250"	0.1250"	0.1250"	1.00"	414	416-4	414	416-4
0.1250"	0.1250"	0.1250"	0.1250"	0.1250"	414-010	416-010	414-010-01	416-010-01
0.1250"	0.1250"	0.1250"	0.1250"	0.1250"	414-015	416-015	414-015-01	416-015-01
0.1250"	0.1250"	0.1250"	0.1250"	0.1250"	414-020	416-020	414-020-01	416-020-01
0.1250"	0.1250"	0.1250"	0.1250"	0.1250"	414-025	416-025	414-025-01	416-025-01
0.1250"	0.1250"	0.1250"	0.1250"	0.1250"	414-030	416-030	414-030-01	416-030-01
0.1250"	0.1250"	0.1250"	0.1250"	0.1250"	414-035	416-035	414-035-01	416-035-01

## RUNNER CUTTERS



- Designed to cut 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100 diameter in metal
- 3 fluted design (137° angle)
- ATN coating for increased performance in various materials
- ATN Nano-coating for superior performance in fatigue and strength in extreme conditions
- Chamfered end
- Solid carbide
- ISO 9001 certified ISO 14001

CUTTER SERIES	Series	LENGTH OF CUT	DIA. OF SHANK	CUTTING LENGTH	METRIC		IMPERIAL		MATERIALS	
					mm	mm	mm	mm	mm	mm
A	100	100	10	10	20	20	0.75	0.75	Aluminum	Steel
		100	15	15	20	20	0.75	0.75	Aluminum	Steel
		100	20	20	20	20	0.75	0.75	Aluminum	Steel
B	100	100	10	10	20	20	0.75	0.75	Aluminum	Steel
		100	15	15	20	20	0.75	0.75	Aluminum	Steel
		100	20	20	20	20	0.75	0.75	Aluminum	Steel
		100	25	25	20	20	0.75	0.75	Aluminum	Steel
		100	30	30	20	20	0.75	0.75	Aluminum	Steel
		100	35	35	20	20	0.75	0.75	Aluminum	Steel
C	100	100	10	10	20	20	0.75	0.75	Aluminum	Steel
		100	15	15	20	20	0.75	0.75	Aluminum	Steel
		100	20	20	20	20	0.75	0.75	Aluminum	Steel
100	100	100	10	10	20	20	0.75	0.75	Aluminum	Steel
		100	15	15	20	20	0.75	0.75	Aluminum	Steel
		100	20	20	20	20	0.75	0.75	Aluminum	Steel
		100	25	25	20	20	0.75	0.75	Aluminum	Steel
		100	30	30	20	20	0.75	0.75	Aluminum	Steel
		100	35	35	20	20	0.75	0.75	Aluminum	Steel
		100	40	40	20	20	0.75	0.75	Aluminum	Steel
		100	45	45	20	20	0.75	0.75	Aluminum	Steel
		100	50	50	20	20	0.75	0.75	Aluminum	Steel
		100	55	55	20	20	0.75	0.75	Aluminum	Steel
		100	60	60	20	20	0.75	0.75	Aluminum	Steel
		100	65	65	20	20	0.75	0.75	Aluminum	Steel
		100	70	70	20	20	0.75	0.75	Aluminum	Steel
		100	75	75	20	20	0.75	0.75	Aluminum	Steel
		100	80	80	20	20	0.75	0.75	Aluminum	Steel

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# RUNNER CUTTERS

(cont.)

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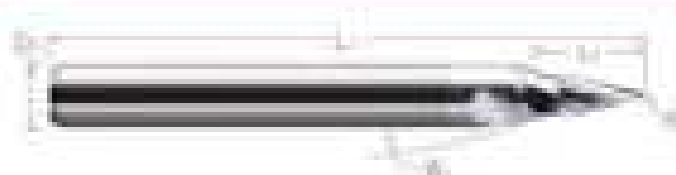
HSS MPT Size	Series	Length in/in	Number of Inserts	Turning Length	Dimensions		With 20° Taper		With 20° Chamfer	
					Ø in	Length in	Ø in	Length in	Ø in	Length in
1/2"	100	1.00	4	1.00	1.00	1.00	1.00	1.00		
	100	1.00	4	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	4	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	4	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	4	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	4	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	4	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	4	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	4	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	4	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	4	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	100	1.00	4	1.00	1.00	1.00	1.00	1.00	1.00	1.00
3/8"	100	0.75	4	0.75	0.75	0.75	0.75	0.75		
	100	0.75	4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	100	0.75	4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	100	0.75	4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	100	0.75	4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	100	0.75	4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	100	0.75	4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	100	0.75	4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	100	0.75	4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	100	0.75	4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	100	0.75	4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
	100	0.75	4	0.75	0.75	0.75	0.75	0.75	0.75	0.75
1/4"	100	0.50	4	0.50	0.50	0.50	0.50	0.50		
	100	0.50	4	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	100	0.50	4	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	100	0.50	4	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	100	0.50	4	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	100	0.50	4	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	100	0.50	4	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	100	0.50	4	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	100	0.50	4	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	100	0.50	4	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	100	0.50	4	0.50	0.50	0.50	0.50	0.50	0.50	0.50
	100	0.50	4	0.50	0.50	0.50	0.50	0.50	0.50	0.50
1/8"	100	0.25	4	0.25	0.25	0.25	0.25	0.25		
	100	0.25	4	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	100	0.25	4	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	100	0.25	4	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	100	0.25	4	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	100	0.25	4	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	100	0.25	4	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	100	0.25	4	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	100	0.25	4	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	100	0.25	4	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	100	0.25	4	0.25	0.25	0.25	0.25	0.25	0.25	0.25
	100	0.25	4	0.25	0.25	0.25	0.25	0.25	0.25	0.25
3/16"	100	0.1875	4	0.1875	0.1875	0.1875	0.1875	0.1875		
	100	0.1875	4	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
	100	0.1875	4	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
	100	0.1875	4	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
	100	0.1875	4	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
	100	0.1875	4	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
	100	0.1875	4	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
	100	0.1875	4	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
	100	0.1875	4	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
	100	0.1875	4	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
	100	0.1875	4	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875
	100	0.1875	4	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875	0.1875

Standard Length

100 100 100 100 100

## RUNNER CUTTERS

For Non-Ferrous Materials

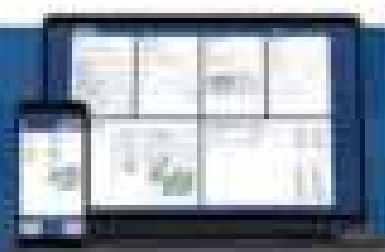


- Optimized for aluminum and aluminum alloys and excellent performance in copper alloys and brass alloys
- Designed for use 10°, 15°, and 20° chamfer at front
- 2 flutes (flute radius = 2R) front
- Chamfer with 15° chamfer to minimize spring
- Super cutting
- Solid carbide
- 100% ground in the USA

Overall Length (mm)	Overall Diameter (mm)	Overall Length (inch)	Overall Diameter (inch)	CUTTING		FL. RADIUS	
				15°	100R	15°	100R
100	10	1.00	0.39	1.00	100R	1.00	100R
	15	1.50	0.59	1.50	150R	1.50	150R
	20	2.00	0.79	2.00	200R	2.00	200R
150	10	1.50	0.39	1.50	150R	1.50	150R
	15	2.25	0.59	2.25	225R	2.25	225R
	20	3.00	0.79	3.00	300R	3.00	300R
200	10	2.00	0.39	2.00	200R	2.00	200R
	15	3.00	0.59	3.00	300R	3.00	300R
	20	4.00	0.79	4.00	400R	4.00	400R

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## HEXALORE CUTTERS



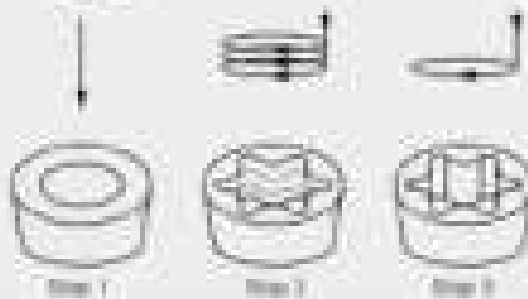
- Optimized for various alloys - Inconel, Incol alloys and other high temperature materials with outstanding performance capability in turbine shafts, compressor shafts and hot shafts.
- Sintered carbides are slightly under heat treated to ensure joints, applied to remove the scale with ease and to extend the strength of the tool.
- All shafts are made for high precision hot turning.
- Super cutting
- Solid solution
- ISO 9001 certified by the ISO.

HEXALORE MODEL NUMBER	DIPPER ELEMENT	LENGTH (IN/CM)	SHAFT DIAMETER	STEM DIAMETER	HEAT TREATING	
					PH	PH2
50-50	110	100 (in)	1.075 (in)	1.075 (in)	1020-1025	1020-1025
70-70	110	100 (in)	1.075 (in)	1.075 (in)	1020-1025	1020-1025
70-110	110	100 (in)	1.075 (in)	1.075 (in)	1020-1025	1020-1025
710-710	80	100 (in)	1.075 (in)	1.075 (in)	1020-1025	1020-1025
700-700	80	100 (in)	1.075 (in)	1.075 (in)	1020-1025	1020-1025
700-710	80	100 (in)	1.075 (in)	1.075 (in)	1020-1025	1020-1025
700-740	80	100 (in)	1.075 (in)	1.075 (in)	1020-1025	1020-1025

### Hexalore Order of Operations



There are a few different approaches when machining a hexalore cutter, as several cutting parameters need to be adjusted to properly control the machine tool surface to achieve the desired pattern and finish. Below are four useful methods used to help create the shape and finish for the desired application.



1. The work is first machined and machined down to width of the hole of the hole and/or control the Hexalore Operations tool.
2. Turn a Long Round Hexalore Cutter to allow traditional roughing and finish or finish operations. (Hexalore have introduced tool that is able to follow-up).
3. Finish with a Chamfer Cutter to remove any stress marks and achieve required finish.

## HEXALUBE CUTTERS

### Long Reach



- Optimized for maximum stress removal, rapid chip load and other high performance materials with outstanding performance in difficult to machine alloys, stainless steels and cast alloys
- Cut-to tolerances are slightly undersized unless hexalube tool, wrapped by various (the rest) with steel and increases the strength of the tool
- Reduced tool diameter to avoid loading
- 100 percent tolerance for high precision tool holders
- Inverse coating
- Super carbide
- CNC ground in the USA

HEXALUBE CUTTER NUMBER	CUTTER DIAMETER	LENGTH OF CUT	OVERALL LENGTH	TYPICAL LENGTH		HEXALUBE CUTTING		
				L1	L2	40%	60%	
101 / 10	.010	.005	.005 / .010	.005 / .010	.005 / .010	.005 / .010	101 / 10	1010
102 / 10	.012	.005	.005 / .010	.005 / .010	.005 / .010	.005 / .010	102 / 10	1020
111 / 10	.008	.005	.005 / .010	.005 / .010	.005 / .010	.005 / .010	111 / 10	1110
103 / 10	.008	.005	.005 / .010	.005 / .010	.005 / .010	.005 / .010	103 / 10	1030
104 / 10	.008	.005	.005 / .010	.005 / .010	.005 / .010	.005 / .010	104 / 10	1040
105 / 10	.008	.005	.005 / .010	.005 / .010	.005 / .010	.005 / .010	105 / 10	1050

### Hexalube Order of Operations:



There are a few different approaches when machining a hexalube pattern. In terms of milling, hexalube cutting is required to properly contour the multiple side surfaces to achieve the dimensional and finish tolerances that require multiple passes to fully create the shape and depth for the desired configuration.



1. We will enter diameter and overall diameter (width) of the tip of the tool with our computer Hexalube CounterSink tool.
2. Insert a Long Reach Hexalube Cutter for initial traditional roughing that allows a faster approach. (Inserters have increased cost. They're able to withstand).
3. Finish with a Hexalube Cutter to remove any witness marks and achieve required finish.

# HEXALOBE CUTTERS

Countersinks



- Designed to be used before a finished cutter
- 140° included tip angle
- 120° included chamfer edge
- 60° chamfer relieved for high pressure cut tools
- Center cutting
- Low coolant
- ISO ground to H6/H7

HEXALOBE COUNTERSINK	D <sub>1</sub> (mm)	L <sub>c</sub> (mm)	D <sub>2</sub> (mm)	D <sub>3</sub> (mm)	D <sub>4</sub> (mm)	MATERIAL	
						SAE	EN
10	14.00	100	100	100	1.00	A2-70	A2-70
15	18.00	100	100	100	1.00	A2-70	A2-70
20	21.00	100	100	100	1.00	A2-70	A2-70
25	25.00	100	110	100	1.00	A2-70	A2-70
30	29.00	100	120	100	1.00	A2-70	A2-70
35	33.00	100	130	100	1.00	A2-70	A2-70
40	37.00	100	140	100	1.00	A2-70	A2-70
45	41.00	100	150	100	1.00	A2-70	A2-70
50	45.00	100	160	100	1.00	A2-70	A2-70
55	49.00	100	170	100	1.00	A2-70	A2-70
60	53.00	100	180	100	1.00	A2-70	A2-70
65	57.00	100	190	100	1.00	A2-70	A2-70
70	61.00	100	200	100	1.00	A2-70	A2-70
75	65.00	100	210	100	1.00	A2-70	A2-70
80	69.00	100	220	100	1.00	A2-70	A2-70
85	73.00	100	230	100	1.00	A2-70	A2-70
90	77.00	100	240	100	1.00	A2-70	A2-70
95	81.00	100	250	100	1.00	A2-70	A2-70
100	85.00	100	260	100	1.00	A2-70	A2-70

## Hexalobe Order of Operations



There are a few different approaches when machining a hexalobe pattern. In order of cutting, minimum tooling is required to properly remove the multiple radii surfaces to produce the desired pattern and finish. However, that requires sufficient time to take create the shape and depth for the desired specification.



1. The end face diameter and axial chamfer width at the top of the hole with our proprietary Hexalobe Countersink tool.
2. Feed a long reach hexalobe cutter to finish multi-cutting (using end feeds or other revolution). (Hexalobe tool selected with the radius to complete)
3. Feed with a finished cutter to create any surface finish and achieve roundness.

## ENGRAVING CUTTERS

### Pointed



- 1) Diameter at point = 1/2 of diameter of shaft
- 2) Radius for right hand cutting = 1/2 of diameter = 1/4 of ground in the shaft



Shaded in **Red** indicates Region

ANGLE	Dia.	LENGTH OF SHAFT	TYPE	SPLIT LENGTH	OVERALL LENGTH	UNSHARPER		SHARPER		RECOMMENDED SPEED	
						TYPE I	TYPE II	TYPE I	TYPE II	TYPE I	TYPE II
10°	1.6	100	1	100	110	W0000	10.00	W0000-01	10.00		
	2.0	100	1	1.0	0	W0000	10.00	W0000-01	10.00		
	1.6	100	1	0.0	0.00	W0000	10.00	W0000-01	10.00		
15°	1.6	100	1	100	110	W0000	10.00	W0000-01	10.00		
	2.0	100	1	1.0	0	W0000	10.00	W0000-01	10.00		
	1.6	100	1	0.0	0.00	W0000	10.00	W0000-01	10.00		
20°	1.6	100	1	100	110	W0000	10.00	W0000-01	10.00	W0000-04	10.00
	2.0	100	1	1.0	0	W0000	10.00	W0000-01	10.00		
	1.6	100	1	0.0	0.00	W0000	10.00	W0000-01	10.00		
25°	1.6	100	1	100	110	W0000	10.00	W0000-01	10.00		
	2.0	100	1	1.0	0	W0000	10.00	W0000-01	10.00		
	1.6	100	1	0.0	0.00	W0000	10.00	W0000-01	10.00		
30°	1.6	100	1	100	110	W0000	10.00	W0000-01	10.00		
	1.6	120	0	1.0	1.00	W0000	10.00	W0000-01	10.00	W0000-04	10.00
	1.6	100	0	1.0	0	W0000	10.00	W0000-01	10.00		
	2.0	100	0	0.0	0	W0000	10.00	W0000-01	10.00		
	1.6	100	0	0.0	0.00	W0000	10.00	W0000-01	10.00	W0000-04	10.00
35°	1.6	100	1	100	110	W0000	10.00	W0000-01	10.00		
	1.6	110	0	1.0	1.00	W0000	10.00	W0000-01	10.00	W0000-04	10.00
	1.6	100	0	1.0	0	W0000	10.00	W0000-01	10.00		
	2.0	100	0	0.0	0	W0000	10.00	W0000-01	10.00		
	1.6	100	0	0.0	0.00	W0000	10.00	W0000-01	10.00	W0000-04	10.00
40°	1.6	100	1	100	110	W0000	10.00	W0000-01	10.00	W0000-04	10.00
	2.0	100	0	1.0	0	W0000	10.00	W0000-01	10.00		
	1.6	100	0	0.0	0.00	W0000	10.00	W0000-01	10.00		
50°	1.6	100	1	100	110	W0000	10.00	W0000-01	10.00		
	2.0	100	0	0.0	0	W0000	10.00	W0000-01	10.00		
	1.6	100	0	0.0	0.00	W0000	10.00	W0000-01	10.00		

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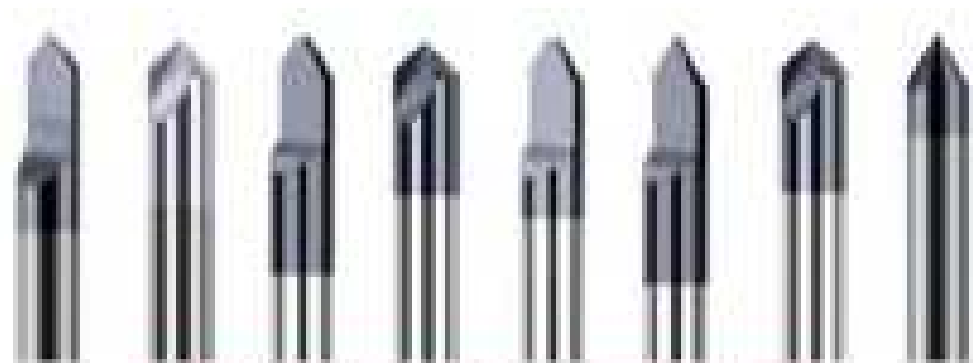
# ENGRAVING CUTTERS

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Continued from previous page

CUTTER ANGLE	Dia.	LENGTH OF CUT	Type	DPI (1 LENGTH)		DPI (2 LENGTH)		RECOMMENDED SPEEDS	
				Tool A	Tool B	Tool A	Tool B	Tool A	Tool B
80°	1.0	1.0	0	1.0	1.0	4000	15.0	8000-12	15.0
	1.0	2.0	0	1.0	2.0	4000	15.0	8000-12	15.0
	1.0	3.0	0	1.0	3.0	4000	15.0	8000-12	15.0
	1.0	4.0	0	1.0	4.0	4000	15.0	8000-12	15.0
	1.0	5.0	0	1.0	5.0	4000	15.0	8000-12	15.0
	1.0	6.0	0	1.0	6.0	4000	15.0	8000-12	15.0
	1.0	8.0	0	1.0	8.0	4000	15.0	8000-12	15.0
	1.0	10.0	0	1.0	10.0	4000	15.0	8000-12	15.0
75°	1.0	1.0	0	1.0	1.0	4000	15.0	8000-12	15.0
	1.0	2.0	0	1.0	2.0	4000	15.0	8000-12	15.0
	1.0	3.0	0	1.0	3.0	4000	15.0	8000-12	15.0
	1.0	4.0	0	1.0	4.0	4000	15.0	8000-12	15.0
	1.0	5.0	0	1.0	5.0	4000	15.0	8000-12	15.0
	1.0	6.0	0	1.0	6.0	4000	15.0	8000-12	15.0
	1.0	8.0	0	1.0	8.0	4000	15.0	8000-12	15.0
	1.0	10.0	0	1.0	10.0	4000	15.0	8000-12	15.0
60°	1.0	1.0	0	1.0	1.0	4000	15.0	8000-12	15.0
	1.0	2.0	0	1.0	2.0	4000	15.0	8000-12	15.0
	1.0	3.0	0	1.0	3.0	4000	15.0	8000-12	15.0
	1.0	4.0	0	1.0	4.0	4000	15.0	8000-12	15.0
	1.0	5.0	0	1.0	5.0	4000	15.0	8000-12	15.0
	1.0	6.0	0	1.0	6.0	4000	15.0	8000-12	15.0
	1.0	8.0	0	1.0	8.0	4000	15.0	8000-12	15.0
	1.0	10.0	0	1.0	10.0	4000	15.0	8000-12	15.0
50°	1.0	1.0	0	1.0	1.0	4000	15.0	8000-12	15.0
	1.0	2.0	0	1.0	2.0	4000	15.0	8000-12	15.0
	1.0	3.0	0	1.0	3.0	4000	15.0	8000-12	15.0
	1.0	4.0	0	1.0	4.0	4000	15.0	8000-12	15.0
	1.0	5.0	0	1.0	5.0	4000	15.0	8000-12	15.0
	1.0	6.0	0	1.0	6.0	4000	15.0	8000-12	15.0
	1.0	8.0	0	1.0	8.0	4000	15.0	8000-12	15.0
	1.0	10.0	0	1.0	10.0	4000	15.0	8000-12	15.0
40°	1.0	1.0	0	1.0	1.0	4000	15.0	8000-12	15.0
	1.0	2.0	0	1.0	2.0	4000	15.0	8000-12	15.0
	1.0	3.0	0	1.0	3.0	4000	15.0	8000-12	15.0

DPI = DEPTH OF CUT PER INCH



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

## ENGRAVING CUTTERS

Printed - Double Fluted



- Double-fluted
- 130° cutting angle designed for improved lifespan at higher RPMs
- Ground to a point
- High speed HSS type
- Polished for right hand cutting
- 1/2 inch length
- 1/8 inch ground in the shank



Designed by **WIPAC** Technical Engineer

ENGRAVING MODEL	D <sub>1</sub>	L <sub>1</sub>	TYPE	D <sub>2</sub> (L <sub>2</sub> )	D <sub>3</sub> (L <sub>3</sub> )	ENGRAVING		DRILLING		RECOMMENDED SPEEDS	
						Feed (mm)	Speed (rpm)	Feed (mm)	Speed (rpm)	Feed (mm)	Speed (rpm)
801	1/8	3/8	0	1/8	0	0.002	1725	0.002	1800	0.002	
	1/16	3/16	0	1/16	0	0.001	3450	0.001	3600	0.001	
	1/32	3/32	0	1/32	0.010	0.0005	6900	0.0005	7200	0.0005	
802	1/8	1/2	0	1/8	0	0.002	1725	0.002	1800	0.002	
	1/16	1/4	0	1/16	0	0.001	3450	0.001	3600	0.001	
	1/32	1/8	0	1/32	0.010	0.0005	6900	0.0005	7200	0.0005	
803	1/8	3/4	0	1/8	0	0.002	1725	0.002	1800	0.002	
	1/16	3/8	0	1/16	0	0.001	3450	0.001	3600	0.001	
	1/32	3/16	0	1/32	0.010	0.0005	6900	0.0005	7200	0.0005	
804	1/8	1 1/8	0	1/8	0	0.002	1725	0.002	1800	0.002	1800 - 3600
	1/16	3/4	0	1/16	0	0.001	3450	0.001	3600	0.001	
	1/32	3/8	0	1/32	0.010	0.0005	6900	0.0005	7200	0.0005	
805	1/8	1 1/4	0	1/8	0	0.002	1725	0.002	1800	0.002	1800 - 3600
	1/16	3/4	0	1/16	0	0.001	3450	0.001	3600	0.001	
	1/32	3/8	0	1/32	0.010	0.0005	6900	0.0005	7200	0.0005	

FIGURE 1



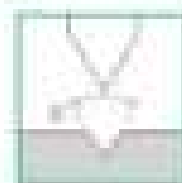


## ENGRAVING CUTTERS

Pointed - Pyramidal Point



- Fluted design increases its strength
- Ground to a point
- Hard surface
- 0.02 ground in the hole



Based on  $\alpha$  - Engraving Angle

ENGRAVING ANGLE	Diameter	LENGTH OF CUT	OVERALL LENGTH	MATERIAL		SPRUE CODES	
				PHOS. #	PHOS.	PHOS. #	PHOS.
60°	10	33	110	9999	0110	999910	0110
	15	40	110	9999	0115	999915	0115
	20	47	110	9999	0120	999920	0120
75°	10	33	110	9999	0110	999910	0110
	15	40	110	9999	0115	999915	0115
	20	47	110	9999	0120	999920	0120
90°	10	33	110	9999	0110	999910	0110
	15	40	110	9999	0115	999915	0115
	20	47	110	9999	0120	999920	0120
105°	10	33	110	9999	0110	999910	0110
	15	40	110	9999	0115	999915	0115
	20	47	110	9999	0120	999920	0120
120°	10	33	110	9999	0110	999910	0110
	15	40	110	9999	0115	999915	0115
	20	47	110	9999	0120	999920	0120
135°	10	33	110	9999	0110	999910	0110
	15	40	110	9999	0115	999915	0115
	20	47	110	9999	0120	999920	0120
150°	10	33	110	9999	0110	999910	0110
	15	40	110	9999	0115	999915	0115
	20	47	110	9999	0120	999920	0120

## ENGRAVING CUTTERS

### Tip Feature

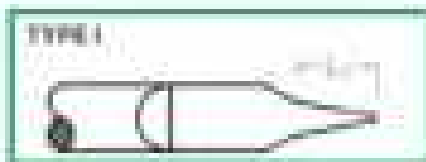


- Manufactured by chemical vapor deposition (CVD) process and improves strength
- Heat treated 48 HRC
- Balance for right hand cutting
- Heat treated : +0.002 precision for length



TWO DRILL	D1	D2	LENGTH OF DRILL	TYPE	DRILL LENGTH	HEAT TREAT HRC	ENGRAVING		WITH COATING		Minimum Flank Surface Roughness	
							TYPE A	TYPE B	TYPE A	TYPE B	TYPE A	TYPE B
10°	14	14.5	100	1	100	47.5	0.15	0.05	0.15			
	16	17	100	1	100	47.5	0.15	0.05	0.15			
15°	14	14.5	100	1	100	47.5	0.15	0.05	0.15			
	16	17	100	1	100	47.5	0.15	0.05	0.15			
20°	14	14.5	100	1	100	47.5	0.15	0.05	0.15			
	16	17	100	1	100	47.5	0.15	0.05	0.15			
30°	14	14.5	100	1	75	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	16	17	100	1	75	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	14	14.5	100	1	75	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	16	17	100	1	75	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	14	14.5	100	1	50	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	16	17	100	1	50	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	14	14.5	100	1	25	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	16	17	100	1	25	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	14	14.5	100	1	0	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	16	17	100	1	0	47.5	0.15	0.05	0.15	0.05	0.15	0.15
45°	14	14.5	100	1	75	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	16	17	100	1	75	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	14	14.5	100	1	50	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	16	17	100	1	50	47.5	0.15	0.05	0.15	0.05	0.15	0.15
50°	14	14.5	100	1	75	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	16	17	100	1	75	47.5	0.15	0.05	0.15	0.05	0.15	0.15
60°	14	14.5	100	1	50	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	16	17	100	1	50	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	14	14.5	100	1	25	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	16	17	100	1	25	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	14	14.5	100	1	0	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	16	17	100	1	0	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	14	14.5	100	1	0	47.5	0.15	0.05	0.15	0.05	0.15	0.15
	16	17	100	1	0	47.5	0.15	0.05	0.15	0.05	0.15	0.15

(continued on next page)



# ENGRAVING CUTTERS

Tip Radius (mm)

Continued from previous page

SERIAL NUMBER	D	H	LENGTH OF CUT	TYP	DWT CUTTERS	CUTTING SPEED	RECOMMEND		STOCK NUMBER		APPROXIMATE WEIGHT	
							FEED	SPR	FEED	SPR	FEED	SPR
A	10	2000	10	0	10	0	0.000	0.00	00000000	0000		
	10	2000	10	0	00	0	0.000	0.00	00000000	0000		
	10	2000	10	0	10	0	0.000	0.00	00000000	0000		
	10	2000	10	0	00	0	0.000	0.00	00000000	0000		
	10	2000	10	0	00	0	0.000	0.00	00000000	0000		
	10	2000	10	0	00	0	0.000	0.00	00000000	0000		
	14	2000	14	0	10	0.10	0.000	0.00	00000000	0000		
	14	2000	14	0	00	0.00	0.000	0.00	00000000	0000		
	14	2000	14	0	10	0.10	0.000	0.00	00000000	0000		
	14	2000	14	0	00	0.00	0.000	0.00	00000000	0000		
	14	2000	14	0	10	0.10	0.000	0.00	00000000	0000		
	14	2000	14	0	00	0.00	0.000	0.00	00000000	0000		
B	10	2000	10	0	10	1.00	0.000	0.00	00000000	0000		
	14	2000	14	0	00	0.00	0.000	0.00	00000000	0000		
C	10	2000	10	0	10	1.00	0.000	0.00	00000000	0000	000000	0000
	10	2000	10	0	00	1.00	0.000	0.00	00000000	0000	000000	0000
	14	2000	14	0	00	0	0.000	0.00	00000000	0000		
	14	2000	14	0	00	1.00	0.000	0.00	00000000	0000		
	14	2000	14	0	10	1.00	0.000	0.00	00000000	0000	000000	0000
	14	2000	14	0	00	1.00	0.000	0.00	00000000	0000		
	10	2000	10	0	10	1.00	0.000	0.00	00000000	0000		
	10	2000	10	0	00	1.00	0.000	0.00	00000000	0000		
	14	2000	14	0	00	1.00	0.000	0.00	00000000	0000		
	10	2000	10	0	00	0	0.000	0.00	00000000	0000		
	10	2000	10	0	10	0	0.000	0.00	00000000	0000		
	10	2000	10	0	00	0	0.000	0.00	00000000	0000		
	14	2000	14	0	10	0.10	0.000	0.00	00000000	0000		
	14	2000	14	0	00	0.00	0.000	0.00	00000000	0000		
	14	2000	14	0	10	0.10	0.000	0.00	00000000	0000		
	14	2000	14	0	00	0.00	0.000	0.00	00000000	0000		
D	10	2000	10	0	00	1.00	0.000	0.00	00000000	0000		
	14	2000	14	0	00	0.00	0.000	0.00	00000000	0000		

CUTTING SPEED (FEED)

## ENGRAVING CUTTERS

### Tip Flatness - Double-Ended



- Double-ended
- 100° tapering end length for increased tolerance of higher RPMs
- Made out of premium quality material of ground and increased strength
- High-speed steel type
- Relieves for right-hand cutting
- Made in India
- ISO 9001 in the USA



ENGRAVING ANGLE	DIAMETER	LENGTH	LENGTH TO TIP	TYPE	SPINDLE Diameter	OVERALL LENGTH	WEIGHT		MATERIAL	
							TYPE A	TYPE B	TYPE A	TYPE B
30°	12	8000	25	A	7/8	7	0.1100	0.040	0.000012	0.000
	12	8000	25	B	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	A	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	B	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	A	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	B	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	A	0.8	7	0.0000	0.0000	0.000012	0.000
45°	12	8000	25	A	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	B	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	A	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	B	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	A	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	B	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	A	0.8	7	0.0000	0.0000	0.000012	0.000
60°	12	8000	25	A	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	B	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	A	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	B	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	A	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	B	0.8	7	0.0000	0.0000	0.000012	0.000
	12	8000	25	A	0.8	7	0.0000	0.0000	0.000012	0.000

#### TYPE II



# ENGRAVING CUTTERS

Tipped Off



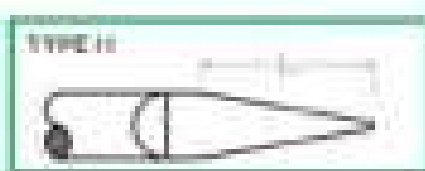
- Tipped off end allows for increased cutting
- Size (D) represents the generated or reference
- High-speed steels
- Suitable for right hand cutting
- Solid carbide
- CNC ground at the end



(Shown to the included diagram)

CUTTING ANGLE	D1	D2	FLAT SURFACE OF CUT	LENGTH OF CUT	TYPE	MAX. LENGTH	D2	DIMENSIONS		MATERIAL		REQUIREMENT	
								TYPE A	TYPE B	TYPE A	TYPE B	TYPE A	TYPE B
10°	10	800	80	5	1	200	1.10	2000	20.00	2000.00	20.00		
	10	400	40	5	1	100	1.10	2000	20.00	2000.00	20.00		
	10	200	20	5	1	50	1.10	2000	20.00	2000.00	20.00		
15°	10	800	80	5	1	200	1.10	2000	20.00	2000.00	20.00		
	10	400	40	5	1	100	1.10	2000	20.00	2000.00	20.00		
	10	200	20	5	1	50	1.10	2000	20.00	2000.00	20.00		
20°	10	800	80	5	1	200	1.10	2000	20.00	2000.00	20.00		
	10	400	40	5	1	100	1.10	2000	20.00	2000.00	20.00		
	10	200	20	5	1	50	1.10	2000	20.00	2000.00	20.00		
30°	10	800	80	5	1	200	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	400	40	5	1	100	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	200	20	5	1	50	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	800	80	5	1	200	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	400	40	5	1	100	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	200	20	5	1	50	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	800	80	5	1	200	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	400	40	5	1	100	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	200	20	5	1	50	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	800	80	5	1	200	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	400	40	5	1	100	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	200	20	5	1	50	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
45°	10	800	80	5	1	200	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	400	40	5	1	100	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	200	20	5	1	50	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	800	80	5	1	200	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	400	40	5	1	100	1.10	2000	20.00	2000.00	20.00	2000.00	20.00
	10	200	20	5	1	50	1.10	2000	20.00	2000.00	20.00	2000.00	20.00

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## ENGRAVING CUTTERS

Tipped Off (cont.)

continued from previous page

WHL Model	Dia.	Flat to Point	Length to Cut	Type	WHL Length	WHL Dia.	Inventory		Ordering Info.		Lead Times (Business Days)	
							7500	7500	7500	7500	7500	7500
44"	18	000	100	0	00	1110	0000	000	0000	0000	0000	
	18	000	100	0	00	1110	0000	000	0000	0000	0000	
	210	000	010	0	00	0	0000	000	0000	0000	0000	
	110	000	000	0	00	0110	0000	000	0000	0000	0000	
60"	18	000	100	0	00	1110	0000	000	0000	0000	0000	0000
	18	000	100	0	00	0	0000	0000	0000	0000	0000	0000
	18	000	000	0	00	1110	0000	000	0000	0000	0000	0000
	18	000	000	0	00	1110	0000	000	0000	0000	0000	0000
	18	000	000	0	00	1110	0000	000	0000	0000	0000	0000
	18	000	000	0	00	1110	0000	000	0000	0000	0000	0000
	18	000	000	0	00	0	0000	0000	0000	0000	0000	0000
	18	000	100	0	00	0	0000	0000	0000	0000	0000	0000
	18	000	100	0	00	0	0000	0000	0000	0000	0000	0000
	18	000	100	0	00	0	0000	0000	0000	0000	0000	0000
	18	000	100	0	00	0	0000	0000	0000	0000	0000	0000
	18	000	100	0	00	0	0000	0000	0000	0000	0000	0000
	18	000	100	0	00	0	0000	0000	0000	0000	0000	0000
	18	000	100	0	00	0	0000	0000	0000	0000	0000	0000
	18	000	100	0	00	0	0000	0000	0000	0000	0000	0000
	80"	18	000	000	0	00	1110	0000	000	0000	0000	0000
18		000	000	0	00	1110	0000	000	0000	0000	0000	0000
18		000	000	0	00	1110	0000	000	0000	0000	0000	0000
18		000	000	0	00	1110	0000	000	0000	0000	0000	0000
18		000	000	0	00	0	0000	0000	0000	0000	0000	0000
18		000	000	0	00	0	0000	0000	0000	0000	0000	0000
18		000	000	0	00	0	0000	0000	0000	0000	0000	0000
18		000	000	0	00	0	0000	0000	0000	0000	0000	0000
18		000	000	0	00	0	0000	0000	0000	0000	0000	0000
18		000	000	0	00	0	0000	0000	0000	0000	0000	0000
100"	18	000	000	0	00	1110	0000	000	0000	0000	0000	0000
	18	000	000	0	00	1110	0000	000	0000	0000	0000	0000

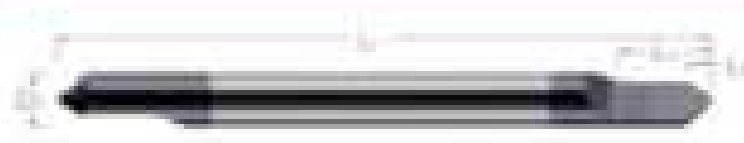
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## ENGRAVING CUTTERS

### Tipped Off – Double-Fluted



- Double-fluted
- 130° cutting edge length for improved tolerance at higher RPMs
- Tipped off end allows for improved cutting
- Flat end prevents the generation of splinters
- Full round end edge
- Reverse for right-hand cutting
- Tool holder
- 1/16" ground at the end



CUTTING SPEED	DIAMETER	FLUTE LENGTH	LENGTH OF CUT	FEED	MAX. RPM	MINIMUM CUTTING SPEED (SFM)	RECOMMENDATION		NEW DATA	
							TYPE A	TYPE B	TYPE A	TYPE B
100'	1/4	0.00	0.00	0	20	0	0.000	0.000	0.00000	0.000
	1/8	0.00	0.00	0	20	0	0.000	0.000	0.00000	0.000
	1/16	0.00	0.00	0	20	0	0.000	0.000	0.00000	0.000
	1/32	0.00	0.00	0	20	0	0.000	0.000	0.00000	0.000
	1/64	0.00	0.00	0	20	0.10	0.000	0.000	0.00000	0.000
100'	1/4	0.00	0.00	0	20	0	0.000	0.000	0.00000	0.000
	1/8	0.00	0.00	0	20	0	0.000	0.000	0.00000	0.000
	1/16	0.00	0.00	0	20	0	0.000	0.000	0.00000	0.000
	1/32	0.00	0.00	0	20	0	0.000	0.000	0.00000	0.000
	1/64	0.00	0.00	0	20	0.10	0.000	0.000	0.00000	0.000
100'	1/4	0.00	0.00	0	20	0	0.000	0.000	0.00000	0.000
	1/8	0.00	0.00	0	20	0	0.000	0.000	0.00000	0.000
	1/16	0.00	0.00	0	20	0	0.000	0.000	0.00000	0.000
	1/32	0.00	0.00	0	20	0	0.000	0.000	0.00000	0.000
	1/64	0.00	0.00	0	20	0.10	0.000	0.000	0.00000	0.000

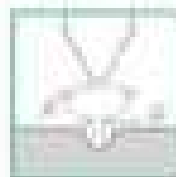


## ENGRAVING CUTTERS

### Typical D01 - Medical Flute



Close-up of cutting edge



- Optimized geometry for accurate engraving in softer materials such as plastics and aluminum
- Also suitable for precision steel, Inconel, titanium, and other high speed steels
- Free cutting action provides excellent surface finish and chip evacuation
- Tapered end and chamfers for improved cutting action
- APX coating for increased performance in ferrous materials
- T14, suitable for high speed performance in steel through materials that do not work extremely well with APX coating
- Right hand spiral, right hand cut
- Hole cutting
- ISO grade of the steel



ENGRAVING ANGLE	Diameter	FLUTE OD PART	LENGTH IN CUT	TOTAL LENGTH	APX COATING		T14 COATING		T16 COATING	
					Part #	Price	Part #	Price	Part #	Price
30°	1/8"	3/16"	1/2"	5"	HT100	\$1.2	HT100-02	\$4.4	HT100-03	\$17.75
	1/8"	3/16"	3/4"	6.125"	HT101	\$2.0	HT101-02	\$6.40	HT101-03	\$23.40
	1/8"	3/16"	1"	7.125"	HT102	\$2.8	HT102-02	\$8.80	HT102-03	\$30.20
45°	1/8"	3/16"	1/2"	5"	HT103	\$1.2	HT103-02	\$4.40	HT103-03	\$17.75
	1/8"	3/16"	3/4"	6.125"	HT104	\$2.0	HT104-02	\$6.40	HT104-03	\$23.40
	1/8"	3/16"	1"	7.125"	HT105	\$2.8	HT105-02	\$8.80	HT105-03	\$30.20
60°	1/8"	3/16"	1/2"	5"	HT106	\$1.2	HT106-02	\$4.40	HT106-03	\$17.75
	1/8"	3/16"	3/4"	6.125"	HT107	\$2.0	HT107-02	\$6.40	HT107-03	\$23.40
	1/8"	3/16"	1"	7.125"	HT108	\$2.8	HT108-02	\$8.80	HT108-03	\$30.20



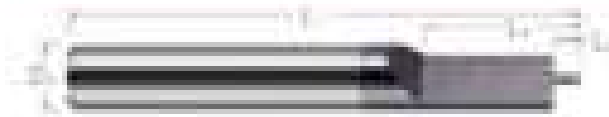
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## ENGRAVING CUTTERS

Parallel - Square



- Superior 60° corner radii
- Flat 90° chamfers for generous chip removal
- Heat-treated tool steel
- Non-rotating fixation radius at end of length of cut
- Suitable for right hand cutting
- 2nd order
- ISO grade 10 to 12

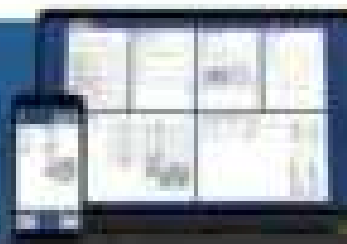


DIMENSION	SI		IPS		DIMENSION		DIMENSION	
	mm	inch	mm	inch	mm	inch	mm	inch
L	10	0.3937	15	0.5906	20	0.7874	25	0.9843
L1	10	0.3937	15	0.5906	20	0.7874	25	0.9843
D	0.8	0.0315	1.0	0.0394	1.2	0.0472	1.5	0.0591
D1	0.8	0.0315	1.0	0.0394	1.2	0.0472	1.5	0.0591
D2	0.8	0.0315	1.0	0.0394	1.2	0.0472	1.5	0.0591
D3	0.8	0.0315	1.0	0.0394	1.2	0.0472	1.5	0.0591
D4	0.8	0.0315	1.0	0.0394	1.2	0.0472	1.5	0.0591
D5	0.8	0.0315	1.0	0.0394	1.2	0.0472	1.5	0.0591
D6	0.8	0.0315	1.0	0.0394	1.2	0.0472	1.5	0.0591
D7	0.8	0.0315	1.0	0.0394	1.2	0.0472	1.5	0.0591

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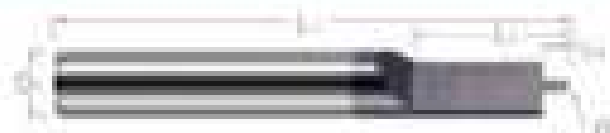


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## ENGRAVING CUTTERS

### Parallel - Ball



- Diameter is 0.07 mm total width
- Radius is 0.15 mm on radius in the section of groove and increases strength
- High-speed steel
- New cutting technique radius at end of length of cut
- Suitable for right hand cutting
- Used on hole
- 100% ground in the hole



Diameter	Ball tip	Cutting length	Total length	Overall length	Material		Price (USD)	
					Stock #	Price	Stock #	Price
0.10	0.15	100	110	1.10	00000	00.00	0000010	01.00
0.14	0.20	100	110	1.10	00000	00.00	0000014	01.00
0.18	0.25	100	110	1.10	00000	00.00	0000018	01.00
0.22	0.30	100	110	1.10	00000	00.00	0000022	01.00
0.26	0.35	100	110	1.10	00000	00.00	0000026	01.00
0.30	0.40	100	110	1.10	00000	00.00	0000030	01.00
0.34	0.45	100	110	1.10	00000	00.00	0000034	01.00
0.38	0.50	100	110	1.10	00000	00.00	0000038	01.00



"Having had others for the past few years, these cutters are the best available. My metal shop finds it good for almost all applications without having to use the custom department. Working correctly and precisely."

— Jeff, USA

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## ENGRAVING CUTTERS

Tip Radius = 2 Flute - For Hardened Steels



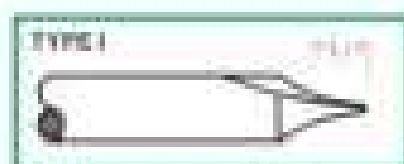
- Strong 2-Flute Design for Engraving Hardened Steels 44-48HRC
- Superior Heat Treatment for Stability and Tool Life
- 1/16" radius and diameter end profiles from design for improved cutting and strength
- Lubrication channels with Nano coating allow coolant for thrust and heat reduction
- Nano coating
- 100% ground to the size



Figure 4. Double-Flute Engraving Cutter

ENGRAVING ANGLE	DIAMETER	LENGTH	LENGTH TO CUT	TYPE	STANDARD LENGTH	STANDARD LENGTH	
						1/16"	1/8"
45°	1/8"	0.000	0.000	1	1/16"	0.0000-0.0000	0.0000
	1/8"	0.005	0.000	1	1/16"	0.0005-0.0005	0.0000
	1/8"	0.010	0.000	1	1/16"	0.0010-0.0010	0.0000
	1/8"	0.020	0.000	1	1/16"	0.0020-0.0020	0.0000
	1/8"	0.040	0.000	1	1/16"	0.0040-0.0040	0.0000
	1/8"	0.080	0.000	1	1/16"	0.0080-0.0080	0.0000
30°	1/8"	0.000	0.000	0	1/16"	0.0000-0.0000	0.0000
	1/8"	0.005	0.000	0	1/16"	0.0005-0.0005	0.0000
	1/8"	0.010	0.000	0	1/16"	0.0010-0.0010	0.0000
	1/8"	0.020	0.000	0	1/16"	0.0020-0.0020	0.0000
	1/8"	0.040	0.000	0	1/16"	0.0040-0.0040	0.0000
	1/8"	0.080	0.000	0	1/16"	0.0080-0.0080	0.0000
	1/8"	0.000	0.000	0	1/8"	0.0000-0.0000	0.0000
	1/8"	0.005	0.000	0	1/8"	0.0005-0.0005	0.0000
	1/8"	0.010	0.000	0	1/8"	0.0010-0.0010	0.0000
	1/8"	0.020	0.000	0	1/8"	0.0020-0.0020	0.0000
	1/8"	0.040	0.000	0	1/8"	0.0040-0.0040	0.0000
	1/8"	0.080	0.000	0	1/8"	0.0080-0.0080	0.0000
40°	1/8"	0.000	0.000	0	1/16"	0.0000-0.0000	0.0000
	1/8"	0.040	0.000	0	1/16"	0.0040-0.0040	0.0000
	1/8"	0.080	0.000	0	1/16"	0.0080-0.0080	0.0000
40°	1/8"	0.000	0.000	0	1/8"	0.0000-0.0000	0.0000
	1/8"	0.010	0.000	0	1/8"	0.0010-0.0010	0.0000
	1/8"	0.020	0.000	0	1/8"	0.0020-0.0020	0.0000
	1/8"	0.040	0.000	0	1/8"	0.0040-0.0040	0.0000

continued on next page



## ENGRAVING CUTTERS

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

Continued from previous page

CUTTER MODEL	DIAMETER	LENGTH	LENGTH WITHOUT FLUTE	TYPE	CUTTING LENGTH	MATERIAL CAPACITY	
						INCH	MM
887	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000	
887	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000	
887	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000
	1/8	3.94	1.57	R	1.18	0.0000-0.0008	0.0000

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## ENGRAVING CUTTERS

**Typical Of - 2 Flute - For Hardened Steels**



- Strong & Sturdy Design for engraving hardened steels A2–A10s
- Excellent chip removal capability and tool life
- Taper of end flutes and shank flute design for improved cutting and strength
- Lower generation with finer cutting edges superior hardness and tool resistance
- Solid carbon
- CNC ground to the flutes



(Detailed in **Color** Technical Report)

ENGRAVING ANGLE	Diameter	No. Flute	Length (L) (mm)	Type	Flute Length	VDR (mm)	
						1.0	0.5
90°	1.0	2	100	1	1.0	0.000	0.000
	1.5	2	100	1	1.5	0.000	0.000
	2.0	2	100	1	2.0	0.000	0.000
30°	1.0	2	100	1	1.0	0.000	0.000
	1.5	2	100	1	1.5	0.000	0.000
	2.0	2	100	1	2.0	0.000	0.000
	2.5	2	100	1	2.5	0.000	0.000
	3.0	2	100	1	3.0	0.000	0.000
	3.5	2	100	1	3.5	0.000	0.000
	4.0	2	100	1	4.0	0.000	0.000
60°	1.0	2	100	1	1.0	0.000	0.000
	1.5	2	100	1	1.5	0.000	0.000
45°	1.0	2	100	1	1.0	0.000	0.000
	1.5	2	100	1	1.5	0.000	0.000
60°	1.0	2	100	1	1.0	0.000	0.000
	1.5	2	100	1	1.5	0.000	0.000
	2.0	2	100	1	2.0	0.000	0.000
	2.5	2	100	1	2.5	0.000	0.000
	3.0	2	100	1	3.0	0.000	0.000
	3.5	2	100	1	3.5	0.000	0.000
	4.0	2	100	1	4.0	0.000	0.000
	4.5	2	100	1	4.5	0.000	0.000
	5.0	2	100	1	5.0	0.000	0.000
	5.5	2	100	1	5.5	0.000	0.000
	6.0	2	100	1	6.0	0.000	0.000

(continued on next page)



## ENGRAVING CUTTERS

Typical Off - 2 Flute - For Hardened Steels used

(continued from previous page)

CUTTING SPEED	FEED	SP. FEED	LENGTH OF CUT	TIME	TOTAL LABOR	TOTAL COST (\$/HOUR)	
						LABOR	OVERHEAD
800'	0.010	0.000	0.10	0.00	0.00	\$1000.00	\$1000.00
	0.015	0.000	0.07	0.00	0.00	\$1428.57	\$1428.57
	0.020	0.000	0.05	0.00	0.00	\$2000.00	\$2000.00
	0.030	0.000	0.03	0.00	0.00	\$3333.33	\$3333.33
	0.040	0.000	0.02	0.00	0.00	\$5000.00	\$5000.00
	0.050	0.000	0.01	0.00	0.00	\$10000.00	\$10000.00
	0.075	0.000	0.01	0.00	0.00	\$13333.33	\$13333.33
	0.100	0.000	0.01	0.00	0.00	\$20000.00	\$20000.00
	0.150	0.000	0.01	0.00	0.00	\$30000.00	\$30000.00
1000'	0.010	0.000	0.07	0.00	0.00	\$1428.57	\$1428.57
	0.015	0.000	0.05	0.00	0.00	\$2000.00	\$2000.00



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## ENGRAVING CUTTERS

### Marking Cutters for Ferrous Materials



- Designed for milling highly pure materials is difficult to engrave materials
- Run slow, use slow cutting speed, use minimum strength near sharp corner engraving
- Requires flat or bevel of gears
- Requires used materials, usually use high speed steel engravers
- Requires use PVD that roll hard engravers
- Best quality
- 20% ground on the side



Figure 10.10 Marking Cutter

CUTTING SIZE	Dc	Dc			Dc		Dc		Dc	
		10	15	20	25	30	35	40	45	50
1/8"	1/8	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/8	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/8	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/8	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/8	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/8	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/8	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/8	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/8	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/8	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
1/4"	1/4	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/4	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/4	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/4	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/4	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/4	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/4	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/4	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/4	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/4	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
3/8"	3/8	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	3/8	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	3/8	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
1/2"	1/2	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/2	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
	1/2	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00

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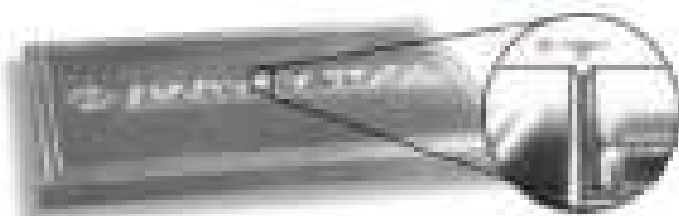
## ENGRAVING CUTTERS

Marking Cutters for Ferrous Materials (cont.)

(continued from previous page)

MILLING ANGLE	DIAMETER	WID. TO CORNER OF CUT	LENGTH		SHANK DIA.	MACHINE		SPINDLE SPEED		RECOMMENDED FEEDS	
			IN.	MM		IPM	MM/REV	IPM	MM/REV		
60°	.125	.005	.125	0	1.00	10000	1000	20000-30	1000		
	.125	.005	.125	0	1.00	10000	1000	20000-30	1000	0.0001	0.001
	.125	.005	.125	0	0	10000	1000	20000-30	1000		
	.125	.010	.125	0	1.00	10000	1000	20000-30	1000	0.0001	0.001
	.125	.010	.125	0	1.00	10000	1000	20000-30	1000		
	.125	.010	.125	0	0	10000	1000	20000-30	1000		
	.125	.015	.125	0	0	10000	1000	20000-30	1000	0.0001	0.001
	.125	.015	.125	0	0	10000	1000	20000-30	1000		
	.125	.015	.125	0	0	10000	1000	20000-30	1000		
80°	.125	.005	.125	0	0.75	10000	1000	20000-30	1000		
	.125	.005	.125	0	0.75	10000	1000	20000-30	1000	0.0001	0.001
	.125	.010	.125	0	0.75	10000	1000	20000-30	1000		
	.125	.010	.125	0	0.75	10000	1000	20000-30	1000		
	.125	.010	.125	0	0.75	10000	1000	20000-30	1000		
80°	.125	.005	.125	0	1.00	10000	1000	20000-30	1000		
	.125	.005	.125	0	1.00	10000	1000	20000-30	1000	0.0001	0.001
	.125	.010	.125	0	0	10000	1000	20000-30	1000		
	.125	.010	.125	0	1.00	10000	1000	20000-30	1000	0.0001	0.001
	.125	.010	.125	0	1.00	10000	1000	20000-30	1000		
	.125	.010	.125	0	0	10000	1000	20000-30	1000		
	.125	.015	.125	0	0	10000	1000	20000-30	1000	0.0001	0.001
	.125	.015	.125	0	0	10000	1000	20000-30	1000		
	.125	.015	.125	0	0.75	10000	1000	20000-30	1000		
	.125	.015	.125	0	0.75	10000	1000	20000-30	1000	0.0001	0.001
	.125	.015	.125	0	0.75	10000	1000	20000-30	1000		
	.125	.015	.125	0	0.75	10000	1000	20000-30	1000		
	.125	.015	.125	0	0.75	10000	1000	20000-30	1000		
120°	.125	.005	.125	0	1.00	10000	1000	20000-30	1000		
	.125	.005	.125	0	1.00	10000	1000	20000-30	1000	0.0001	0.001
	.125	.010	.125	0	0	10000	1000	20000-30	1000		
	.125	.010	.125	0	0	10000	1000	20000-30	1000		
	.125	.010	.125	0	0.75	10000	1000	20000-30	1000		
	.125	.010	.125	0	0.75	10000	1000	20000-30	1000		

For Marking Cutters for Non-Ferrous Materials, please see page 325.

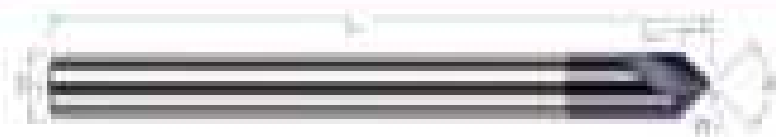


Produces Flat  
in Bottom  
of Groove



## ENGRAVING CUTTERS

### Marking Cutters - TYP MATRICES



- Designed for milling highly part numbers in difficult-to-machine materials
- Relieved top design for increased strength
- 2-flute cutting design has improved chip removal and chip control properties
- Standard radius of bottom of groove
- Standard radius = 0.0025 inches in the USA



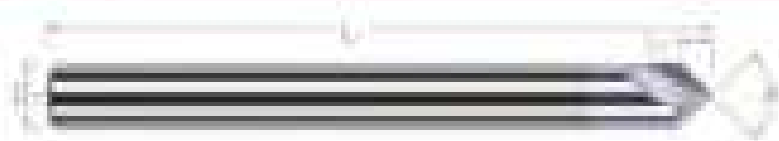
Standard 0.0025 Inch Radius

MATERIAL GRADE	Diameter	Length	Cutting Length	Overall Length	WEIGHTS		NET WEIGHTS	
					g	oz	g	oz
20°	1/8	0.375	0.25	0.50	0.017	0.60	0.014	0.48
	1/8	0.50	0.375	0.625	0.022	0.75	0.018	0.60
	1/8	0.625	0.50	0.75	0.027	0.90	0.022	0.75
	0.10	0.375	0.25	0.50	0.017	0.60	0.014	0.48
	0.10	0.50	0.375	0.625	0.022	0.75	0.018	0.60
	0.10	0.625	0.50	0.75	0.027	0.90	0.022	0.75
40°	1/8	0.375	0.25	0.50	0.016	0.55	0.013	0.45
	1/8	0.50	0.375	0.625	0.021	0.70	0.017	0.55
	1/8	0.625	0.50	0.75	0.026	0.85	0.021	0.70
60°	1/8	0.375	0.25	0.50	0.015	0.50	0.012	0.40
	1/8	0.50	0.375	0.625	0.020	0.65	0.016	0.50
	1/8	0.625	0.50	0.75	0.025	0.80	0.020	0.65
80°	1/8	0.375	0.25	0.50	0.014	0.45	0.011	0.35
	1/8	0.50	0.375	0.625	0.019	0.60	0.015	0.50
	1/8	0.625	0.50	0.75	0.024	0.75	0.020	0.65
	0.10	0.375	0.25	0.50	0.014	0.45	0.011	0.35
	0.10	0.50	0.375	0.625	0.019	0.60	0.015	0.50
	0.10	0.625	0.50	0.75	0.024	0.75	0.020	0.65
	0.15	0.375	0.25	0.50	0.020	0.60	0.016	0.50
	0.15	0.50	0.375	0.625	0.026	0.75	0.021	0.65
	0.15	0.625	0.50	0.75	0.031	0.90	0.026	0.80
	0.20	0.375	0.25	0.50	0.026	0.75	0.022	0.70
	0.20	0.50	0.375	0.625	0.032	0.90	0.028	0.85
	0.20	0.625	0.50	0.75	0.037	1.05	0.033	0.95
90°	1/8	0.375	0.25	0.50	0.013	0.40	0.010	0.30
	1/8	0.50	0.375	0.625	0.018	0.55	0.014	0.45
	1/8	0.625	0.50	0.75	0.023	0.70	0.019	0.60
	0.10	0.375	0.25	0.50	0.013	0.40	0.010	0.30
	0.10	0.50	0.375	0.625	0.018	0.55	0.014	0.45
	0.10	0.625	0.50	0.75	0.023	0.70	0.019	0.60
	0.15	0.375	0.25	0.50	0.019	0.60	0.015	0.50
	0.15	0.50	0.375	0.625	0.025	0.75	0.021	0.65
	0.15	0.625	0.50	0.75	0.030	0.90	0.026	0.80
	0.20	0.375	0.25	0.50	0.025	0.75	0.021	0.70
	0.20	0.50	0.375	0.625	0.031	0.90	0.027	0.85
	0.20	0.625	0.50	0.75	0.036	1.05	0.032	0.95
100°	1/8	0.375	0.25	0.50	0.012	0.35	0.009	0.25
	1/8	0.50	0.375	0.625	0.017	0.50	0.013	0.35

Standard 0.0025 Inch Radius

## ENGRAVING CUTTERS

### Marking Cutters for Non-Ferrous Materials



- Designed for marking legible part numbers in non-ferrous and easy-to-machine materials.
- 2.5mm cutting length has improved strength and edge wear resistance.
- Flat outer edge for improved finish in aluminum and other non-ferrous applications.
- Polished for a better fit of ground.
- Heat treated.
- CNC ground to the edge.



INCLUDES (PCS)	LENGTH	WID. TOLERANCE	LENGTH OF CUT	CUTTING ANGLE	DIMENSIONS		TYP. MATERIALS	
					Ø11	Ø10	15	Ø10
50°	10	±0.05	10	1:1	90000	90000	9000000	2:20
	15	±0.05	10	1:1	90000	90000	9000000	2:20
	20	±0.05	10	1:1	90000	90000	9000000	2:20
	25	±0.05	10	2	90000	90000	9000000	2:20
	30	±0.05	10	2:1	90000	90000	9000000	2:20
60°	10	±0.05	10	1:1	90000	90000	9000000	2:20
	15	±0.05	10	1:1	90000	90000	9000000	2:20
	20	±0.05	10	2	90000	90000	9000000	2:20
	25	±0.05	10	2:1	90000	90000	9000000	2:20
	30	±0.05	10	2:1	90000	90000	9000000	2:20
80°	10	±0.05	10	1:1	90000	90000	9000000	2:20
	15	±0.05	10	1:1	90000	90000	9000000	2:20
	20	±0.05	10	2	90000	90000	9000000	2:20
	25	±0.05	10	2:1	90000	90000	9000000	2:20
	30	±0.05	10	2:1	90000	90000	9000000	2:20
100°	10	±0.05	10	1:1	90000	90000	9000000	2:20
	15	±0.05	10	1:1	90000	90000	9000000	2:20

## ENGRAVING CUTTERS

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



- Designed for writing legible part numbers in non-ferrous and easy-to-machine materials
- Reinforcing design for increased strength
- Flat end design for improved results
- Interchangeable
- DMS grinding in the side



Shank in **Flute**  
Interchange design

MARKING CUTTER	IN (mm)	DIA (mm)	LENGTH OF CUT (mm)	TOTAL LENGTH (mm)	MATERIAL		FINISH (mm)	
					SAE	UNS	100	1000
80°	1/8	3/32	1/8	1/8	A2115	A6-70	0.015-0.03	0.001
	1/8	3/32	3/32	1/8	A6-70	A6-70	0.015-0.03	0.001
	1/8	3/32	1/4	1/8	A6-70	A6-70	0.015-0.03	0.001
	1/8	3/32	3/8	1/8	T7000	A6-70	0.015-0.03	0.001
90°	1/8	3/32	1/8	1/8	A2115	A6-70	0.015-0.03	0.001
	1/8	3/32	3/32	1/8	A6-70	A6-70	0.015-0.03	0.001
	1/8	3/32	1/4	1/8	A6-70	A6-70	0.015-0.03	0.001
	3/16	3/32	3/8	1/8	<b>A6-70</b>	<b>A6-70</b>	<b>0.015-0.03</b>	<b>0.001</b>
	3/16	3/32	1/2	1/8	<b>A6-70</b>	<b>A6-70</b>	<b>0.015-0.03</b>	<b>0.001</b>
90°	1/8	3/32	1/8	1/8	T7000	A6-70	0.015-0.03	0.001
	1/8	3/32	3/32	1/8	A6-70	A6-70	0.015-0.03	0.001
	1/8	3/32	1/4	1/8	A6-70	A6-70	0.015-0.03	0.001
	1/8	3/32	3/8	1/8	T7000	A6-70	0.015-0.03	0.001



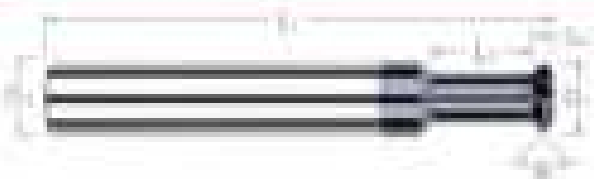
### Main Differences Between Engravers vs. Marking Cutters

Although similar in look, Engravers and Marking Cutters serve different purposes. Do you need assistance deciding between the two? We can help! Stay "in the loop!" and visit [Main Differences Between Engravers & Marking Cutters](#) from our [Insights](#) article today!

[Read more on: \[https://www.harsco.com/en/insights\]\(#\)](#)

## DOUBLE ANGLE SHANK CUTTERS

Painted



- Used for both chamfering, chamfering, reaming, and drilling of grooves
- Preferred tool for deep rough machining - To all included angle ground to a point
- 100° angle cutters can be used for thread turning - Solid inserts - 120° ground to the side

Good for Chamfering and Borework



Included Angle Dimension

100°	105°	110°	115°	120°	125°	130°	135°	140°	145°	150°	155°	160°	165°	170°	175°	180°
------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------



Based on 100mm included angle

ISO CODE	CUTTING DIA.	CUTTING LENGTH	SHANK DIA.	SHANK LENGTH	TYP. FLUTES	GRAIN DIA.	VAL.	FINISHING		UP-DRAWING		DRILLING CHAMFER	
								TYPE 1	TYPE 2	TYPE 1	TYPE 2	TYPE 1	TYPE 2
30°	100	100	100	100	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	120	120	120	120	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	150	150	150	150	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	20	100	100	100	1	4	1.0	1.0	0.05	0.05	0.05	0.10	
	25	100	100	100	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	30	100	100	100	1	4	1.0	1.0	0.05	0.05	0.05	0.10	
	35	100	100	100	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	40	100	100	100	1	4	1.0	1.0	0.05	0.05	0.05	0.10	
	45	100	100	100	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	50	100	100	100	1	4	1.0	1.0	0.05	0.05	0.05	0.10	
	55	100	100	100	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	60	100	100	100	1	4	1.0	1.0	0.05	0.05	0.05	0.10	
40°	100	100	100	100	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	120	120	120	120	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	150	150	150	150	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	20	100	100	100	1	4	1.0	1.0	0.05	0.05	0.05	0.10	
	25	100	100	100	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	30	100	100	100	1	4	1.0	1.0	0.05	0.05	0.05	0.10	
60°	100	100	100	100	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	120	120	120	120	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	150	150	150	150	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	20	100	100	100	1	4	1.0	1.0	0.05	0.05	0.05	0.10	
	25	100	100	100	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	30	100	100	100	1	4	1.0	1.0	0.05	0.05	0.05	0.10	
	35	100	100	100	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	40	100	100	100	1	4	1.0	1.0	0.05	0.05	0.05	0.10	
	45	100	100	100	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	50	100	100	100	1	4	1.0	1.0	0.05	0.05	0.05	0.10	
	55	100	100	100	1	0	1.0	1.0	0.05	0.05	0.05	0.10	
	60	100	100	100	1	4	1.0	1.0	0.05	0.05	0.05	0.10	

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# DOUBLE ANGLE SHANK CUTTERS

Printed in India

(Continued from previous page)

NO. ANGLES	CUTTER DIA.	CUTTER WIDTH	NO. ANGLES	NO. ANGLES	TAPER	FLUTE	SHANK DIA.	SHANK LEN.	INCLUDES		WITH TAPER		WITH POINT	
									TOOL	PRICE	TOOL	PRICE	TOOL	PRICE
60°	12	100	110	107	1	0	10	110	10000	11.00	100000	10.00		
	14	120	130	126	1	0	10	130	11000	11.70	110000	10.70		
	16	140	150	138	1	0	10	150	12000	12.40	120000	11.40		
	18	160	170	150	1	0	10	170	13000	13.10	130000	12.10		
	20	180	190	162	1	0	10	190	14000	13.80	140000	12.80		
	22	200	210	174	1	0	10	210	15000	14.50	150000	13.50		
	24	220	230	186	1	0	10	230	16000	15.20	160000	14.20		
	26	240	250	198	1	0	10	250	17000	15.90	170000	14.90		
	28	260	270	210	1	0	10	270	18000	16.60	180000	15.60		
	30	280	290	222	1	0	10	290	19000	17.30	190000	16.30		
90°	12	100	110	103	1	0	10	110	11000	11.00	110000	10.00		
	14	120	130	115	1	0	10	130	12000	11.70	120000	10.70		
	16	140	150	127	1	0	10	150	13000	12.40	130000	11.40		
	18	160	170	139	1	0	10	170	14000	13.10	140000	12.10		
	20	180	190	151	1	0	10	190	15000	13.80	150000	12.80		
	22	200	210	163	1	0	10	210	16000	14.50	160000	13.50		
	24	220	230	175	1	0	10	230	17000	15.20	170000	14.20		
	26	240	250	187	1	0	10	250	18000	15.90	180000	14.90		
	28	260	270	199	1	0	10	270	19000	16.60	190000	15.60		
	30	280	290	211	1	0	10	290	20000	17.30	200000	16.30		
	32	300	310	223	1	0	10	310	21000	18.00	210000	17.00		
	34	320	330	235	1	0	10	330	22000	18.70	220000	17.70		
	36	340	350	247	1	0	10	350	23000	19.40	230000	18.40		
	38	360	370	259	1	0	10	370	24000	20.10	240000	19.10		
	40	380	390	271	1	0	10	390	25000	20.80	250000	19.80		
	42	400	410	283	1	0	10	410	26000	21.50	260000	20.50		
	44	420	430	295	1	0	10	430	27000	22.20	270000	21.20		
	46	440	450	307	1	0	10	450	28000	22.90	280000	21.90		
	48	460	470	319	1	0	10	470	29000	23.60	290000	22.60		
	50	480	490	331	1	0	10	490	30000	24.30	300000	23.30		
52	500	510	343	1	0	10	510	31000	25.00	310000	24.00			
54	520	530	355	1	0	10	530	32000	25.70	320000	24.70			
56	540	550	367	1	0	10	550	33000	26.40	330000	25.40			
58	560	570	379	1	0	10	570	34000	27.10	340000	26.10			
60	580	590	391	1	0	10	590	35000	27.80	350000	26.80			
62	600	610	403	1	0	10	610	36000	28.50	360000	27.50			
64	620	630	415	1	0	10	630	37000	29.20	370000	28.20			
66	640	650	427	1	0	10	650	38000	29.90	380000	28.90			
68	660	670	439	1	0	10	670	39000	30.60	390000	29.60			
70	680	690	451	1	0	10	690	40000	31.30	400000	30.30			
72	700	710	463	1	0	10	710	41000	32.00	410000	31.00			
74	720	730	475	1	0	10	730	42000	32.70	420000	31.70			
76	740	750	487	1	0	10	750	43000	33.40	430000	32.40			
78	760	770	499	1	0	10	770	44000	34.10	440000	33.10			
80	780	790	511	1	0	10	790	45000	34.80	450000	33.80			
82	800	810	523	1	0	10	810	46000	35.50	460000	34.50			
84	820	830	535	1	0	10	830	47000	36.20	470000	35.20			
86	840	850	547	1	0	10	850	48000	36.90	480000	35.90			
88	860	870	559	1	0	10	870	49000	37.60	490000	36.60			
90	880	890	571	1	0	10	890	50000	38.30	500000	37.30			
92	900	910	583	1	0	10	910	51000	39.00	510000	38.00			
94	920	930	595	1	0	10	930	52000	39.70	520000	38.70			
96	940	950	607	1	0	10	950	53000	40.40	530000	39.40			
98	960	970	619	1	0	10	970	54000	41.10	540000	40.10			
100	980	990	631	1	0	10	990	55000	41.80	550000	40.80			

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INDIAN TOOL WORKS PVT. LTD.

# DOUBLE ANGLE SHANK CUTTERS

Parted page 1

(continued from previous page)

Part number	Cutter dia.	Cutter width	WCD dia.	WCD length	Type	Flutes	Grade	ISO	Reference		ISO system		ISO system	
									Table 1	Table 2	Table 1	Table 2	Table 1	Table 2
20°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
30°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
45°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
60°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
75°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
90°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
120°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
150°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
180°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
210°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
240°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
270°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
300°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
330°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			
360°	14	100	10	210	1	0	YG10	2	Y1400	Y1400	Y1400-10	Y1400		
	18	100	10	260	1	0	YG10	Y1400	Y1400	Y1400-10	Y1400			

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## DOUBLE ANGLE SHANK CUTTERS

Printed in Great Britain

continued from previous page

UNS. 2000	SHANK DIA.		SHANK LENGTH	SHANK WALL THICKNESS	TYPE	FEATURES	SHANK DIA.		SHANK LENGTH		SHANK WEIGHT		SHANK TENSILE STRENGTH	
	METRIC	INCH					METRIC	INCH	KG	LBS	MPa	MPa	KG/CM <sup>2</sup>	KG/CM <sup>2</sup>
40	10	10	100	3	A		10	1.0	4000	40	4000.00	40		
45	11	11	110	3	A		11	1.1	4000	45	4000.00	45		
50	12	12	120	3	A		12	1.2	4000	50	4000.00	50	4000.00 40.0	
55	13	13	130	3	A		13	1.3	4000	55	4000.00	55	4000.00 40.0	
60	14	14	140	3	A		14	1.4	4000	60	4000.00	60		
65	15	15	150	3	A		15	1.5	4000	65	4000.00	65		
70	16	16	160	3	A		16	1.6	4000	70	4000.00	70		
75	17	17	170	3	A		17	1.7	4000	75	4000.00	75		
80	18	18	180	3	A		18	1.8	4000	80	4000.00	80		
85	19	19	190	3	A		19	1.9	4000	85	4000.00	85		
90	20	20	200	3	A		20	2.0	4000	90	4000.00	90		
95	21	21	210	3	A		21	2.1	4000	95	4000.00	95		
100	22	22	220	3	A		22	2.2	4000	100	4000.00	100		
110	25	25	250	3	A		25	2.5	4000	110	4000.00	110		
120	30	30	300	3	A		30	3.0	4000	120	4000.00	120		
130	35	35	350	3	A		35	3.5	4000	130	4000.00	130		
140	40	40	400	3	A		40	4.0	4000	140	4000.00	140		
150	45	45	450	3	A		45	4.5	4000	150	4000.00	150		
160	50	50	500	3	A		50	5.0	4000	160	4000.00	160		
170	55	55	550	3	A		55	5.5	4000	170	4000.00	170		
180	60	60	600	3	A		60	6.0	4000	180	4000.00	180		
190	65	65	650	3	A		65	6.5	4000	190	4000.00	190		
200	70	70	700	3	A		70	7.0	4000	200	4000.00	200		
220	75	75	750	3	A		75	7.5	4000	220	4000.00	220		
240	80	80	800	3	A		80	8.0	4000	240	4000.00	240		
260	85	85	850	3	A		85	8.5	4000	260	4000.00	260		
280	90	90	900	3	A		90	9.0	4000	280	4000.00	280		
300	95	95	950	3	A		95	9.5	4000	300	4000.00	300		
320	100	100	1000	3	A		100	10.0	4000	320	4000.00	320		
340	105	105	1050	3	A		105	10.5	4000	340	4000.00	340		
360	110	110	1100	3	A		110	11.0	4000	360	4000.00	360		
380	115	115	1150	3	A		115	11.5	4000	380	4000.00	380		
400	120	120	1200	3	A		120	12.0	4000	400	4000.00	400		
420	125	125	1250	3	A		125	12.5	4000	420	4000.00	420		
440	130	130	1300	3	A		130	13.0	4000	440	4000.00	440		
460	135	135	1350	3	A		135	13.5	4000	460	4000.00	460		
480	140	140	1400	3	A		140	14.0	4000	480	4000.00	480		
500	145	145	1450	3	A		145	14.5	4000	500	4000.00	500		
520	150	150	1500	3	A		150	15.0	4000	520	4000.00	520		
540	155	155	1550	3	A		155	15.5	4000	540	4000.00	540		
560	160	160	1600	3	A		160	16.0	4000	560	4000.00	560		
580	165	165	1650	3	A		165	16.5	4000	580	4000.00	580		
600	170	170	1700	3	A		170	17.0	4000	600	4000.00	600		
620	175	175	1750	3	A		175	17.5	4000	620	4000.00	620		
640	180	180	1800	3	A		180	18.0	4000	640	4000.00	640		
660	185	185	1850	3	A		185	18.5	4000	660	4000.00	660		
680	190	190	1900	3	A		190	19.0	4000	680	4000.00	680		
700	195	195	1950	3	A		195	19.5	4000	700	4000.00	700		
720	200	200	2000	3	A		200	20.0	4000	720	4000.00	720		
740	205	205	2050	3	A		205	20.5	4000	740	4000.00	740		
760	210	210	2100	3	A		210	21.0	4000	760	4000.00	760		
780	215	215	2150	3	A		215	21.5	4000	780	4000.00	780		
800	220	220	2200	3	A		220	22.0	4000	800	4000.00	800		
820	225	225	2250	3	A		225	22.5	4000	820	4000.00	820		
840	230	230	2300	3	A		230	23.0	4000	840	4000.00	840		
860	235	235	2350	3	A		235	23.5	4000	860	4000.00	860		
880	240	240	2400	3	A		240	24.0	4000	880	4000.00	880		
900	245	245	2450	3	A		245	24.5	4000	900	4000.00	900		
920	250	250	2500	3	A		250	25.0	4000	920	4000.00	920		
940	255	255	2550	3	A		255	25.5	4000	940	4000.00	940		
960	260	260	2600	3	A		260	26.0	4000	960	4000.00	960		
980	265	265	2650	3	A		265	26.5	4000	980	4000.00	980		
1000	270	270	2700	3	A		270	27.0	4000	1000	4000.00	1000		

continued on next page





# DOUBLE ANGLE SHANK CUTTERS

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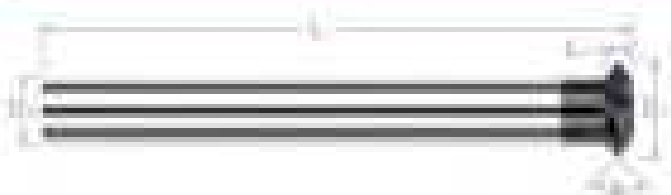
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SHANK ANGLE	CUTTER DIA.		HARD DIA.	HARD LENGTH	TYPE	FLUTES	SHANK DIA.		LENGTH	CUTTER PRICE		SHANK PRICE	
	OUTER	INNER					TOP	BOTTOM		TOP	BOTTOM	TOP	BOTTOM
90°	12	12	0.75	1.000	1	0	0.75	0	1.000	100.00	100.00	100.00	100.00
	14	14	0.75	1.000	1	0	0.75	0	1.000	100.00	100.00	100.00	100.00
	16	16	0.75	1.000	1	0	0.75	0	1.000	100.00	100.00	100.00	100.00
	18	18	0.75	1.000	1	0	0.75	0	1.000	100.00	100.00	100.00	100.00
	20	20	0.75	1.000	1	0	0.75	0	1.000	100.00	100.00	100.00	100.00
	22	22	0.75	1.000	1	0	0.75	0	1.000	100.00	100.00	100.00	100.00
	24	24	0.75	1.000	1	0	0.75	0	1.000	100.00	100.00	100.00	100.00
	26	26	0.75	1.000	1	0	0.75	0	1.000	100.00	100.00	100.00	100.00
	28	28	0.75	1.000	1	0	0.75	0	1.000	100.00	100.00	100.00	100.00
	30	30	0.75	1.000	1	0	0.75	0	1.000	100.00	100.00	100.00	100.00
100°	12	12	0.75	1.000	1	0	0.75	0.125	1.000	100.00	100.00	100.00	100.00
	14	14	0.75	1.000	1	0	0.75	0.125	1.000	100.00	100.00	100.00	100.00
	16	16	0.75	1.000	1	0	0.75	0.125	1.000	100.00	100.00	100.00	100.00
	18	18	0.75	1.000	1	0	0.75	0.125	1.000	100.00	100.00	100.00	100.00
	20	20	0.75	1.000	1	0	0.75	0.125	1.000	100.00	100.00	100.00	100.00
	22	22	0.75	1.000	1	0	0.75	0.125	1.000	100.00	100.00	100.00	100.00
	24	24	0.75	1.000	1	0	0.75	0.125	1.000	100.00	100.00	100.00	100.00
	26	26	0.75	1.000	1	0	0.75	0.125	1.000	100.00	100.00	100.00	100.00
	28	28	0.75	1.000	1	0	0.75	0.125	1.000	100.00	100.00	100.00	100.00
	30	30	0.75	1.000	1	0	0.75	0.125	1.000	100.00	100.00	100.00	100.00
110°	12	12	0.75	1.000	1	0	0.75	0.250	1.000	100.00	100.00	100.00	100.00
	14	14	0.75	1.000	1	0	0.75	0.250	1.000	100.00	100.00	100.00	100.00
	16	16	0.75	1.000	1	0	0.75	0.250	1.000	100.00	100.00	100.00	100.00
	18	18	0.75	1.000	1	0	0.75	0.250	1.000	100.00	100.00	100.00	100.00
	20	20	0.75	1.000	1	0	0.75	0.250	1.000	100.00	100.00	100.00	100.00
	22	22	0.75	1.000	1	0	0.75	0.250	1.000	100.00	100.00	100.00	100.00
	24	24	0.75	1.000	1	0	0.75	0.250	1.000	100.00	100.00	100.00	100.00
	26	26	0.75	1.000	1	0	0.75	0.250	1.000	100.00	100.00	100.00	100.00
	28	28	0.75	1.000	1	0	0.75	0.250	1.000	100.00	100.00	100.00	100.00
	30	30	0.75	1.000	1	0	0.75	0.250	1.000	100.00	100.00	100.00	100.00
120°	12	12	0.75	1.000	1	0	0.75	0.375	1.000	100.00	100.00	100.00	100.00
	14	14	0.75	1.000	1	0	0.75	0.375	1.000	100.00	100.00	100.00	100.00
	16	16	0.75	1.000	1	0	0.75	0.375	1.000	100.00	100.00	100.00	100.00
	18	18	0.75	1.000	1	0	0.75	0.375	1.000	100.00	100.00	100.00	100.00
	20	20	0.75	1.000	1	0	0.75	0.375	1.000	100.00	100.00	100.00	100.00
	22	22	0.75	1.000	1	0	0.75	0.375	1.000	100.00	100.00	100.00	100.00
	24	24	0.75	1.000	1	0	0.75	0.375	1.000	100.00	100.00	100.00	100.00
	26	26	0.75	1.000	1	0	0.75	0.375	1.000	100.00	100.00	100.00	100.00
	28	28	0.75	1.000	1	0	0.75	0.375	1.000	100.00	100.00	100.00	100.00
	30	30	0.75	1.000	1	0	0.75	0.375	1.000	100.00	100.00	100.00	100.00
135°	12	12	0.75	1.000	1	0	0.75	0.500	1.000	100.00	100.00	100.00	100.00
	14	14	0.75	1.000	1	0	0.75	0.500	1.000	100.00	100.00	100.00	100.00

SHANKS ARE MADE TO ORDER

## DOUBLE ANGLE SHANK CUTTERS

Pointed - Reduced Shank



- Used for both chamfering, chamfering, chamfering, and drilling a "Z" groove!
- Reduced shank steel allows any shank steel
- Top of reduced shank ground to a point
- 60° angle can also be used for increased cutting
- Some variants have grooves into shank steel
- CNC ground to the 4th



Tool Size	CUTTER LENGTH	CUTTER SHANK	Name	SHANK DIAMETER	SHANK LENGTH	Material		Price (USD)	
						Part #	Price	Part #	Price
60°	14	010	0	14	0.03	60000	14.00	60000-00	13.00
	24	100	0	24	0.03	60000	14.00	60000-00	14.00
	34	144	0	34	0.03	60000	14.00	60000-00	14.00
	44	144	0	44	0.04	60000	14.00	60000-00	17.00
	54	144	0	54	0.04	60000	14.00	60000-00	18.00
	1	010	0	00	0.01	60000	14.00	60000-00	00.00
60°	14	010	0	14	0.03	67000	14.00	67000-00	13.00
	14	020	0	14	0.03	77000	14.00	77000-00	14.00
	14	030	0	14	0.03	87000	14.00	87000-00	14.00
	14	040	0	14	0.03	97000	14.00	97000-00	14.00
	14	050	0	14	0.03	107000	14.00	107000-00	14.00
	14	060	0	14	0.03	117000	14.00	117000-00	14.00
	14	070	0	14	0.03	127000	14.00	127000-00	14.00
	14	080	0	14	0.03	137000	14.00	137000-00	14.00
	14	090	0	14	0.03	147000	14.00	147000-00	14.00
	14	100	0	14	0.03	157000	14.00	157000-00	14.00
	14	110	0	14	0.03	167000	14.00	167000-00	14.00
	14	120	0	14	0.03	177000	14.00	177000-00	14.00
	14	130	0	14	0.03	187000	14.00	187000-00	14.00
1	010	0	00	0.01	60000	14.00	60000-00	00.00	
177	100	0	00	0.00	67000	21.00	67000-00	00.00	

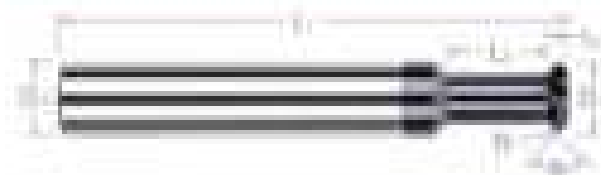


Access Simulation Files in DXF Format for Every Harvey Tool Product

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## DOUBLE ANGLE SHANK CUTTERS

Typ. Material



Shank to Top Fluted Section

- Ideal for both straightening, planishing, following and finishing a 7° groove
- Excellent for the improved strength and wear resistance
- Requires less for long reach machining
- High speed steel
- CED grade 514-100

INCL. ANGLE	CUTTER DIA.	RADIUS	CUTTER WIDTH	HORN SPACING	HORN LENGTH	FLUTE WIDTH	SHANK DIA.	L	LENGTH		P/N	
									TOT. L	FLUTE	TOT. L	P/N
60°	1/8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.156	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.188	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.219	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.250	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.281	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.312	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.344	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.375	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70°	1/8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.156	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.188	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.219	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.250	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.281	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.312	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.344	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.375	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.406	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.438	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.469	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.531	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.562	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.594	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.625	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.656	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.688	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.719	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.750	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.781	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0.812	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.844	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.875	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

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HARSCO ENGINEERING PRODUCTS

## DOUBLE ANGLE SHANK CUTTERS

Tip radius (cont.)

Continued from previous page

TIP ANGLE	CUTTER DIA.		CUTTER WIDTH	SHANK DIAMETER	MAX LENGTH	MAX RPM	SHANK DIA.		LENGTH		TYP. PRICE	
	IN.	MM					IN.	MM	IN.	MM	IN.	MM
80°	0.5	12.7	0.25	0.5	0.85	0	0.5	12.7	0.000	0.000	0.000	110.00
	0.5	12.7	0.25	0.5	1.000	0	0.5	12.7	0.000	0.000	0.000	110.00
	0.5	12.7	0.25	0.5	1.000	0	0.5	12.7	0.000	0.000	0.000	110.00
	0.5	12.7	0.25	0.5	0.85	0	0.5	12.7	0.000	0.000	0.000	110.00
	0.5	12.7	0.25	0.5	1.000	0	0.5	12.7	0.000	0.000	0.000	110.00
	0.5	12.7	0.25	0.5	1.000	0	0.5	12.7	0.000	0.000	0.000	110.00
	0.5	12.7	0.25	0.5	1.000	0	0.5	12.7	0.000	0.000	0.000	110.00
	0.5	12.7	0.25	0.5	1.000	0	0.5	12.7	0.000	0.000	0.000	110.00
	0.5	12.7	0.25	0.5	1.000	0	0.5	12.7	0.000	0.000	0.000	110.00
	0.5	12.7	0.25	0.5	1.000	0	0.5	12.7	0.000	0.000	0.000	110.00
	0.5	12.7	0.25	0.5	1.000	0	0.5	12.7	0.000	0.000	0.000	110.00
	0.5	12.7	0.25	0.5	1.000	0	0.5	12.7	0.000	0.000	0.000	110.00

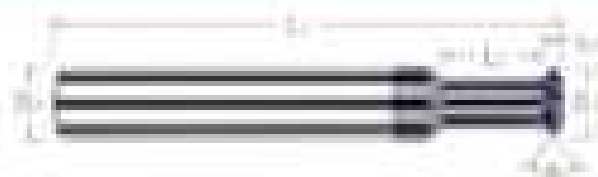


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## DOUBLE ANGLE SHANK CUTTERS

Tip Flat



- Ideal for most machining, chamfering, deburring, and fitting of tapered
- Flat end tip for optimized strength and stress resistance
- Reduced cost for long reach machining
- High accuracy
- ISO grade of the ISO



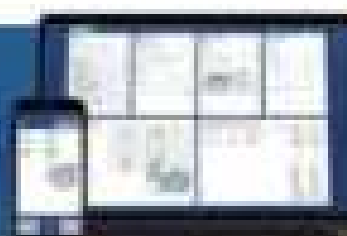
Double End Tip Flat End Tip

TAPER ANGLES	CUTTER DIA.	SHANK DIA.	CUTTER LENGTH	CUTTING DIAMETER	CUTTING LENGTH	CUTTING FLUTES	SHANK DIA.	L1	MATERIAL		PRICE PER UNIT	
									7045	7046	7045	7046
60°	10	8.0	100	11.0	107	6	10	110	7045	6046	7045010	6046010
	15	8.0	100	11.0	107	6	10	110	7045	6046	7045015	6046015
	20	8.0	100	11.0	107	6	10	110	7045	6046	7045020	6046020
	25	8.0	100	11.0	107	6	10	110	7045	6046	7045025	6046025
	30	8.0	100	11.0	107	6	10	110	7045	6046	7045030	6046030
80°	10	8.0	100	11.0	107	6	10	110	7045	6046	7045010	6046010
	15	8.0	100	11.0	107	6	10	110	7045	6046	7045015	6046015
	20	8.0	100	11.0	107	6	10	110	7045	6046	7045020	6046020
	25	8.0	100	11.0	107	6	10	110	7045	6046	7045025	6046025
	30	8.0	100	11.0	107	6	10	110	7045	6046	7045030	6046030
	35	8.0	100	11.0	107	6	10	110	7045	6046	7045035	6046035
	40	8.0	100	11.0	107	6	10	110	7045	6046	7045040	6046040
	45	8.0	100	11.0	107	6	10	110	7045	6046	7045045	6046045
	50	8.0	100	11.0	107	6	10	110	7045	6046	7045050	6046050
	55	8.0	100	11.0	107	6	10	110	7045	6046	7045055	6046055

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## BACK DEBURRING MILLS



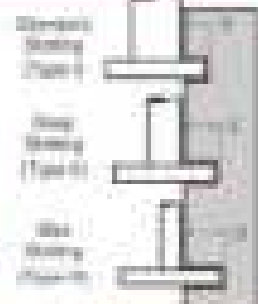
- Ideal for deburring on backside of cast parts and tight pockets
- Slightly undersize to fit in standard hole sizes
- 20° included angle, cutting on angle only
- Design has broader radial clearance than double angle chamfer cutters and back chamfer cutters, which results in increased hole diameter and increased strength
- Left hand chamfer flute / Right hand cut (cutting from away from part)
- Multiple Flutes for increased finish
- Tool series: 1-1000 series in the USA



BACK MILL U.S.	BACK MILL MET.	TYPE U.S.	TYPE MET.	MATERIAL U.S. (AISI)	MATERIAL MET. (EN)	QUANTITY PER BOX (U.S.)	QUANTITY PER BOX (MET.)	SHANK U.S.	SHANK MET.	DIMENSIONS		ITEM NUMBER	
										TYPE U.S.	TYPE MET.	TYPE U.S.	TYPE MET.
100	100	01	000	1010	1010	5	5	1/8"	10	10000	0010	10000-01	10.00
100	100	02	100	1010	1010	5	5	1/8"	10	10000	0020	10000-02	10.00
100	100	03	200	1010	1010	5	5	1/8"	10	10000	0030	10000-03	10.00
100	100	04	300	1010	1010	5	5	1/8"	10	10000	0040	10000-04	10.00
100	100	05	400	1010	1010	5	5	1/8"	10	10000	0050	10000-05	10.00
100	100	06	500	1010	1010	5	5	1/8"	10	10000	0060	10000-06	10.00
100	100	07	600	1010	1010	5	5	1/8"	10	10000	0070	10000-07	10.00
100	100	08	700	1010	1010	5	5	1/8"	10	10000	0080	10000-08	10.00
100	100	09	800	1010	1010	5	5	1/8"	10	10000	0090	10000-09	10.00
100	100	10	900	1010	1010	5	5	1/8"	10	10000	0100	10000-10	10.00
100	100	11	1000	1010	1010	5	5	1/8"	10	10000	0110	10000-11	10.00
100	100	12	1100	1010	1010	5	5	1/8"	10	10000	0120	10000-12	10.00
100	100	13	1200	1010	1010	5	5	1/8"	10	10000	0130	10000-13	10.00
100	100	14	1300	1010	1010	5	5	1/8"	10	10000	0140	10000-14	10.00
100	100	15	1400	1010	1010	5	5	1/8"	10	10000	0150	10000-15	10.00
100	100	16	1500	1010	1010	5	5	1/8"	10	10000	0160	10000-16	10.00
100	100	17	1600	1010	1010	5	5	1/8"	10	10000	0170	10000-17	10.00
100	100	18	1700	1010	1010	5	5	1/8"	10	10000	0180	10000-18	10.00
100	100	19	1800	1010	1010	5	5	1/8"	10	10000	0190	10000-19	10.00
100	100	20	1900	1010	1010	5	5	1/8"	10	10000	0200	10000-20	10.00
100	100	21	2000	1010	1010	5	5	1/8"	10	10000	0210	10000-21	10.00
100	100	22	2100	1010	1010	5	5	1/8"	10	10000	0220	10000-22	10.00
100	100	23	2200	1010	1010	5	5	1/8"	10	10000	0230	10000-23	10.00
100	100	24	2300	1010	1010	5	5	1/8"	10	10000	0240	10000-24	10.00
100	100	25	2400	1010	1010	5	5	1/8"	10	10000	0250	10000-25	10.00
100	100	26	2500	1010	1010	5	5	1/8"	10	10000	0260	10000-26	10.00
100	100	27	2600	1010	1010	5	5	1/8"	10	10000	0270	10000-27	10.00
100	100	28	2700	1010	1010	5	5	1/8"	10	10000	0280	10000-28	10.00
100	100	29	2800	1010	1010	5	5	1/8"	10	10000	0290	10000-29	10.00
100	100	30	2900	1010	1010	5	5	1/8"	10	10000	0300	10000-30	10.00

# KEYSEAT CUTTERS

Square



- Keyseat cutters down to 1/16" diameter
- Both sides of cutter are dulled for clearance
- Solid design
- ISO standard in the USA

Minimum Clearance  
From Flank of Cut

CUTTER DIA.	CUTTER LENGTH	CUTTER DIA.	CUTTER LENGTH	Minimum GAP	TYPE	SHAPE	CUTTER DIA.	CUTTER LEN.	PROFILES		ITEM NUMBER	
									TYPE 1	TYPE 2	TYPE 1	TYPE 2
1/16"	1/16"	1/16"	1/16" (2.54)	.015	1	2	1/16"	1/16"	2001	2002	2001-10	2002-10
	1/16"	1/16"	1/16" (2.54)	.015	1	4	1/16"	1/16"	2001	2002	2001-10	2002-10
	1/16"	1/16"	1/16" (2.54)	.015	1	4	1/16"	1/16"	2003	2004	2003-10	2004-10
	1/16"	1/16"	1/16" (2.54)	.015	1	4	1/16"	1/16"	2005	2006	2005-10	2006-10
	1/16"	1/16"	1/16" (2.54)	.015	1	4	1/16"	1/16"	2007	2008	2007-10	2008-10
	1/16"	1/16"	1/16" (2.54)	.015	1	4	1/16"	1/16"	2009	2010	2009-10	2010-10
	1/16"	1/16"	1/16" (2.54)	.015	1	4	1/16"	1/16"	2011	2012	2011-10	2012-10
	1/16"	1/16"	1/16" (2.54)	.015	1	4	1/16"	1/16"	2013	2014	2013-10	2014-10
	1/16"	1/16"	1/16" (2.54)	.015	1	4	1/16"	1/16"	2015	2016	2015-10	2016-10
	1/16"	1/16"	1/16" (2.54)	.015	1	4	1/16"	1/16"	2017	2018	2017-10	2018-10
	1/16"	1/16"	1/16" (2.54)	.015	1	4	1/16"	1/16"	2019	2020	2019-10	2020-10
	1/16"	1/16"	1/16" (2.54)	.015	1	4	1/16"	1/16"	2021	2022	2021-10	2022-10
5/64"	5/64"	5/64"	5/64" (3.54)	.015	1	2	5/64"	5/64"	2701	2702	2701-10	2702-10
	5/64"	5/64"	5/64" (3.54)	.015	1	4	5/64"	5/64"	2701	2702	2701-10	2702-10
	5/64"	5/64"	5/64" (3.54)	.015	1	4	5/64"	5/64"	2703	2704	2703-10	2704-10
	5/64"	5/64"	5/64" (3.54)	.015	1	4	5/64"	5/64"	2705	2706	2705-10	2706-10
	5/64"	5/64"	5/64" (3.54)	.015	1	4	5/64"	5/64"	2707	2708	2707-10	2708-10
	5/64"	5/64"	5/64" (3.54)	.015	1	4	5/64"	5/64"	2709	2710	2709-10	2710-10
	5/64"	5/64"	5/64" (3.54)	.015	1	4	5/64"	5/64"	2711	2712	2711-10	2712-10
	5/64"	5/64"	5/64" (3.54)	.015	1	4	5/64"	5/64"	2713	2714	2713-10	2714-10
	5/64"	5/64"	5/64" (3.54)	.015	1	4	5/64"	5/64"	2715	2716	2715-10	2716-10
	5/64"	5/64"	5/64" (3.54)	.015	1	4	5/64"	5/64"	2717	2718	2717-10	2718-10
	5/64"	5/64"	5/64" (3.54)	.015	1	4	5/64"	5/64"	2719	2720	2719-10	2720-10
	5/64"	5/64"	5/64" (3.54)	.015	1	4	5/64"	5/64"	2721	2722	2721-10	2722-10
3/32"	3/32"	3/32"	3/32" (2.54)	.015	1	2	3/32"	3/32"	3001	3002	3001-10	3002-10
	3/32"	3/32"	3/32" (2.54)	.015	1	4	3/32"	3/32"	3001	3002	3001-10	3002-10
	3/32"	3/32"	3/32" (2.54)	.015	1	4	3/32"	3/32"	3003	3004	3003-10	3004-10
	3/32"	3/32"	3/32" (2.54)	.015	1	4	3/32"	3/32"	3005	3006	3005-10	3006-10
	3/32"	3/32"	3/32" (2.54)	.015	1	4	3/32"	3/32"	3007	3008	3007-10	3008-10
	3/32"	3/32"	3/32" (2.54)	.015	1	4	3/32"	3/32"	3009	3010	3009-10	3010-10
	3/32"	3/32"	3/32" (2.54)	.015	1	4	3/32"	3/32"	3011	3012	3011-10	3012-10
	3/32"	3/32"	3/32" (2.54)	.015	1	4	3/32"	3/32"	3013	3014	3013-10	3014-10
	3/32"	3/32"	3/32" (2.54)	.015	1	4	3/32"	3/32"	3015	3016	3015-10	3016-10
	3/32"	3/32"	3/32" (2.54)	.015	1	4	3/32"	3/32"	3017	3018	3017-10	3018-10
	3/32"	3/32"	3/32" (2.54)	.015	1	4	3/32"	3/32"	3019	3020	3019-10	3020-10
	3/32"	3/32"	3/32" (2.54)	.015	1	4	3/32"	3/32"	3021	3022	3021-10	3022-10
5/64"	5/64"	5/64"	5/64" (3.54)	.015	1	2	5/64"	5/64"	3301	3302	3301-10	3302-10
	5/64"	5/64"	5/64" (3.54)	.015	1	4	5/64"	5/64"	3301	3302	3301-10	3302-10

\*Based on ISO standards for keyseat cutters.

continued on next page

# KEYSEAT CUTTERS

Squares (cont.)

(continued from previous page)

CUTTER NO.	CUTTER WIDTH	HEAT SHA.	HEAT LENGTH	HEAT DIA.	TYPE	MATERIAL	GRADE NO.	VAL.	WEIGHT		NET WEIGHT	
									NO. 1	NO. 2	NO. 1	NO. 2
200	1/2	118	610 (23.6)	300	1	2	18	11.0	20.00	44.00	20.00 (0.9)	44.00
201	1/2	118	710 (27.9)	300	1	2	18	14.0	20.00	47.00	20.00 (0.9)	47.00
202	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	37.00	16.00 (0.7)	37.00
203	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	38.00	16.00 (0.7)	38.00
204	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	39.00	16.00 (0.7)	39.00
205	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	40.00	16.00 (0.7)	40.00
206	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	41.00	16.00 (0.7)	41.00
207	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	42.00	16.00 (0.7)	42.00
208	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	43.00	16.00 (0.7)	43.00
209	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	44.00	16.00 (0.7)	44.00
210	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	45.00	16.00 (0.7)	45.00
211	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	46.00	16.00 (0.7)	46.00
212	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	47.00	16.00 (0.7)	47.00
213	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	48.00	16.00 (0.7)	48.00
214	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	49.00	16.00 (0.7)	49.00
215	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	50.00	16.00 (0.7)	50.00
216	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	51.00	16.00 (0.7)	51.00
217	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	52.00	16.00 (0.7)	52.00
218	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	53.00	16.00 (0.7)	53.00
219	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	54.00	16.00 (0.7)	54.00
220	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	55.00	16.00 (0.7)	55.00
221	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	56.00	16.00 (0.7)	56.00
222	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	57.00	16.00 (0.7)	57.00
223	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	58.00	16.00 (0.7)	58.00
224	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	59.00	16.00 (0.7)	59.00
225	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	60.00	16.00 (0.7)	60.00
226	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	61.00	16.00 (0.7)	61.00
227	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	62.00	16.00 (0.7)	62.00
228	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	63.00	16.00 (0.7)	63.00
229	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	64.00	16.00 (0.7)	64.00
230	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	65.00	16.00 (0.7)	65.00
231	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	66.00	16.00 (0.7)	66.00
232	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	67.00	16.00 (0.7)	67.00
233	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	68.00	16.00 (0.7)	68.00
234	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	69.00	16.00 (0.7)	69.00
235	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	70.00	16.00 (0.7)	70.00
236	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	71.00	16.00 (0.7)	71.00
237	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	72.00	16.00 (0.7)	72.00
238	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	73.00	16.00 (0.7)	73.00
239	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	74.00	16.00 (0.7)	74.00
240	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	75.00	16.00 (0.7)	75.00
241	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	76.00	16.00 (0.7)	76.00
242	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	77.00	16.00 (0.7)	77.00
243	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	78.00	16.00 (0.7)	78.00
244	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	79.00	16.00 (0.7)	79.00
245	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	80.00	16.00 (0.7)	80.00
246	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	81.00	16.00 (0.7)	81.00
247	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	82.00	16.00 (0.7)	82.00
248	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	83.00	16.00 (0.7)	83.00
249	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	84.00	16.00 (0.7)	84.00
250	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	85.00	16.00 (0.7)	85.00
251	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	86.00	16.00 (0.7)	86.00
252	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	87.00	16.00 (0.7)	87.00
253	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	88.00	16.00 (0.7)	88.00
254	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	89.00	16.00 (0.7)	89.00
255	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	90.00	16.00 (0.7)	90.00
256	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	91.00	16.00 (0.7)	91.00
257	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	92.00	16.00 (0.7)	92.00
258	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	93.00	16.00 (0.7)	93.00
259	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	94.00	16.00 (0.7)	94.00
260	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	95.00	16.00 (0.7)	95.00
261	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	96.00	16.00 (0.7)	96.00
262	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	97.00	16.00 (0.7)	97.00
263	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	98.00	16.00 (0.7)	98.00
264	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	99.00	16.00 (0.7)	99.00
265	3/8	118	110 (4.3)	200	0	0	18	11.0	16.00	100.00	16.00 (0.7)	100.00

\*Model 200 is discontinued. For replacement contact us at 800-451-7000.

(continued on next page)



# KEYSEAT CUTTERS

Square (cont.)

continued from previous page

CUTTER DIA.	CUTTER HEIGHT	PART NO.	ITEM QUANTITY	PART NO.	TYPE	FLUTES	WEAR DIA.	W.C.	DIMENSIONS		WEIGHTS			
									TYPE 1	TYPE 2	TYPE 1	TYPE 2		
Ø 3/8"	1-1/8"	312	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	312-1	312-2	312-1-2	312-2-2		
		312 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	312-1	312-2	312-1-2	312-2-2		
		312 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	312-1	312-2	312-1-2	312-2-2		
		313	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	313-1	313-2	313-1-2	313-2-2		
		314	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	314-1	314-2	314-1-2	314-2-2		
		315	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	315-1	315-2	315-1-2	315-2-2		
		316	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	316-1	316-2	316-1-2	316-2-2		
		317 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	317-1	317-2	317-1-2	317-2-2		
		318 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	318-1	318-2	318-1-2	318-2-2		
		319 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	319-1	319-2	319-1-2	319-2-2		
		320	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	320-1	320-2	320-1-2	320-2-2		
		321	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	321-1	321-2	321-1-2	321-2-2		
		322	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	322-1	322-2	322-1-2	322-2-2		
		323	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	323-1	323-2	323-1-2	323-2-2		
		324	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	324-1	324-2	324-1-2	324-2-2		
		325	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	325-1	325-2	325-1-2	325-2-2		
		326 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	326-1	326-2	326-1-2	326-2-2		
		327 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	327-1	327-2	327-1-2	327-2-2		
		328 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	328-1	328-2	328-1-2	328-2-2		
		329 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	329-1	329-2	329-1-2	329-2-2		
		330 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	330-1	330-2	330-1-2	330-2-2		
		331 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	331-1	331-2	331-1-2	331-2-2		
		332 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	332-1	332-2	332-1-2	332-2-2		
		333 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	333-1	333-2	333-1-2	333-2-2		
		334 (100)	100	210 11 00	200	2	Ø 3/8"	Ø 3/8"	334-1	334-2	334-1-2	334-2-2		
		Ø 1/2"	1-1/2"	335	100	210 11 00	200	2	Ø 1/2"	Ø 1/2"	335-1	335-2	335-1-2	335-2-2
				336 (100)	100	210 11 00	200	2	Ø 1/2"	Ø 1/2"	336-1	336-2	336-1-2	336-2-2
				337 (100)	100	210 11 00	200	2	Ø 1/2"	Ø 1/2"	337-1	337-2	337-1-2	337-2-2
				338 (100)	100	210 11 00	200	2	Ø 1/2"	Ø 1/2"	338-1	338-2	338-1-2	338-2-2
				339	100	210 11 00	200	2	Ø 1/2"	Ø 1/2"	339-1	339-2	339-1-2	339-2-2
				340	100	210 11 00	200	2	Ø 1/2"	Ø 1/2"	340-1	340-2	340-1-2	340-2-2
				341	100	210 11 00	200	2	Ø 1/2"	Ø 1/2"	341-1	341-2	341-1-2	341-2-2
				342	100	210 11 00	200	2	Ø 1/2"	Ø 1/2"	342-1	342-2	342-1-2	342-2-2
343	100			210 11 00	200	2	Ø 1/2"	Ø 1/2"	343-1	343-2	343-1-2	343-2-2		
344	100			210 11 00	200	2	Ø 1/2"	Ø 1/2"	344-1	344-2	344-1-2	344-2-2		
345	100			210 11 00	200	2	Ø 1/2"	Ø 1/2"	345-1	345-2	345-1-2	345-2-2		
346	100			210 11 00	200	2	Ø 1/2"	Ø 1/2"	346-1	346-2	346-1-2	346-2-2		
347	100			210 11 00	200	2	Ø 1/2"	Ø 1/2"	347-1	347-2	347-1-2	347-2-2		
348	100			210 11 00	200	2	Ø 1/2"	Ø 1/2"	348-1	348-2	348-1-2	348-2-2		
349	100			210 11 00	200	2	Ø 1/2"	Ø 1/2"	349-1	349-2	349-1-2	349-2-2		
350	100			210 11 00	200	2	Ø 1/2"	Ø 1/2"	350-1	350-2	350-1-2	350-2-2		
351	100			210 11 00	200	2	Ø 1/2"	Ø 1/2"	351-1	351-2	351-1-2	351-2-2		
352	100			210 11 00	200	2	Ø 1/2"	Ø 1/2"	352-1	352-2	352-1-2	352-2-2		
353 (100)	100	210 11 00	200	2	Ø 1/2"	Ø 1/2"	353-1	353-2	353-1-2	353-2-2				
354 (100)	100	210 11 00	200	2	Ø 1/2"	Ø 1/2"	354-1	354-2	354-1-2	354-2-2				

\*Weld 100% according to Hilti specifications unless otherwise stated.

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# KEYSLAT CUTTERS

Squares (cont.)

(continued from previous page)

CUTTER NO.	CUTTER DEPTH	SEEN NO.	SEEN LENGTH	SEEN DIA.	TYP. HUBS	SEEN DIA.	DIA.	WEIGHT		OTHER DATA		
								NO. 1	NO. 2	NO. 1	NO. 2	
2 1/4	44	175	270 1/2	275	0	0	275	0	2000	2000	2000 1/2	44.00
	45	175	270 1/2	280	0	0	275	0	2000	2000	2000 1/2	44.00
	46	175	270 1/2	285	0	0	275	0	2000	2000	2000 1/2	44.00
	47	175	270 1/2	290	0	0	275	0	2000	2000	2000 1/2	44.00
	48	175	270 1/2	295	0	0	275	0	2000	2000	2000 1/2	44.00
	49	175	270 1/2	300	0	0	275	0	2000	2000	2000 1/2	44.00
	491000	175	270 1/2	290	0	0	275	0	2000	2000	2000 1/2	44.00
	491001	175	270 1/2	295	0	0	275	0	2000	2000	2000 1/2	44.00
	491002	175	270 1/2	300	0	0	275	0	2000	2000	2000 1/2	44.00
	491003	175	270 1/2	305	0	0	275	0	2000	2000	2000 1/2	44.00
	491004	175	270 1/2	310	0	0	275	0	2000	2000	2000 1/2	44.00
	491005	175	270 1/2	315	0	0	275	0	2000	2000	2000 1/2	44.00
	491006	175	270 1/2	320	0	0	275	0	2000	2000	2000 1/2	44.00
	491007	175	270 1/2	325	0	0	275	0	2000	2000	2000 1/2	44.00
	491008	175	270 1/2	330	0	0	275	0	2000	2000	2000 1/2	44.00
	491009	175	270 1/2	335	0	0	275	0	2000	2000	2000 1/2	44.00
	491010	175	270 1/2	340	0	0	275	0	2000	2000	2000 1/2	44.00
	491011	175	270 1/2	345	0	0	275	0	2000	2000	2000 1/2	44.00
	491012	175	270 1/2	350	0	0	275	0	2000	2000	2000 1/2	44.00
	491013	175	270 1/2	355	0	0	275	0	2000	2000	2000 1/2	44.00
	491014	175	270 1/2	360	0	0	275	0	2000	2000	2000 1/2	44.00
	491015	175	270 1/2	365	0	0	275	0	2000	2000	2000 1/2	44.00
	491016	175	270 1/2	370	0	0	275	0	2000	2000	2000 1/2	44.00
	491017	175	270 1/2	375	0	0	275	0	2000	2000	2000 1/2	44.00
	491018	175	270 1/2	380	0	0	275	0	2000	2000	2000 1/2	44.00
	491019	175	270 1/2	385	0	0	275	0	2000	2000	2000 1/2	44.00
	491020	175	270 1/2	390	0	0	275	0	2000	2000	2000 1/2	44.00
	491021	175	270 1/2	395	0	0	275	0	2000	2000	2000 1/2	44.00
	491022	175	270 1/2	400	0	0	275	0	2000	2000	2000 1/2	44.00
	491023	175	270 1/2	405	0	0	275	0	2000	2000	2000 1/2	44.00
491024	175	270 1/2	410	0	0	275	0	2000	2000	2000 1/2	44.00	
491025	175	270 1/2	415	0	0	275	0	2000	2000	2000 1/2	44.00	
491026	175	270 1/2	420	0	0	275	0	2000	2000	2000 1/2	44.00	
491027	175	270 1/2	425	0	0	275	0	2000	2000	2000 1/2	44.00	
491028	175	270 1/2	430	0	0	275	0	2000	2000	2000 1/2	44.00	
491029	175	270 1/2	435	0	0	275	0	2000	2000	2000 1/2	44.00	
491030	175	270 1/2	440	0	0	275	0	2000	2000	2000 1/2	44.00	
3 1/4	491031	175	270 1/2	445	0	0	275	0	2000	2000	2000 1/2	44.00
	491032	175	270 1/2	450	0	0	275	0	2000	2000	2000 1/2	44.00
	491033	175	270 1/2	455	0	0	275	0	2000	2000	2000 1/2	44.00
	491034	175	270 1/2	460	0	0	275	0	2000	2000	2000 1/2	44.00
	491035	175	270 1/2	465	0	0	275	0	2000	2000	2000 1/2	44.00
	491036	175	270 1/2	470	0	0	275	0	2000	2000	2000 1/2	44.00
4 1/4	491037	175	270 1/2	475	0	0	275	0	2000	2000	2000 1/2	44.00
	491038	175	270 1/2	480	0	0	275	0	2000	2000	2000 1/2	44.00
	491039	175	270 1/2	485	0	0	275	0	2000	2000	2000 1/2	44.00
	491040	175	270 1/2	490	0	0	275	0	2000	2000	2000 1/2	44.00
	491041	175	270 1/2	495	0	0	275	0	2000	2000	2000 1/2	44.00
	491042	175	270 1/2	500	0	0	275	0	2000	2000	2000 1/2	44.00
5 1/4	491043	175	270 1/2	505	0	0	275	0	2000	2000	2000 1/2	44.00
	491044	175	270 1/2	510	0	0	275	0	2000	2000	2000 1/2	44.00
	491045	175	270 1/2	515	0	0	275	0	2000	2000	2000 1/2	44.00
	491046	175	270 1/2	520	0	0	275	0	2000	2000	2000 1/2	44.00
	491047	175	270 1/2	525	0	0	275	0	2000	2000	2000 1/2	44.00
	491048	175	270 1/2	530	0	0	275	0	2000	2000	2000 1/2	44.00

\*Metric sizes converted from inch fractions. See page 9 for details.

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## KEYSEAT CUTTERS

Square (cont.)

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CATYR No.	CATYR Metric	MMA No.	MMA Metric	Horse- power HP	Type	Spindle No.	MMA No.	MMA Metric	UNION:		HYDRA-RAIL:	
									PSI-A	PSI-B	PSI-A	PSI-B
140		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
141		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
142		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
143		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
144		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
145		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
146		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
147		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
148		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
149		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
150		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
151		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
152		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
153		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
154		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
155		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
156		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
157		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
158		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
159		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
160		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
161		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
162		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
163		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
164		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
165		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
166		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
167		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
168		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
169		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
170		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
171		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
172		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
173		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
174		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
175		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
176		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
177		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
178		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
179		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
180		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
181		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
182		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
183		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
184		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
185		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
186		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
187		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
188		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
189		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
190		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
191		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
192		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
193		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
194		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
195		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
196		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
197		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
198		100	1.2 (30)	200	0	0	100	0.100	1000	10.0	1000-10	10.00
199		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00
200		100	1.2 (30)	200	1	0	104	0.104	1000	10.0	1000-10	10.00

\*Horse-HP values for use in determining values in table.

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# KEYSLAT CUTTERS

Square (cont.)

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CUTTER DIA.	CUTTER WIDTH	CUTTER DIA.	CUTTER LENGTH	MATERIAL	TYPE	NUMBER	CUTTER DIA.	CUTTER DIA.	REMARKS		MATERIAL		
									TYPE	REMARKS	TYPE	REMARKS	
1/4	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	0.375	0.375	1.125	A12	1	1	0.375	0.375	1.125	A12	1.125	1.125	
	5/16	0.3125	0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125
		0.3125	0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	
0.3125		0.3125	1.125	A12	1	1	0.3125	0.3125	1.125	A12	1.125	1.125	



# KEYSLAT CUTTERS

Square (cont)

continued from previous page

CUTTER SIZE	CUTTER WIDTH	MCS SIZE	MCS LENGTH	MCS OD	TYP THICK	MCS HEIGHT	MCS WT	MCS LEN	PART NO.		UNIT PRICE			
									700.1	700.2	700.3	700.4		
1/2	271000	0.75	0.75	1.00	0.05	2	0	0.05	0.15	2700	0.15	2700	0.00	
	271000	0.75	1.125	0.75	0.05	2	0	0.05	0.15	7000	0.15	7000	0.00	
	Note: average 270 for quantity discounts													
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	7100	0.15	7100	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	281000	0.75	0.75	1.00	0.05	0	0	0.05	0.15	8000	0.15	8000	0.00	
	1/4	291000	0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00
		291000	0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00
291000		0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00	
291000		0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00	
291000		0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00	
291000		0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00	
291000		0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00	
291000		0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00	
291000		0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00	
291000		0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00	
291000		0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00	
291000		0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00	
291000		0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00	
291000		0.50	0.50	0.75	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00	
1/8	301000	0.25	0.25	0.50	0.05	0	0	0.05	0.15	6000	0.15	6000	0.00	
	301000	0.25	0.25	0.50	0.05	0	0	0.05	0.15	7000	0.15	7000	0.00	
	301000	0.25	0.25	0.50	0.05	0	0	0.05	0.15	6000	0.15	6000	0.00	
	301000	0.25	0.25	0.50	0.05	0	0	0.05	0.15	6000	0.15	6000	0.00	
	301000	0.25	0.25	0.50	0.05	0	0	0.05	0.15	6000	0.15	6000	0.00	
	301000	0.25	0.25	0.50	0.05	0	0	0.05	0.15	6000	0.15	6000	0.00	
	301000	0.25	0.25	0.50	0.05	0	0	0.05	0.15	6000	0.15	6000	0.00	
	301000	0.25	0.25	0.50	0.05	0	0	0.05	0.15	6000	0.15	6000	0.00	
	301000	0.25	0.25	0.50	0.05	0	0	0.05	0.15	6000	0.15	6000	0.00	
	301000	0.25	0.25	0.50	0.05	0	0	0.05	0.15	6000	0.15	6000	0.00	
301000	0.25	0.25	0.50	0.05	0	0	0.05	0.15	6000	0.15	6000	0.00		

# KEYSEAT CUTTERS

Square (cont.)

(continued from previous page)

KEYWAY W.A.	KEYWAY W.A.	W.C. W.A.	W.C. W.A.	STANDARD W.C.	TYP. FLUTES	WHEEL W.A.	W.C.	DIMENSIONS		LIFE EXPECT.		
								DIN 6362	PKIN.	FEW. L.	FEW. H.	
140	14	14	14	14	2	4	100	4	3000	10000	1000	1000
140-125mm	14	14	14	14	2	4	125	4	2200	10000	1000-12	1000
140	200	14	14	140	2	4	100	4	1200	10000	1000-22	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1100	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140-125mm	140	14	14	140	2	4	100	4	3000	10000	1000-22	1000
140-125mm	200	14	14	140	2	4	100	4	1200	10000	1000-22	1000
140-125mm	200	14	14	140	2	4	100	4	1000	10000	1000-22	1000
140-125mm	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140-125mm	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140	14	14	14	14	2	4	100	4	1000	10000	1000-14	1000
140-125mm	200	14	14	140	2	4	100	4	1000	10000	1000-22	1000
140-125mm	14	14	14	140	2	4	100	4	1000	10000	1000-14	1000

\*Rigid tool holders for new tool designs please refer to...

(continued on next page)

# KEYSEAT CUTTERS

Square (mm)

continued from previous page

CUTTER NO.	CUTTER WIDTH	CUTTER NO.	CUTTER LENGTH	CUTTER WIDTH	TEETH	FLUTES	CUTTER NO.	CUTTER NO.	DIMENSIONS		CUTTER NO.	
									W x L	W x L	W x L	W x L
1 1/2	150000	15	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	15	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	15	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	15	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	15	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	15	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	15	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	15	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	15	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	15	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	15	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	150000	15	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
	2 1/2	150000	150	150 (6)	150	0	0	150	0	1100	1100	150 x 110
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500
150000		150	150 (6)	150	0	0	150	0	1100	1100	150 x 110	1500

\*Refer to accessories for further information

For reduced claims and gross retail depths of cut, please see Reduced Shank Keyseat Cutters on pages 268, 270, 272, etc.



## KEYSEAT CUTTERS

Square for Hardened Steels

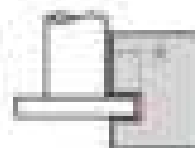


- Optimized for hardened steels (HRC up to 60) with high feed rates and specialized bevel geometry
- Latest generation ATB face coating offers superior toughness and load resistance
- Both sides of cutter are drilled for chip evacuation
- Solid carbide
- CBN ground in the USA



High Feed Coating  
Advanced Bevel Geometry

Special  
Cutting  
Flutes



CUTTER DIA.	CUTTER LENGTH	FACE DIA.	FACE LENGTH	FACE FL. DIA.	TYPE	CUTTER	HARD DIA.	L1	HILTI MODEL NUMBER	
									TYPE	TYPE
1/8"	100-11000	1/8"	0.18" (4.6)	0.02"	1"	8	1/8"	0.12"	100-11000	100-11000
	100-11001	1/8"	0.18" (4.6)	0.02"	1"	8	1/8"	0.12"	100-11001	100-11001
	100-11002	1/8"	0.18" (4.6)	0.02"	1"	8	1/8"	0.12"	100-11002	100-11002
	100-11003	1/8"	0.18" (4.6)	0.02"	1"	8	1/8"	0.12"	100-11003	100-11003
	100-11004	1/8"	0.18" (4.6)	0.02"	1"	8	1/8"	0.12"	100-11004	100-11004
5/32"	100-11005	5/32"	0.18" (4.6)	0.02"	1"	8	5/32"	0"	100-11005	100-11005
	100-11006	5/32"	0.18" (4.6)	0.02"	1"	8	5/32"	0"	100-11006	100-11006
3/16"	100-11007	3/16"	0.18" (4.6)	0.02"	1"	8	3/16"	0"	100-11007	100-11007
	100-11008	3/16"	0.18" (4.6)	0.02"	1"	8	3/16"	0"	100-11008	100-11008
	100-11009	3/16"	0.18" (4.6)	0.02"	1"	8	3/16"	0"	100-11009	100-11009
	100-11010	3/16"	0.18" (4.6)	0.02"	1"	8	3/16"	0"	100-11010	100-11010
	100-11011	3/16"	0.18" (4.6)	0.02"	1"	8	3/16"	0"	100-11011	100-11011
1/4"	100-11012	1/4"	0.18" (4.6)	0.02"	1"	8	1/4"	0.12"	100-11012	100-11012
	100-11013	1/4"	0.18" (4.6)	0.02"	1"	8	1/4"	0.12"	100-11013	100-11013
	100-11014	1/4"	0.18" (4.6)	0.02"	1"	8	1/4"	0.12"	100-11014	100-11014
	100-11015	1/4"	0.18" (4.6)	0.02"	1"	8	1/4"	0.12"	100-11015	100-11015
	100-11016	1/4"	0.18" (4.6)	0.02"	1"	8	1/4"	0.12"	100-11016	100-11016
	100-11017	1/4"	0.18" (4.6)	0.02"	1"	8	1/4"	0.12"	100-11017	100-11017
	100-11018	1/4"	0.18" (4.6)	0.02"	1"	8	1/4"	0.12"	100-11018	100-11018
	100-11019	1/4"	0.18" (4.6)	0.02"	1"	8	1/4"	0.12"	100-11019	100-11019
	100-11020	1/4"	0.18" (4.6)	0.02"	1"	8	1/4"	0.12"	100-11020	100-11020
	100-11021	1/4"	0.18" (4.6)	0.02"	1"	8	1/4"	0.12"	100-11021	100-11021
5/16"	100-11022	5/16"	0.18" (4.6)	0.02"	1"	8	5/16"	0.12"	100-11022	100-11022
	100-11023	5/16"	0.18" (4.6)	0.02"	1"	8	5/16"	0.12"	100-11023	100-11023
	100-11024	5/16"	0.18" (4.6)	0.02"	1"	8	5/16"	0.12"	100-11024	100-11024
	100-11025	5/16"	0.18" (4.6)	0.02"	1"	8	5/16"	0.12"	100-11025	100-11025
	100-11026	5/16"	0.18" (4.6)	0.02"	1"	8	5/16"	0.12"	100-11026	100-11026
3/8"	100-11027	3/8"	0.18" (4.6)	0.02"	1"	11	3/8"	0"	100-11027	100-11027
	100-11028	3/8"	0.18" (4.6)	0.02"	1"	11	3/8"	0"	100-11028	100-11028
	100-11029	3/8"	0.18" (4.6)	0.02"	1"	11	3/8"	0"	100-11029	100-11029
	100-11030	3/8"	0.18" (4.6)	0.02"	1"	11	3/8"	0"	100-11030	100-11030
	100-11031	3/8"	0.18" (4.6)	0.02"	1"	11	3/8"	0"	100-11031	100-11031
	100-11032	3/8"	0.18" (4.6)	0.02"	1"	11	3/8"	0"	100-11032	100-11032

\*HilTI USA reserves the right to change specifications without notice.

continued on next page

## KEYSLAT CUTTERS

Squares for Hardened Steels (cont.)

(continued from previous page)

HARVEY S.A.	HARVEY S.A.	HARVEY S.A.	HARVEY S.A.	HARVEY S.A.	TYPE	FLUTES	HARVEY S.A.	HARVEY S.A.	APPROXIMATE WEIGHT	
									KG	POUNDS
D-100	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
S-10	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5
	100-1000	10	100-1000	100	1	10	100	10	22.0	48.5

\*Approximate weight for tool in standard condition only.



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## KEYSEAT CUTTERS

Square for Non-Ferrous Materials



- Optimized for maximum and consistent alloy performance (copper, brass, and aluminum)
- Large flute opening and chamfered cutting edge
- Offset with 15° coating to minimize galling
- Both sides of cutter are coated for clearance
- Solid Carbide
- ISO 9 ground in the USA



Large Flute Opening & Chamfered Cutting Edge



CUTTER DIA	CUTTING LENGTH	HOLE DIA	HOLE LENGTH	RADIAL INCH	TYPE CUTTER	GRADE DIA	L (in)	Material		HSA, HSB	
								SAE 4140	SAE 4142	SAE 4140	SAE 4142
1/2" Ø	1.000	.400	.100	.001	2	1/2	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	1.500	.400	.100	.001	2	1/2	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	2.000	.400	.100	.001	2	1/2	1.12	SAE4140	SAE4142	SAE4140	SAE4142
3/8" Ø	1.000	.312	.075	.001	2	3/8	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	1.500	.312	.075	.001	2	3/8	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	2.000	.312	.075	.001	2	3/8	1.12	SAE4140	SAE4142	SAE4140	SAE4142
1/4" Ø	1.000	.250	.062	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	1.500	.250	.062	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	2.000	.250	.062	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
1/4" Ø	1.000	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	1.500	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	2.000	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	2.500	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	3.000	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	3.500	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	4.000	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	4.500	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	5.000	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	5.500	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	6.000	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	6.500	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	7.000	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	7.500	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142
	8.000	.187	.047	.001	2	1/4	1.12	SAE4140	SAE4142	SAE4140	SAE4142

\*Note: HSA is available in a separate table at the end of this page.

continued on next page

## KEYSEAT CUTTERS

Spigots for Non-Ferrous Materials (cont.)

(continued from previous page)

ITEM NO.	ITEM NAME	WGT. (LBS.)	KEY LENGTH (IN.)	MATERIAL (HTC)	TYPE	APPROX. WAVE NO.	INCH	DIMENSIONS		FIN. DIMENSIONS	
								WAVE L	WAVE R	WAVE L	WAVE R
K-100	981100	0.2	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981100	0.20	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981100	0.20	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981100	0.20	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
K-11	981101	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981101	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981101	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981101	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981101	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981101	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981101	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981101	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
K-12	981102	0.1	0.00100	00	0	0.00	0	0.0000	0.00	0.0000	0.00
	981102	0.10	0.00100	00	0	0.00	0	0.0000	0.00	0.0000	0.00
	981102	0.10	0.00100	00	0	0.00	0	0.0000	0.00	0.0000	0.00
	981102	0.10	0.00100	00	0	0.00	0	0.0000	0.00	0.0000	0.00
	981102	0.10	0.00100	00	0	0.00	0	0.0000	0.00	0.0000	0.00
	981102	0.10	0.00100	00	0	0.00	0	0.0000	0.00	0.0000	0.00
	981102	0.10	0.00100	00	0	0.00	0	0.0000	0.00	0.0000	0.00
	981102	0.10	0.00100	00	0	0.00	0	0.0000	0.00	0.0000	0.00
	981102	0.10	0.00100	00	0	0.00	0	0.0000	0.00	0.0000	0.00
	981102	0.10	0.00100	00	0	0.00	0	0.0000	0.00	0.0000	0.00
	981102	0.10	0.00100	00	0	0.00	0	0.0000	0.00	0.0000	0.00
	981102	0.10	0.00100	00	0	0.00	0	0.0000	0.00	0.0000	0.00
K-13	981103	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981103	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981103	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981103	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981103	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00
	981103	0.10	0.00100	00	0	0.00	0.10	0.0000	0.00	0.0000	0.00

\*Refer to drawing for dimensions unless noted.



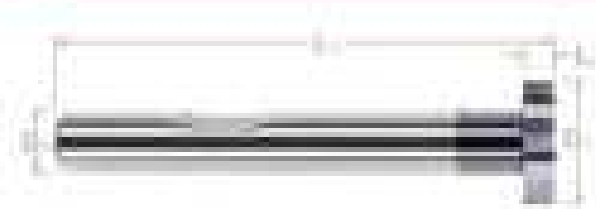
"We didn't have time to have a new tool ordered for this job so we did a 3/4" under cut with a power ratchet having 420R from @ hardware. The only tool that got part of the head and also broke out there."

—@hardware

Follow us on Instagram @horingtool

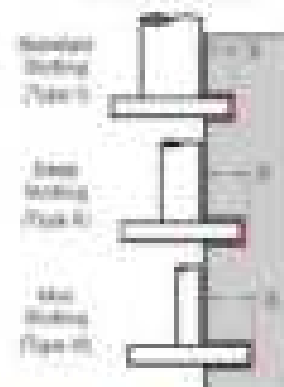
## KEYSEAT CUTTERS

Square - Reduced Shank



- Square carbide faced insert with a steel shank
- Both sides of insert are sharpened for efficiency
- Precision fit
- Available in the USA

Maximum Depth  
of Cut



1/2"  
3/8"  
1/4"

CUTTER DESCRIPTION	CUTTER SKETCH	SHANK DIA	TYPE	LENGTH	SHANK DIAMETER	CUTTING DIAMETER	MATERIAL		ITEM WEIGHT	
							ITEM #	PRICE	ITEM #	PRICE
<b>1/2"</b>	<b>1/2"</b>	<b>0</b>	<b>D</b>	<b>L</b>	<b>D</b>	<b>L</b>				
1/2" 1/2"	1/2"	0	D	14	1/2	1/2	048010	80.00	048010	15.10
1/2" 1/4"	1/2"	0	D	14	1/4	1/2	048020	80.00	048020	15.10
1/2" 3/8"	1/2"	0	D	14	3/8	1/2	048030	80.00	048030	15.10
1/2" 7/16"	1/2"	0	D	14	7/16	1/2	048040	80.00	048040	15.10
1/2" 15/16"	1/2"	0	D	14	15/16	1/2	048050	80.00	048050	15.10
1/2" 1"	1/2"	0	D	14	1"	1/2	048060	80.00	048060	15.10
1/2" 1 1/8"	1/2"	0	D	14	1 1/8"	1/2	048070	80.00	048070	15.10
1/2" 1 1/4"	1/2"	0	D	14	1 1/4"	1/2	048080	80.00	048080	15.10
1/2" 1 3/8"	1/2"	0	D	14	1 3/8"	1/2	048090	80.00	048090	15.10
1/2" 1 1/2"	1/2"	0	D	14	1 1/2"	1/2	048100	80.00	048100	15.10
1/2" 1 5/8"	1/2"	0	D	14	1 5/8"	1/2	048110	80.00	048110	15.10
1/2" 1 3/4"	1/2"	0	D	14	1 3/4"	1/2	048120	80.00	048120	15.10
1/2" 1 7/8"	1/2"	0	D	14	1 7/8"	1/2	048130	80.00	048130	15.10
1/2" 2"	1/2"	0	D	14	2"	1/2	048140	80.00	048140	15.10
1/2" 2 1/8"	1/2"	0	D	14	2 1/8"	1/2	048150	80.00	048150	15.10
1/2" 2 1/4"	1/2"	0	D	14	2 1/4"	1/2	048160	80.00	048160	15.10
1/2" 2 3/8"	1/2"	0	D	14	2 3/8"	1/2	048170	80.00	048170	15.10
1/2" 2 1/2"	1/2"	0	D	14	2 1/2"	1/2	048180	80.00	048180	15.10
1/2" 2 5/8"	1/2"	0	D	14	2 5/8"	1/2	048190	80.00	048190	15.10
1/2" 2 3/4"	1/2"	0	D	14	2 3/4"	1/2	048200	80.00	048200	15.10
1/2" 2 7/8"	1/2"	0	D	14	2 7/8"	1/2	048210	80.00	048210	15.10
1/2" 3"	1/2"	0	D	14	3"	1/2	048220	80.00	048220	15.10
1/2" 3 1/8"	1/2"	0	D	14	3 1/8"	1/2	048230	80.00	048230	15.10
1/2" 3 1/4"	1/2"	0	D	14	3 1/4"	1/2	048240	80.00	048240	15.10
1/2" 3 3/8"	1/2"	0	D	14	3 3/8"	1/2	048250	80.00	048250	15.10
1/2" 3 1/2"	1/2"	0	D	14	3 1/2"	1/2	048260	80.00	048260	15.10
1/2" 3 5/8"	1/2"	0	D	14	3 5/8"	1/2	048270	80.00	048270	15.10
1/2" 3 3/4"	1/2"	0	D	14	3 3/4"	1/2	048280	80.00	048280	15.10
1/2" 3 7/8"	1/2"	0	D	14	3 7/8"	1/2	048290	80.00	048290	15.10
1/2" 4"	1/2"	0	D	14	4"	1/2	048300	80.00	048300	15.10
1/2" 4 1/8"	1/2"	0	D	14	4 1/8"	1/2	048310	80.00	048310	15.10
1/2" 4 1/4"	1/2"	0	D	14	4 1/4"	1/2	048320	80.00	048320	15.10
1/2" 4 3/8"	1/2"	0	D	14	4 3/8"	1/2	048330	80.00	048330	15.10
1/2" 4 1/2"	1/2"	0	D	14	4 1/2"	1/2	048340	80.00	048340	15.10
1/2" 4 5/8"	1/2"	0	D	14	4 5/8"	1/2	048350	80.00	048350	15.10
1/2" 4 3/4"	1/2"	0	D	14	4 3/4"	1/2	048360	80.00	048360	15.10
1/2" 4 7/8"	1/2"	0	D	14	4 7/8"	1/2	048370	80.00	048370	15.10
1/2" 5"	1/2"	0	D	14	5"	1/2	048380	80.00	048380	15.10

1/2" - Please see Item 048000 - Minimum Quantity

## KEYSEAT CUTTERS

Square - Resharpened Shark (series)

continued from previous page.

CUTTER ITEM NUMBER	CUTTER WIDTH	MOUNT CODE	SERIES	MATER. GROUP	SHARP CORNER	CUTTER DIAMETER	CUTTER LENGTH	WEIGHT		M.T.F. CAPACITY	
								MM	LB	MM	IN
34	NSK0201	01	34	10	00	0.678	0.787	0.005	0.011	0.0001	0.0002
	NSK0202	02	34	10	00	1.260	1.417	0.010	0.022	0.0002	0.0004
	NSK0203	03	34	10	10	2.000	2.264	0.015	0.033	0.0003	0.0006
	NSK0204	04	34	10	00	3.346	3.768	0.025	0.055	0.0005	0.0010
	NSK0205	05	34	10	00	5.000	5.610	0.040	0.088	0.0008	0.0016
	NSK0206	06	34	10	00	7.476	8.376	0.065	0.143	0.0012	0.0024
	NSK0207	07	34	10	10	10.942	12.216	0.100	0.220	0.0020	0.0040
38	NSK0208	01	38	10	00	0.914	1.041	0.008	0.018	0.0001	0.0002
	NSK0209	02	38	10	00	1.575	1.764	0.015	0.033	0.0002	0.0004
	NSK0210	03	38	10	00	2.540	2.858	0.025	0.055	0.0003	0.0006
	NSK0211	04	38	10	00	4.191	4.713	0.040	0.088	0.0005	0.0010
	NSK0212	05	38	10	00	6.350	7.112	0.065	0.143	0.0008	0.0016
	NSK0213	06	38	10	00	9.144	10.284	0.100	0.220	0.0012	0.0024
	NSK0214	07	38	10	10	12.700	14.288	0.150	0.330	0.0020	0.0040
	NSK0215	08	38	10	00	18.250	20.584	0.250	0.550	0.0030	0.0060
	NSK0216	09	38	10	10	25.400	28.584	0.400	0.880	0.0050	0.0100
4	NSK0217	01	4	10	00	0.125	0.142	0.002	0.004	0.0000	0.0000
	NSK0218	02	4	10	00	0.229	0.259	0.003	0.007	0.0000	0.0000
	NSK0219	03	4	10	00	0.413	0.463	0.005	0.011	0.0000	0.0000
	NSK0220	04	4	10	00	0.762	0.852	0.008	0.018	0.0000	0.0000
	NSK0221	05	4	10	00	1.378	1.548	0.012	0.027	0.0000	0.0000
	NSK0222	06	4	10	00	2.500	2.810	0.020	0.044	0.0000	0.0000
	NSK0223	07	4	10	00	4.127	4.617	0.035	0.077	0.0000	0.0000
	NSK0224	08	4	10	00	6.350	7.112	0.050	0.110	0.0000	0.0000
	NSK0225	09	4	10	00	9.144	10.284	0.075	0.165	0.0000	0.0000
	NSK0226	10	4	10	00	13.476	15.160	0.110	0.242	0.0000	0.0000
	NSK0227	11	4	10	00	19.688	22.160	0.160	0.352	0.0000	0.0000
	NSK0228	12	4	10	00	28.940	32.600	0.220	0.485	0.0000	0.0000
	NSK0229	13	4	10	00	42.676	47.920	0.320	0.705	0.0000	0.0000
	NSK0230	14	4	10	00	62.700	70.160	0.450	0.990	0.0000	0.0000
	NSK0231	15	4	10	00	91.140	101.600	0.650	1.435	0.0000	0.0000
	NSK0232	16	4	10	00	131.776	148.160	0.950	2.095	0.0000	0.0000
	NSK0233	17	4	10	00	190.480	213.600	1.350	2.970	0.0000	0.0000
	NSK0234	18	4	10	00	274.320	304.000	1.900	4.190	0.0000	0.0000
	NSK0235	19	4	10	00	399.360	446.400	2.700	5.950	0.0000	0.0000
	NSK0236	20	4	10	00	573.600	640.000	3.750	8.290	0.0000	0.0000
	NSK0237	21	4	10	00	825.120	924.800	5.250	11.590	0.0000	0.0000
	NSK0238	22	4	10	00	1182.720	1328.000	7.250	16.090	0.0000	0.0000
	NSK0239	23	4	10	00	1696.320	1888.000	10.000	21.900	0.0000	0.0000
	NSK0240	24	4	10	00	2416.640	2704.000	13.750	30.100	0.0000	0.0000
	NSK0241	25	4	10	00	3432.960	3824.000	18.750	41.300	0.0000	0.0000

\* For those for which M.T.F. capacity is low (smaller value of mm)

continued on next page

## KEYSEAT CUTTERS

Square - Rectangular Shank (cont.)

continued from previous page

CUTTER QUANTITY	CUTTER WIDTH	HOLE DIA.	TYPE	H.1 (IN)	HOLE DEPTH	OVERALL LENGTH	WEIGHT		CUTTING EDGE	
							THEO. L.	NET WT.	THEO. L.	NET WT.
1-100	100-100	.175	1	10	.10	3.000	100.70	100.20	10.0000	1.1100
	100-100	.175	2	20	.10	3.000	100.70	100.20	10.0000	1.1100
5-100	100-100	.200	1	10	.10	3.000	219.00	100.20	10.0000	1.1100
	100-100	.200	2	20	.10	3.000	219.00	100.20	10.0000	1.1100
	100-100	.200	3	30	.10	3.000	219.00	100.20	10.0000	1.1100
	100-100	.200	4	40	.10	3.000	219.00	100.20	10.0000	1.1100
	100-100	.200	5	50	.10	3.000	219.00	100.20	10.0000	1.1100
	100-100	.200	6	60	.10	3.000	219.00	100.20	10.0000	1.1100
10-100	100-100	.250	1	10	.10	3.000	370.00	100.20	10.0000	1.1100
	100-100	.250	2	20	.10	3.000	370.00	100.20	10.0000	1.1100
	100-100	.250	3	30	.10	3.000	370.00	100.20	10.0000	1.1100
	100-100	.250	4	40	.10	3.000	370.00	100.20	10.0000	1.1100
	100-100	.250	5	50	.10	3.000	370.00	100.20	10.0000	1.1100
	100-100	.250	6	60	.10	3.000	370.00	100.20	10.0000	1.1100
	100-100	.250	7	70	.10	3.000	370.00	100.20	10.0000	1.1100
	100-100	.250	8	80	.10	3.000	370.00	100.20	10.0000	1.1100
	100-100	.250	9	90	.10	3.000	370.00	100.20	10.0000	1.1100
	100-100	.250	10	100	.10	3.000	370.00	100.20	10.0000	1.1100
	100-100	.250	1	10	.10	3.000	370.00	100.20	10.0000	1.1100
	100-100	.250	2	20	.10	3.000	370.00	100.20	10.0000	1.1100
	100-100	.250	3	30	.10	3.000	370.00	100.20	10.0000	1.1100
	100-100	.250	4	40	.10	3.000	370.00	100.20	10.0000	1.1100

\*We Reserve The Right To Change Specifications Without Notice.



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 Ted Crowl as he gives you specific cutting techniques, answering the  
 toughest questions and more. So long you remember more of the episode.

[WWW.TYCTOOL.COM/INTHELOUPE11](http://www.tyctool.com/INTHELOUPE11)

## KEYSLAT CUTTERS

### Retaining Ring Keyslots



Designed for  
 fitting Retaining /  
 Snap Ring Grooves

- Designed to cut precise slots within the common retaining ring sizes
- Outer diameter, total length, radial, and axial depths of cut optimized for internal retaining ring grooves per ANSI standards
- Both ends of cutter are sharpened for retention
- Solid carbide
- DMC ground to the finish

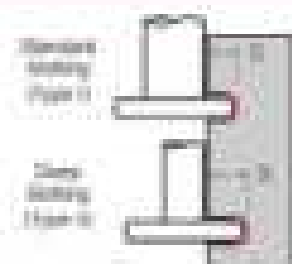
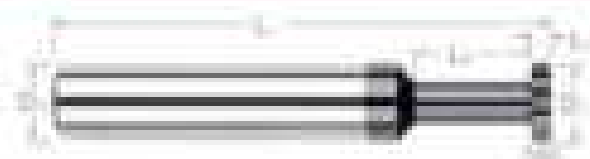
CUTTER SIZE	CUTTER LENGTH	CUTTER DIA.	CUTTER LENGTH	CUTTER DIA.**	TYPICAL CUTTING DIA.	CUTTER DIA.	CUTTER DIA.	CUTTER PRICE		CUTTER PRICE	
								PK10	PK25	PK10	PK25
1/16"	1/2"	1.6	1.6	1.6	0	0.10	0	0004	0010	0004-01	0010-01
1/16"	3/8"	1.6	1.6	1.6	0	0.10	0	0004	0010	0004-01	0010-01
1/8"	3/8"	2.0	2.0	2.0	0	0.10	0.10	0005	0010	0005-01	0010-01
	1/2"	2.0	2.0	2.0	0	0.10	0.10	0005	0010	0005-01	0010-01
3/16"	1/2"	2.5	2.5	2.5	0	0.10	0.10	0006	0010	0006-01	0010-01
	3/4"	2.5	2.5	2.5	0	0.10	0.10	0006	0010	0006-01	0010-01
1/4"	3/4"	3.2	3.2	3.2	0	0.10	0	0007	0010	0007-01	0010-01
	1"	3.2	3.2	3.2	0	0.10	0	0007	0010	0007-01	0010-01
5/16"	1"	4.0	4.0	4.0	0	0.10	0.10	0008	0010	0008-01	0010-01
	1 1/4"	4.0	4.0	4.0	0	0.10	0.10	0008	0010	0008-01	0010-01
3/8"	1 1/4"	5.0	5.0	5.0	0	0.10	0.10	0009	0010	0009-01	0010-01
	1 3/4"	5.0	5.0	5.0	0	0.10	0.10	0009	0010	0009-01	0010-01
1/2"	1 3/4"	6.3	6.3	6.3	0	0.10	0.10	0010	0010	0010-01	0010-01
	2"	6.3	6.3	6.3	0	0.10	0.10	0010	0010	0010-01	0010-01

\*Standard length with standard overhang \*\* Note: DMC ground to the finish condition of cut



# KEYSEAT CUTTERS

Erkerflansche



- Both sides of cutter are drilled for clearance
- Double flange for increased strength
- Heat treated
- DMC ground to the 1000

CUTTER DIA.	CUTTER CODE	CUTTER HEIGHT	FLANGE DIA.	FLANGE LENGTH	SHANK DIA.	SHANK LENGTH	SHANK DIA. FLANGE	SHANK DIA.	L	CUTTER		CUTTER CODE	
										CODE	HT	CODE	HT
1/8"	2011194	300	110	210 (1.75)	110	0	18	110	1000	1000	2011194	1000	
	300	300	110	210 (1.75)	110	0	18	1100	1000	300	1000	300	
	2011192	300	110	210 (1.75)	110	0	18	110	1000	1000	2011192	1000	
5/16"	2011195	300	130	230 (1.75)	127	0	18	110	1000	1000	2011195	1000	
	300	300	130	230 (1.75)	127	0	18	110	1000	1000	300	1000	
	2011193	300	130	230 (1.75)	127	0	18	110	1000	1000	2011193	1000	
1/2"	2011196	300	170	270 (1.75)	160	0	18	110	1000	1000	2011196	1000	
	300	300	170	270 (1.75)	160	0	18	110	1000	1000	300	1000	
	2011197	300	170	270 (1.75)	160	0	18	110	1000	1000	2011197	1000	
	2011198	300	170	270 (1.75)	160	0	18	110	1000	1000	2011198	1000	
	300	300	170	270 (1.75)	160	0	18	110	1000	1000	300	1000	
	2011199	300	170	270 (1.75)	160	0	18	110	1000	1000	2011199	1000	
	2011200	300	170	270 (1.75)	160	0	18	110	1000	1000	2011200	1000	
	2011201	300	170	270 (1.75)	160	0	18	110	1000	1000	2011201	1000	
	2011202	300	170	270 (1.75)	160	0	18	110	1000	1000	2011202	1000	
	2011203	300	170	270 (1.75)	160	0	18	110	1000	1000	2011203	1000	
	2011204	300	170	270 (1.75)	160	0	18	110	1000	1000	2011204	1000	
	2011205	300	170	270 (1.75)	160	0	18	110	1000	1000	2011205	1000	
3/4"	2011206	300	210	310 (1.75)	200	0	18	110	1000	1000	2011206	1000	
	300	300	210	310 (1.75)	200	0	18	110	1000	1000	300	1000	
	2011207	300	210	310 (1.75)	200	0	18	110	1000	1000	2011207	1000	
	2011208	300	210	310 (1.75)	200	0	18	110	1000	1000	2011208	1000	
	300	300	210	310 (1.75)	200	0	18	110	1000	1000	300	1000	
	2011209	300	210	310 (1.75)	200	0	18	110	1000	1000	2011209	1000	
	2011210	300	210	310 (1.75)	200	0	18	110	1000	1000	2011210	1000	
	2011211	300	210	310 (1.75)	200	0	18	110	1000	1000	2011211	1000	
	2011212	300	210	310 (1.75)	200	0	18	110	1000	1000	2011212	1000	
	2011213	300	210	310 (1.75)	200	0	18	110	1000	1000	2011213	1000	
	2011214	300	210	310 (1.75)	200	0	18	110	1000	1000	2011214	1000	
	2011215	300	210	310 (1.75)	200	0	18	110	1000	1000	2011215	1000	

\*Refer to dimensions in the technical drawing.

continued on next page

# KEYSLLOT CUTTERS

Corner Radius (mm)

(continued from previous page)

ITEM NO.	ITEM CODE	DIMEN. (mm)	MATERIAL	HRC	HSA	HSA	HSA	HSA	HSA	WEIGHT		PACKAGING		EPA CODES	
										Net	Gross	Net	Gross	Net	Gross
N/10	ST11100	88	18	24	0.02	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11100	1.00
	ST11101	88	18	24	0.24	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11101	1.00
	ST11102	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11102	1.00
	ST11103	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11103	1.00
	ST11104	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11104	1.00
	ST11105	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11105	1.00
	ST11106	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11106	1.00
	ST11107	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11107	1.00
	ST11108	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11108	1.00
	ST11109	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11109	1.00
	ST11110	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11110	1.00
	ST11111	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11111	1.00
	ST11112	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11112	1.00
	ST11113	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11113	1.00
	ST11114	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11114	1.00
	ST11115	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11115	1.00
	ST11116	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11116	1.00
	ST11117	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11117	1.00
	ST11118	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11118	1.00
	ST11119	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11119	1.00
	ST11120	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11120	1.00
	ST11121	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11121	1.00
	ST11122	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11122	1.00
	ST11123	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11123	1.00
	ST11124	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11124	1.00
	ST11125	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11125	1.00
	ST11126	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11126	1.00
	ST11127	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11127	1.00
	ST11128	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11128	1.00
	ST11129	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11129	1.00
	ST11130	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11130	1.00
	ST11131	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11131	1.00
	ST11132	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11132	1.00
	ST11133	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11133	1.00
	ST11134	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11134	1.00
ST11135	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11135	1.00	
ST11136	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11136	1.00	
ST11137	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11137	1.00	
ST11138	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11138	1.00	
ST11139	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11139	1.00	
ST11140	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11140	1.00	
ST11141	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11141	1.00	
ST11142	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11142	1.00	
ST11143	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11143	1.00	
ST11144	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11144	1.00	
ST11145	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11145	1.00	
ST11146	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11146	1.00	
ST11147	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11147	1.00	
ST11148	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11148	1.00	
ST11149	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11149	1.00	
ST11150	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11150	1.00	
ST11151	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11151	1.00	
ST11152	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11152	1.00	
ST11153	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11153	1.00	
ST11154	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11154	1.00	
ST11155	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11155	1.00	
ST11156	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11156	1.00	
ST11157	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11157	1.00	
ST11158	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11158	1.00	
ST11159	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11159	1.00	
ST11160	88	18	24	0.34	0.02	0	0	14	0.02	0.02	0.02	0.02	ST11160	1.00	

\*Net weight based on the standard size of tool.

(continued on next page)

## KEYSEAT CUTTERS

Corner Radius (cont.)

Continued from previous page

CUTTER DIA.	CUTTER WIDTH	CUTTER LENGTH	CUTTER DIA.	CUTTER LENGTH	CUTTER DIA.	TYPE	FLUTE	CUTTER DIA.	CUTTER DIA.	CORNER RADIUS		CUTTER DIA.	
										R1	R2	TYPE	TYPE
1.0	011030	000	010	010 (1.0)	000	0	0	00	010	0100	0100	010000	0000
	011040	000	010	010 (1.0)	000	1	0	00	010	0100	0100	010000	0000
	021030	000	020	010 (1.0)	000	0	0	00	010	0200	0100	020000	0000
	021040	000	020	010 (1.0)	000	1	0	00	010	0200	0100	020000	0000
	031030	000	030	010 (1.0)	000	0	0	00	010	0300	0100	030000	0000
	031040	000	030	010 (1.0)	000	1	0	00	010	0300	0100	030000	0000
	041030	000	040	010 (1.0)	000	0	0	00	010	0400	0100	040000	0000
	041040	000	040	010 (1.0)	000	1	0	00	010	0400	0100	040000	0000
	051030	000	050	010 (1.0)	000	0	0	00	010	0500	0100	050000	0000
	051040	000	050	010 (1.0)	000	1	0	00	010	0500	0100	050000	0000
	061030	000	060	010 (1.0)	000	0	0	00	010	0600	0100	060000	0000
	061040	000	060	010 (1.0)	000	1	0	00	010	0600	0100	060000	0000
	071030	000	070	010 (1.0)	000	0	0	00	010	0700	0100	070000	0000
	071040	000	070	010 (1.0)	000	1	0	00	010	0700	0100	070000	0000
	081030	000	080	010 (1.0)	000	0	0	00	010	0800	0100	080000	0000
	081040	000	080	010 (1.0)	000	1	0	00	010	0800	0100	080000	0000
	091030	000	090	010 (1.0)	000	0	0	00	010	0900	0100	090000	0000
	091040	000	090	010 (1.0)	000	1	0	00	010	0900	0100	090000	0000
	101030	000	100	010 (1.0)	000	0	0	00	010	1000	0100	100000	0000
	101040	000	100	010 (1.0)	000	1	0	00	010	1000	0100	100000	0000
	111030	000	110	010 (1.0)	000	0	0	00	010	1100	0100	110000	0000
	111040	000	110	010 (1.0)	000	1	0	00	010	1100	0100	110000	0000
	121030	000	120	010 (1.0)	000	0	0	00	010	1200	0100	120000	0000
	121040	000	120	010 (1.0)	000	1	0	00	010	1200	0100	120000	0000
	131030	000	130	010 (1.0)	000	0	0	00	010	1300	0100	130000	0000
	131040	000	130	010 (1.0)	000	1	0	00	010	1300	0100	130000	0000
	141030	000	140	010 (1.0)	000	0	0	00	010	1400	0100	140000	0000
	141040	000	140	010 (1.0)	000	1	0	00	010	1400	0100	140000	0000
	151030	000	150	010 (1.0)	000	0	0	00	010	1500	0100	150000	0000
	151040	000	150	010 (1.0)	000	1	0	00	010	1500	0100	150000	0000
	161030	000	160	010 (1.0)	000	0	0	00	010	1600	0100	160000	0000
	161040	000	160	010 (1.0)	000	1	0	00	010	1600	0100	160000	0000
171030	000	170	010 (1.0)	000	0	0	00	010	1700	0100	170000	0000	
171040	000	170	010 (1.0)	000	1	0	00	010	1700	0100	170000	0000	
181030	000	180	010 (1.0)	000	0	0	00	010	1800	0100	180000	0000	
181040	000	180	010 (1.0)	000	1	0	00	010	1800	0100	180000	0000	
191030	000	190	010 (1.0)	000	0	0	00	010	1900	0100	190000	0000	
191040	000	190	010 (1.0)	000	1	0	00	010	1900	0100	190000	0000	
201030	000	200	010 (1.0)	000	0	0	00	010	2000	0100	200000	0000	
201040	000	200	010 (1.0)	000	1	0	00	010	2000	0100	200000	0000	
211030	000	210	010 (1.0)	000	0	0	00	010	2100	0100	210000	0000	
211040	000	210	010 (1.0)	000	1	0	00	010	2100	0100	210000	0000	
221030	000	220	010 (1.0)	000	0	0	00	010	2200	0100	220000	0000	
221040	000	220	010 (1.0)	000	1	0	00	010	2200	0100	220000	0000	
231030	000	230	010 (1.0)	000	0	0	00	010	2300	0100	230000	0000	
231040	000	230	010 (1.0)	000	1	0	00	010	2300	0100	230000	0000	
241030	000	240	010 (1.0)	000	0	0	00	010	2400	0100	240000	0000	
241040	000	240	010 (1.0)	000	1	0	00	010	2400	0100	240000	0000	
251030	000	250	010 (1.0)	000	0	0	00	010	2500	0100	250000	0000	
251040	000	250	010 (1.0)	000	1	0	00	010	2500	0100	250000	0000	

\*Ruled sizes according to ISO standards (please refer to ISO 10300)

Continued on next page

## KEYSLAT CUTTERS

Corner Radius (mm)

continued from previous page

CUTTER S/N	CUTTER WIDTH	CORNER RADIUS	HSC S/N	HSC LENGTH	MAX. CL. S/N	TYP. NUMBER	SHEET S/N	SHEET LEN.	DIMENSIONS		WEIGHTS		
									TOOL L	TOOL R	TOOL L	TOOL R	
T-3	201000	075	11	201000	110	1	0	110	2	2000	2000	2000000	2000
	201000	090	12	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	075	12	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	075	15	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	075	18	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	090	18	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	090	21	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	075	21	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	075	24	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	090	24	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	090	27	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	075	27	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	075	30	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	090	30	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	090	33	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	075	33	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	075	36	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	090	36	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	090	39	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	075	39	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	075	42	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	090	42	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	075	45	201000	115	1	0	115	2	2000	2000	2000000	2000
	201000	090	45	201000	115	1	0	115	2	2000	2000	2000000	2000
S-3	201000	075	075	110000	100	1	0	100	0.10	2000	2000	2000000	2000
	201000	075	075	110000	100	1	0	100	0.10	2000	2000	2000000	2000
	201000	090	075	110000	100	1	0	100	0.10	2000	2000	2000000	2000
	201000	075	075	110000	100	1	0	100	0.10	2000	2000	2000000	2000
	201000	075	075	110000	100	1	0	100	0.10	2000	2000	2000000	2000
	201000	090	075	110000	100	1	0	100	0.10	2000	2000	2000000	2000
	201000	075	075	110000	100	1	0	100	0.10	2000	2000	2000000	2000
	201000	075	075	110000	100	1	0	100	0.10	2000	2000	2000000	2000
	201000	090	075	110000	100	1	0	100	0.10	2000	2000	2000000	2000
	201000	075	075	110000	100	1	0	100	0.10	2000	2000	2000000	2000
	201000	075	075	110000	100	1	0	100	0.10	2000	2000	2000000	2000
	201000	090	075	110000	100	1	0	100	0.10	2000	2000	2000000	2000

Note: 2000 mm length for one meter length of tool

For reduced blank and geometrical reports of cut, please see  
Reduced Blank Keyseat Cutters on pages 273, 307, 334, 355.

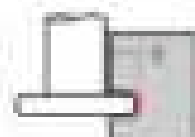
# KEYSEAT CUTTERS

Corner Radius - Reduced Shank



- Solid carbide fixed against only a steel insert
- Both sides of cutter are chamfered for clearance
- Chamfer radius for improved strength
- Metric tip
- ISO ground to the 10th

Standard  
Cutting  
(Type 1)



CUTTER DIAMETER	CUTTER WIDTH	TYPICAL MAX. DE.	MAX. DE. ISO*	Type	FLUTES IN CUTTER	MAX. LENGTH IN CUTTER	TYPICAL LENGTH	Material		Metric (mm)	
								EN8-4	PM34	EN8-4	PM34
1/4"	100 0100	240	177	1	10	20	210	44000	100 01	10000100	14040
	100 0100	240	177	1	10	20	210	40000	100 01	10000100	14040
	100 0100	210	157	1	10	20	210	30000	100 01	10000100	14040
	170 0100	240	177	1	10	20	240	44000	100 01	10000100	14040
	170 0100	210	157	1	10	20	240	40000	100 01	10000100	14040
	100 0100	240	177	1	10	20	210	40000	100 01	10000100	14040
	100 0100	210	157	1	10	20	210	30000	100 01	10000100	14040
	100 0100	240	177	1	10	20	210	40000	100 01	10000100	14040
	100 0100	210	157	1	10	20	210	30000	100 01	10000100	14040
	100 0100	240	177	1	10	20	210	40000	100 01	10000100	14040
	100 0100	210	157	1	10	20	210	30000	100 01	10000100	14040
	100 0100	240	177	1	10	20	210	40000	100 01	10000100	14040
	100 0100	210	157	1	10	20	210	30000	100 01	10000100	14040
	100 0100	240	177	1	10	20	210	40000	100 01	10000100	14040
	100 0100	210	157	1	10	20	210	30000	100 01	10000100	14040
	100 0100	240	177	1	10	20	210	40000	100 01	10000100	14040
	100 0100	210	157	1	10	20	210	30000	100 01	10000100	14040
	100 0100	240	177	1	10	20	210	40000	100 01	10000100	14040
	100 0100	210	157	1	10	20	210	30000	100 01	10000100	14040
	1/2"	100 0100	240	177	1	10	20	210	44000	100 01	10000100
100 0100		210	157	1	10	20	210	40000	100 01	10000100	14040
100 0100		240	177	1	10	20	210	40000	100 01	10000100	14040
100 0100		210	157	1	10	20	210	30000	100 01	10000100	14040
100 0100		240	177	1	10	20	210	40000	100 01	10000100	14040
100 0100		210	157	1	10	20	210	30000	100 01	10000100	14040
100 0100		240	177	1	10	20	210	40000	100 01	10000100	14040
100 0100		210	157	1	10	20	210	30000	100 01	10000100	14040
100 0100		240	177	1	10	20	210	40000	100 01	10000100	14040
100 0100		210	157	1	10	20	210	30000	100 01	10000100	14040
100 0100		240	177	1	10	20	210	40000	100 01	10000100	14040
100 0100		210	157	1	10	20	210	30000	100 01	10000100	14040
100 0100		240	177	1	10	20	210	40000	100 01	10000100	14040
100 0100		210	157	1	10	20	210	30000	100 01	10000100	14040
100 0100		240	177	1	10	20	210	40000	100 01	10000100	14040
100 0100		210	157	1	10	20	210	30000	100 01	10000100	14040
100 0100		240	177	1	10	20	210	40000	100 01	10000100	14040
100 0100		210	157	1	10	20	210	30000	100 01	10000100	14040
100 0100		240	177	1	10	20	210	40000	100 01	10000100	14040
100 0100		210	157	1	10	20	210	30000	100 01	10000100	14040

\*Type 100 0100 is for maximum value of use

continued on next page

## KEYSEAT CUTTERS

Corner Marking - Rebarbed Sharktooth

continued from previous page

ITEM NUMBER	ITEM SIZE	ITEM LENGTH	ITEM DIA.	ITEM TYPE	ITEM NAME	ITEM WEIGHT (LBS)	ITEM PRICE	ITEM CODES		ITEM PRICE	
								ITEM #	ITEM #	ITEM #	ITEM #
1	10-1/4"	3/8"	3/8"	1	11	10	11-10	84010	10-10	84010-10	110.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84015	10-10	84015-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84020	10-10	84020-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84025	10-10	84025-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84030	10-10	84030-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84035	10-10	84035-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84040	10-10	84040-10	115.00
1/2" x 3/4"	10-1/4"	3/8"	3/8"	1	11	10	11-10	84045	10-10	84045-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84050	10-10	84050-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84055	10-10	84055-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84060	10-10	84060-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84065	10-10	84065-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84070	10-10	84070-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84075	10-10	84075-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84080	10-10	84080-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84085	10-10	84085-10	115.00
	10-1/4"	3/8"	3/8"	1	11	10	11-10	84090	10-10	84090-10	115.00

\*Note: 10-1/4" length for 10-1/2" overall length.

## QUICKTURN KEYSEATS

3 Day Turnaround - Instant Pricing Model - Infinite Custom Combinations

### THE PROGRAM

The Quickturn Keyseat Program complements our already extensive line of over 2,200 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](http://www.harveytool.com) 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.



Maximized Dr. Foster® - Graham L.

LEARN MORE

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

## KEYSEAT CUTTERS

### Staggered Teeth - Square



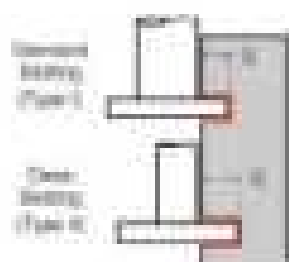
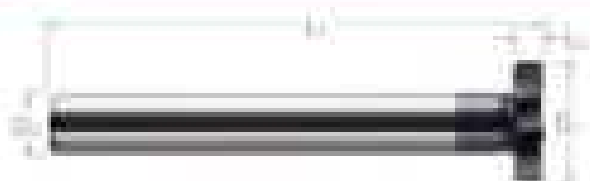
- Required tooth design with alternating fit (19 steel holes, H9/u9)
- Release to allow cutting on both sides of flange
- Design includes cutting points and flat areas minimizing chip-breaking and reducing tool-breaking frequency
- Tool can be offset to increase width of groove
- Solid outside - 100% ground by the drill

CUTTER DIA.	CUTTER WIDTH	HOLE DIA.	HOLE SPACING	HOLE DIA. 30°	TYPE FLANGES	HOLE DIA.	L	MATERIAL		LONG LENGTHS	
								TYPE P	TYPE S	TYPE A	TYPE B
1/8"	1/8" (1.6)	1/8"	1/8" (1.6)	3/32"	0	1/8"	1.10	SAE52100	SAE52100	SAE52100	SAE52100
	1/8" (1.6)	1/8"	1/8" (1.6)	3/32"	0	1/8"	1.10	SAE52100	SAE52100	SAE52100	SAE52100
	1/8" (1.6)	1/8"	1/8" (1.6)	3/32"	0	1/8"	1.10	SAE52100	SAE52100	SAE52100	SAE52100
	1/8" (1.6)	1/8"	1/8" (1.6)	3/32"	0	1/8"	1.10	SAE52100	SAE52100	SAE52100	SAE52100
	1/8" (1.6)	1/8"	1/8" (1.6)	3/32"	0	1/8"	1.10	SAE52100	SAE52100	SAE52100	SAE52100
5/16"	5/16" (8.0)	5/16"	5/16" (8.0)	3/16"	0	5/16"	0	SAE52100	SAE52100	SAE52100	SAE52100
	5/16" (8.0)	5/16"	5/16" (8.0)	3/16"	0	5/16"	0	SAE52100	SAE52100	SAE52100	SAE52100
	5/16" (8.0)	5/16"	5/16" (8.0)	3/16"	0	5/16"	0	SAE52100	SAE52100	SAE52100	SAE52100
3/8"	3/8" (9.5)	3/8"	3/8" (9.5)	3/16"	0	3/8"	0	SAE52100	SAE52100	SAE52100	SAE52100
	3/8" (9.5)	3/8"	3/8" (9.5)	3/16"	0	3/8"	0	SAE52100	SAE52100	SAE52100	SAE52100
	3/8" (9.5)	3/8"	3/8" (9.5)	3/16"	0	3/8"	0	SAE52100	SAE52100	SAE52100	SAE52100
	3/8" (9.5)	3/8"	3/8" (9.5)	3/16"	0	3/8"	0	SAE52100	SAE52100	SAE52100	SAE52100
	3/8" (9.5)	3/8"	3/8" (9.5)	3/16"	0	3/8"	0	SAE52100	SAE52100	SAE52100	SAE52100
1/2"	1/2" (12.7)	1/2"	1/2" (12.7)	3/16"	0	1/2"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
	1/2" (12.7)	1/2"	1/2" (12.7)	3/16"	0	1/2"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
	1/2" (12.7)	1/2"	1/2" (12.7)	3/16"	0	1/2"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
	1/2" (12.7)	1/2"	1/2" (12.7)	3/16"	0	1/2"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
	1/2" (12.7)	1/2"	1/2" (12.7)	3/16"	0	1/2"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
5/8"	5/8" (15.9)	5/8"	5/8" (15.9)	3/16"	0	5/8"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
	5/8" (15.9)	5/8"	5/8" (15.9)	3/16"	0	5/8"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
	5/8" (15.9)	5/8"	5/8" (15.9)	3/16"	0	5/8"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
1"	1" (25.4)	1"	1" (25.4)	3/16"	0	1"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
	1" (25.4)	1"	1" (25.4)	3/16"	0	1"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
	1" (25.4)	1"	1" (25.4)	3/16"	0	1"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
	1" (25.4)	1"	1" (25.4)	3/16"	0	1"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
	1" (25.4)	1"	1" (25.4)	3/16"	0	1"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
1 1/8"	1 1/8" (31.8)	1 1/8"	1 1/8" (31.8)	3/16"	0	1 1/8"	0	SAE52100	SAE52100	SAE52100	SAE52100
	1 1/8" (31.8)	1 1/8"	1 1/8" (31.8)	3/16"	0	1 1/8"	0	SAE52100	SAE52100	SAE52100	SAE52100
	1 1/8" (31.8)	1 1/8"	1 1/8" (31.8)	3/16"	0	1 1/8"	0	SAE52100	SAE52100	SAE52100	SAE52100
	1 1/8" (31.8)	1 1/8"	1 1/8" (31.8)	3/16"	0	1 1/8"	0	SAE52100	SAE52100	SAE52100	SAE52100
	1 1/8" (31.8)	1 1/8"	1 1/8" (31.8)	3/16"	0	1 1/8"	0	SAE52100	SAE52100	SAE52100	SAE52100
1 1/2"	1 1/2" (38.1)	1 1/2"	1 1/2" (38.1)	3/16"	0	1 1/2"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
	1 1/2" (38.1)	1 1/2"	1 1/2" (38.1)	3/16"	0	1 1/2"	0.15	SAE52100	SAE52100	SAE52100	SAE52100
	1 1/2" (38.1)	1 1/2"	1 1/2" (38.1)	3/16"	0	1 1/2"	0.15	SAE52100	SAE52100	SAE52100	SAE52100

Notes: 1) See Hilti website for the complete table of sizes.

## KEYSEAT CUTTERS

Staggered Teeth – Square – Reinforced Shank



- Staggered teeth design with alternating right-hand and left-hand flutes
- Relieved to allow cutting on both sides of tool
- Tool can be offset to increase width of groove
- Solid carbide construction for maximum rigidity
- 100% ground to the size

KEYWAY # HARVEY	KEYWAY WIDTH	KEYWAY DEPTH	TYPE	LENGTH	SHANK DIAMETER	SHANK LENGTH	Inventory		Price Range	
							Part #	mm	Part #	mm
1/4"	1/4" x 1/8"	1/8"	2	12	1/4"	3"	71000	80.00	71000-02	80.00
	1/4" x 1/8"	1/8"	2	18	1/4"	3"	71001	100.00	71001-02	100.00
	1/4" x 1/8"	1/8"	2	18	1/4"	4"	71002	100.00	71002-02	100.00
	1/4" x 1/8"	1/8"	2	18	1/4"	6"	71003	100.00	71003-02	100.00
	1/4" x 1/8"	1/8"	2	18	1/4"	8"	71004	100.00	71004-02	100.00
1/2"	1/2" x 1/8"	1/8"	2	12	1/2"	3-1/2"	71005	275.00	71005-02	275.00
	1/2" x 1/8"	1/8"	2	18	1/2"	3-1/2"	71006	375.00	71006-02	375.00
	1/2" x 1/8"	1/8"	2	18	1/2"	4-1/2"	71007	375.00	71007-02	375.00
	1/2" x 1/8"	1/8"	2	18	1/2"	6-1/2"	71008	375.00	71008-02	375.00
	1/2" x 1/8"	1/8"	2	18	1/2"	8-1/2"	71009	375.00	71009-02	375.00
3/4"	3/4" x 1/8"	1/8"	2	12	3/4"	3-1/2"	71010	475.00	71010-02	475.00
	3/4" x 1/8"	1/8"	2	18	3/4"	3-1/2"	71011	575.00	71011-02	575.00
	3/4" x 1/8"	1/8"	2	18	3/4"	4-1/2"	71012	575.00	71012-02	575.00
	3/4" x 1/8"	1/8"	2	18	3/4"	6-1/2"	71013	575.00	71013-02	575.00
	3/4" x 1/8"	1/8"	2	18	3/4"	8-1/2"	71014	575.00	71014-02	575.00

† Prices listed are for the maximum length of tool.



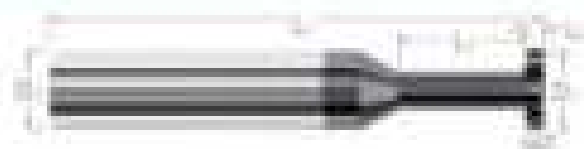
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On [harveytool.com](http://harveytool.com)



## KEYSEAT CUTTERS

### Staggered Tooth - Corner Radius



#### Staggered Tooth Design for Optimal Performance

- Staggered tooth design with increasing RPM (up to 6000 RPM) for
- Design promotes shearing action, eliminates chip dragging and smearing,
- Decreases vibration, and improves edge wear levels
- Reduced to allow cooling on both sides of hole
- Tool run-in effect to increase width of groove
- Strong radius for increased strength
- Good results
- 100% ground in the USA



CUTTER SIZE	CUTTER LENGTH	CORNER RADIUS	FACE DIA.	FACE LENGTH	HEEL DIA.	TYPE	CUTTER DIA.	CUTTER L.	RECOMMENDATIONS		LITON NUMBER		
									FEED (in)	SPR (in)	FEED (mm)	SPR (mm)	
1/8"	901-0100	.005	.118	0.18	0.100	00	3/8	1.18	1.18	0.005	0.010	901-0100	7100
	901-0100	.005	.118	.08	.080	00	3/8	1.18	1.18	0.005	0.010	901-0100	9070
	901-0100	.005	.118	0.14	0.100	00	3/8	1.18	1.18	0.005	0.010	901-0100	9040
	901-0100	.005	.118	0.14	0.150	00	3/8	1.18	1.18	0.005	0.010	901-0100	7100
	901-0100	.005	.118	0.14	0.100	00	3/8	1.18	1.18	0.005	0.010	901-0100	9050
1/16"	901-0100	.005	.078	0.10	0.100	00	3/8	0.78	0	0.005	0.010	901-0100	7040
	901-0100	.005	.078	0.08	0.100	00	3/8	0.78	0	0.005	0.010	901-0100	7050
	901-0100	.005	.078	0.08	0.100	00	3/8	0.78	0	0.005	0.010	901-0100	7040
	901-0100	.005	.078	0.10	0.100	00	3/8	0.78	0	0.005	0.010	901-0100	7050
1/4"	901-0100	.005	.378	0.48	0.100	00	3/8	3.74	0.10	0.005	0.010	901-0100	9020
	901-0100	.005	.378	.08	0.100	00	3/8	3.74	0.10	0.005	0.010	901-0100	9030
	901-0100	.005	.378	.08	0.100	00	3/8	3.74	0.10	0.005	0.010	901-0100	9040
	901-0100	.005	.378	.08	0.100	00	3/8	3.74	0.10	0.005	0.010	901-0100	10000
	901-0100	.005	.378	.08	0.100	00	3/8	3.74	0.10	0.005	0.010	901-0100	9050
	901-0100	.005	.378	.08	0.100	00	3/8	3.74	0.10	0.005	0.010	901-0100	10000
	901-0100	.005	.378	.08	0.100	00	3/8	3.74	0.10	0.005	0.010	901-0100	10000
	901-0100	.005	.378	.08	0.100	00	3/8	3.74	0.10	0.005	0.010	901-0100	9020
	901-0100	.005	.378	.08	0.100	00	3/8	3.74	0.10	0.005	0.010	901-0100	9030
	901-0100	.005	.378	.08	0.100	00	3/8	3.74	0.10	0.005	0.010	901-0100	9040
3/8"	901-0100	.005	.578	0.78	0.100	00	3/8	5.74	0.10	0.005	0.010	901-0100	10000
	901-0100	.005	.578	0.78	0.100	00	3/8	5.74	0.10	0.005	0.010	901-0100	10000
	901-0100	.005	.578	0.78	0.100	00	3/8	5.74	0.10	0.005	0.010	901-0100	10000
	901-0100	.005	.578	0.78	0.100	00	3/8	5.74	0.10	0.005	0.010	901-0100	10000
	901-0100	.005	.578	0.78	0.100	00	3/8	5.74	0.10	0.005	0.010	901-0100	10000
	901-0100	.005	.578	0.78	0.100	00	3/8	5.74	0.10	0.005	0.010	901-0100	10000

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## KEYSLAT CUTTERS

Staggered Tooth - Corner Radius (mm)

Continued from previous page

ITEM NO.	ITEM NAME	ITEM PART NO.	ITEM DIA.	ITEM LENGTH	ITEM DIA. (mm)	ITEM LENGTH (mm)	ITEM TYPE	ITEM FLUTES	ITEM DIA. (mm)	ITEM LENGTH (mm)	ITEM PRICE		ITEM NAME		
											ITEM PRICE	ITEM PRICE	ITEM PRICE	ITEM PRICE	
1.1	1001110	000	1.4	100	1.4	100	1	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	2	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	3	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	4	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	5	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	6	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	7	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	8	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	9	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	10	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	11	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	12	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	13	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	14	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	15	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	16	0	1.4	100	000	1.4	100	1001110	000
1.4	1001110	000	1.4	100	1.4	100	1	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	2	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	3	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	4	0	1.4	100	000	1.4	100	1001110	000
	1001110	000	1.4	100	1.4	100	5	0	1.4	100	000	1.4	100	1001110	000

Note: All dimensions are in millimeters unless otherwise specified.



### Keyseat Cutter Considerations

With more than 1,000 individual keyseat cutters in the lineup, Tool Supply, Inc. has certainly many options to choose from. Select which style is best for your machining operation or use "fit the cutter" shop size. [Keyseat Cutter Considerations](#)

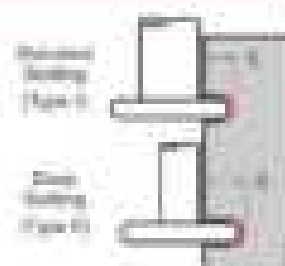
Read more on the [Keyseat Cutter](#) page.





## KEYSEAT CUTTERS

Full Flutes - Reduced Shank



- Standard diameters can be requested without being listed
- **D Series** → Both sides of cutter are chamfered for ease of use
- **Full Shank** → Full length with same shank
- **Reduced Shank** → CNC ground to fit ISO

PART NO.	OUTER DIAMETER	TOTAL LENGTH	SHANK DIA. (mm)	FLUTE	SHANK LENGTH	TOTAL LENGTH	DIMENSIONS		OTHER SIZES	
							DIA.	LENGTH	DIA.	LENGTH
1201104	04	100.00	4.00	0	00	0.100	0000	0000	100.00	
1201106	06	100.00	6.00	1	00	0.100	0000	0000	100.00	
1201108	8	100.00	8.00	1	00	0.100	0000	0000	100.00	
1201110	10	100.00	10.00	1	00	0.100	0000	0000	100.00	
1201112	12	100.00	12.00	1	00	0.100	0000	0000	100.00	
1201114	14	100.00	14.00	0	00	0.100	0000	0000	100.00	
1201116	16	100.00	16.00	0	00	0.100	0000	0000	100.00	
1201118	18	100.00	18.00	1	00	0.100	0000	0000	100.00	
1201120	20	100.00	20.00	1	00	0.100	0000	0000	100.00	
1201122	22	100.00	22.00	1	00	0.100	0000	0000	100.00	
1201124	24	100.00	24.00	0	00	0.100	0000	0000	100.00	
1201126	26	100.00	26.00	1	00	0.100	0000	0000	100.00	
1201128	28	100.00	28.00	1	00	0.100	0000	0000	100.00	
1201130	30	100.00	30.00	0	00	0.100	0000	0000	100.00	
1201132	32	100.00	32.00	1	00	0.100	0000	0000	100.00	
1201134	34	100.00	34.00	1	00	0.100	0000	0000	100.00	
1201136	36	100.00	36.00	1	00	0.100	0000	0000	100.00	
1201138	38	100.00	38.00	0	00	0.100	0000	0000	100.00	
1201140	40	100.00	40.00	0	00	0.100	0000	0000	100.00	
1201142	42	100.00	42.00	1	00	0.100	0000	0000	100.00	
1201144	44	100.00	44.00	1	00	0.100	0000	0000	100.00	
1201146	46	100.00	46.00	1	00	0.100	0000	0000	100.00	
1201148	48	100.00	48.00	0	00	0.100	0000	0000	100.00	
1201150	50	100.00	50.00	1	00	0.100	0000	0000	100.00	
1201152	52	100.00	52.00	1	00	0.100	0000	0000	100.00	
1201154	54	100.00	54.00	1	00	0.100	0000	0000	100.00	
1201156	56	100.00	56.00	0	00	0.100	0000	0000	100.00	
1201158	58	100.00	58.00	1	00	0.100	0000	0000	100.00	
1201160	60	100.00	60.00	1	00	0.100	0000	0000	100.00	
1201162	62	100.00	62.00	1	00	0.100	0000	0000	100.00	
1201164	64	100.00	64.00	0	00	0.100	0000	0000	100.00	
1201166	66	100.00	66.00	1	00	0.100	0000	0000	100.00	
1201168	68	100.00	68.00	1	00	0.100	0000	0000	100.00	
1201170	70	100.00	70.00	1	00	0.100	0000	0000	100.00	
1201172	72	100.00	72.00	1	00	0.100	0000	0000	100.00	
1201174	74	100.00	74.00	0	00	0.100	0000	0000	100.00	
1201176	76	100.00	76.00	1	00	0.100	0000	0000	100.00	
1201178	78	100.00	78.00	1	00	0.100	0000	0000	100.00	
1201180	80	100.00	80.00	0	00	0.100	0000	0000	100.00	
1201182	82	100.00	82.00	1	00	0.100	0000	0000	100.00	
1201184	84	100.00	84.00	1	00	0.100	0000	0000	100.00	
1201186	86	100.00	86.00	1	00	0.100	0000	0000	100.00	
1201188	88	100.00	88.00	0	00	0.100	0000	0000	100.00	
1201190	90	100.00	90.00	1	00	0.100	0000	0000	100.00	
1201192	92	100.00	92.00	1	00	0.100	0000	0000	100.00	
1201194	94	100.00	94.00	1	00	0.100	0000	0000	100.00	
1201196	96	100.00	96.00	0	00	0.100	0000	0000	100.00	
1201198	98	100.00	98.00	1	00	0.100	0000	0000	100.00	
1201200	100	100.00	100.00	1	00	0.100	0000	0000	100.00	

Table 100: Standard Dimensions (mm) of Key

## SLITTING SAWS



• Fully sharpened, re-sharpened or ATB coated

- Sizes of saw are stated by diameter
- Slitting on 50° angle - No keyway or hole
- The saw with standard saw action
- Blade material - T102 grade in the USA

SAW CLASSIFICATION	ITEM NUMBER	TOOTH CLASSIFICATION	NUMBER OF TEETH	DIMENSIONS		UNIT WEIGHT	
				INCH	MM	INCH	MM
1/4"	1000	10	18	0.7500	19.05	0.0000	0.0000
	1001	10	18	0.7500	19.05	0.0000	0.0000
	1002	10	18	0.7500	19.05	0.0000	0.0000
	1003	10	18	0.7500	19.05	0.0000	0.0000
	1004	10	18	0.7500	19.05	0.0000	0.0000
	1005	10	18	0.7500	19.05	0.0000	0.0000
1/2"	1006	20	36	0.7500	19.05	0.0000	0.0000
	1007	20	36	0.7500	19.05	0.0000	0.0000
	1008	20	36	0.7500	19.05	0.0000	0.0000
	1009	20	36	0.7500	19.05	0.0000	0.0000
	1010	20	36	0.7500	19.05	0.0000	0.0000
	1011	20	36	0.7500	19.05	0.0000	0.0000
	1012	20	36	0.7500	19.05	0.0000	0.0000
	1013	20	36	0.7500	19.05	0.0000	0.0000
	1014	20	36	0.7500	19.05	0.0000	0.0000
	1015	20	36	0.7500	19.05	0.0000	0.0000
3/8"	1016	30	54	0.7500	19.05	0.0000	0.0000
	1017	30	54	0.7500	19.05	0.0000	0.0000
	1018	30	54	0.7500	19.05	0.0000	0.0000
	1019	30	54	0.7500	19.05	0.0000	0.0000
	1020	30	54	0.7500	19.05	0.0000	0.0000
1/2"	1021	40	72	0.7500	19.05	0.0000	0.0000
	1022	40	72	0.7500	19.05	0.0000	0.0000
	1023	40	72	0.7500	19.05	0.0000	0.0000
	1024	40	72	0.7500	19.05	0.0000	0.0000
	1025	40	72	0.7500	19.05	0.0000	0.0000
	1026	40	72	0.7500	19.05	0.0000	0.0000
	1027	40	72	0.7500	19.05	0.0000	0.0000
	1028	40	72	0.7500	19.05	0.0000	0.0000
	1029	40	72	0.7500	19.05	0.0000	0.0000
	1030	40	72	0.7500	19.05	0.0000	0.0000

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## SLITTING SAWS

Continued

Continued from previous page

Length in feet (in)	The quantity	Number of teeth	Number of holes	Part #		MSRP	
				Part #	MSRP	Part #	MSRP
1/4 (6)	100	100	10	20000	10.00	20000000	10.00
	200 (100)	100	10	20001	10.00	20000000	10.00
	500	100	10	20002	10.00	20000000	10.00
	1000 (500)	100	10	20003	10.00	20000000	10.00
	2000 (1000)	100	10	20004	10.00	20000000	10.00
1/2 (6)	100	100	10	20005	10.00	20000000	10.00
	200	100	10	20006	10.00	20000000	10.00
	500 (250)	100	10	20007	10.00	20000000	10.00
	1000	100	10	20008	10.00	20000000	10.00
	2000	100	10	20009	10.00	20000000	10.00
	5000	100	10	20010	10.00	20000000	10.00
	10000	100	10	20011	10.00	20000000	10.00
	20000	100	10	20012	10.00	20000000	10.00
	50000	100	10	20013	10.00	20000000	10.00
	100000	100	10	20014	10.00	20000000	10.00
	200000	100	10	20015	10.00	20000000	10.00
	500000	100	10	20016	10.00	20000000	10.00
	1000000	100	10	20017	10.00	20000000	10.00
3/4 (6)	100	100	10	20018	10.00	20000000	10.00
	200 (100)	100	10	20019	10.00	20000000	10.00
	500 (250)	100	10	20020	10.00	20000000	10.00
	1000	100	10	20021	10.00	20000000	10.00
	2000	100	10	20022	10.00	20000000	10.00
	5000	100	10	20023	10.00	20000000	10.00
	10000	100	10	20024	10.00	20000000	10.00
1 (6)	100 (50)	100	10	20025	10.00	20000000	10.00
	200 (100)	100	10	20026	10.00	20000000	10.00
	500 (250)	100	10	20027	10.00	20000000	10.00
	1000	100	10	20028	10.00	20000000	10.00
	2000	100	10	20029	10.00	20000000	10.00
	5000	100	10	20030	10.00	20000000	10.00
	10000	100	10	20031	10.00	20000000	10.00

For Saw Action, see page 215.



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## SLITTING SAWS

For Non-Ferrous Materials



- Sizes of saw have decreased due to multiple part removal.
- Material grade refers to the following: 1 - Cutting on CD only, 2 - No tapping on face, 3 - No tap with standard case solution, 4 - Full pattern, 5 - 200 ground on the CD.

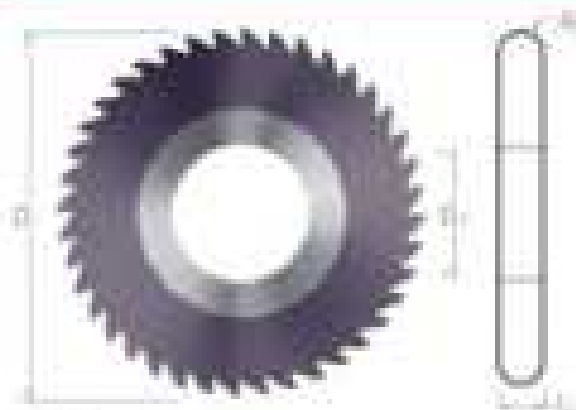
OUTER DIAMETER	NO. TEETH	INNER DIAMETER	NUMBER OF TEETH	RECOMMENDATION	
				Type	Price
Ø 100	100	50	50	1000000	51.00
	1000000	50	50	1000000	49.00
	100	50	50	1000000	51.00
	1000000	50	50	1000000	51.00
	1000000	50	50	1000000	51.00
Ø 110	1000000	55	55	1000000	54.00
	100	55	55	1000000	53.00
	1000000	55	55	1000000	53.00
	1000000	55	55	1000000	53.00
Ø 120	1000	60	60	1000000	55.00
	1000000	60	60	1000000	55.00
	1000000	60	60	1000000	55.00
	1000	60	60	1000000	55.00
	1000000	60	60	1000000	55.00
	1000000	60	60	1000000	55.00
Ø 130	1000	65	65	1000000	56.00
	1000000	65	65	1000000	56.00
	1000000	65	65	1000000	56.00
	1000000	65	65	1000000	56.00
	1000000	65	65	1000000	56.00
Ø 140	1000	70	70	1000000	57.00
	1000000	70	70	1000000	57.00
	1000000	70	70	1000000	57.00
	1000000	70	70	1000000	57.00
	1000000	70	70	1000000	57.00
	1000000	70	70	1000000	57.00
Ø 150	1000000	75	75	1000000	58.00
	1000000	75	75	1000000	58.00
	1000000	75	75	1000000	58.00
	1000000	75	75	1000000	58.00
Ø 160	1000000	80	80	1000000	59.00
	1000000	80	80	1000000	59.00
	1000000	80	80	1000000	59.00
	1000000	80	80	1000000	59.00
Ø 180	1000000	90	90	1000000	60.00
	1000000	90	90	1000000	60.00
	1000000	90	90	1000000	60.00
	1000000	90	90	1000000	60.00

For Saw Blades, see page 103



## SLITTING SAWS

Full Profile



• Full-profile profile

• Blades of steel are coated for durability

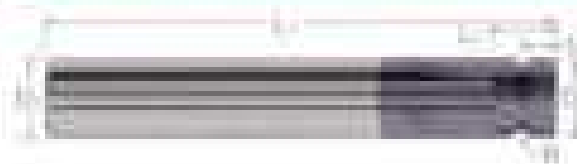
• Cutting on inside only – fit housing on hole

• For use with standard saw wheels – Solid wheels – 100% ground to the 100%

CUTTER DIAMETER	MARKING	THE GRIND	CUTTER DIAMETER	NUMBER OF TEETH	WEIGHTS		MARKING	
					TYPE 1	TYPE 2	TYPE 1	TYPE 2
100	100	100	100	20	0.000	0.000	0000000	0000
	100 (100)	100 (100)	100	20	0.000	0.000	0000000	0000
	100	100 (100)	100	20	0.000	0.000	0000000	0000
	100 (100)	100 (100)	100	20	0.000	0.000	0000000	0000
125	125 (125)	125 (125)	125	20	0.000	0.000	0000000	0000
	125	125 (125)	125	20	0.000	0.000	0000000	0000
	125 (125)	125 (125)	125	20	0.000	0.000	0000000	0000
	125 (125)	125 (125)	125	20	0.000	0.000	0000000	0000
150	150 (150)	150 (150)	150	20	0.000	0.000	0000000	0000
	150	150 (150)	150	20	0.000	0.000	0000000	0000
	150 (150)	150 (150)	150	20	0.000	0.000	0000000	0000
	150 (150)	150 (150)	150	20	0.000	0.000	0000000	0000
200	200	200 (200)	200	20	0.000	0.000	0000000	0000
	200 (200)	200 (200)	200	20	0.000	0.000	0000000	0000
	200 (200)	200 (200)	200	20	0.000	0.000	0000000	0000
	200 (200)	200 (200)	200	20	0.000	0.000	0000000	0000

For Saw Arrows, see page 196.

## CONCAVE RADIUS END MILLS



- Ground inner diameter used for re-ground without losing radial
- 4 Flutes
- Coating on OD and radius only (not end cutting)
- Solid carbide
- DMC grade 6 for HSS

PART NO.	DIAMETER	LENGTH	RADIUS	WIDTH	STANDARD LENGTH	PRICE		PRICE	
						USD	EUR	USD	EUR
064	10	100	100	10	0.110	1000	80.00	1000.00	80.00
064	10	150	100	10	0	1000	80.00	1000.00	80.00
064	10	200	100	10	0.110	1000	80.00	1000.00	80.00
064	10	250	100	10	0.110	1000	80.00	1000.00	80.00
064	10	300	100	10	0	1000	80.00	1000.00	80.00
064	10	350	100	10	0.110	1000	80.00	1000.00	80.00
064	10	400	100	10	0	1000	80.00	1000.00	80.00
064	10	450	100	10	0.110	1000	80.00	1000.00	80.00
064	10	500	100	10	0	1000	80.00	1000.00	80.00
064	10	550	100	10	0	1000	80.00	1000.00	80.00
064	10	600	100	10	0.110	1000	80.00	1000.00	80.00
064	10	650	100	10	0	1000	80.00	1000.00	80.00
064	10	700	100	10	0.110	1000	80.00	1000.00	80.00
064	10	750	100	10	0	1000	80.00	1000.00	80.00
064	10	800	100	10	0.110	1000	80.00	1000.00	80.00
064	10	850	100	10	0	1000	80.00	1000.00	80.00
064	10	900	100	10	0.110	1000	80.00	1000.00	80.00
064	10	950	100	10	0	1000	80.00	1000.00	80.00
064	10	1000	100	10	0	1000	80.00	1000.00	80.00
064	10	1050	100	10	0	1000	80.00	1000.00	80.00
064	10	1100	100	10	0.110	1000	80.00	1000.00	80.00
064	10	1150	100	10	0	1000	80.00	1000.00	80.00
064	10	1200	100	10	0	1000	80.00	1000.00	80.00

See website for all part types



Access Simulation Files in DXF Format for Every Harvey Tool Product

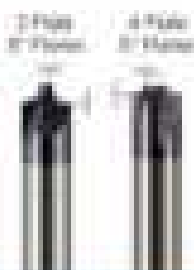
[harveytool.com/resources/simulation-files](http://harveytool.com/resources/simulation-files)

# CORNER ROUNDING END MILLS

2 & 4 Flute - Flannit



- Flutes are tapered to reduce flank wear and improve chip removal
- Double-flute
- Axial depth of cut is twice that of 2D
- Best pricing
- Total surface is 100% ground to the edge



SERIES	FLUTE DIAMETER	FLUTES	SHANK DIAMETER	SHANK LENGTH		SERIES		SERIES	
						FLUTE	SHANK	FLUTE	SHANK
200	0.0625	2	0.0625	0.125		200	0.0625	200	0.0625
200	0.075	2	0.075	0.15		200	0.075	200	0.075
200	0.0875	2	0.0875	0.175		200	0.0875	200	0.0875
200	0.1	2	0.1	0.2		200	0.1	200	0.1
200	0.1125	2	0.1125	0.225		200	0.1125	200	0.1125
200	0.125	2	0.125	0.25	1000	200	0.125	200	0.125
200	0.1375	2	0.1375	0.275		200	0.1375	200	0.1375
200	0.15	2	0.15	0.3		200	0.15	200	0.15
200	0.1625	2	0.1625	0.325		200	0.1625	200	0.1625
200	0.175	2	0.175	0.35		200	0.175	200	0.175
200	0.1875	2	0.1875	0.375		200	0.1875	200	0.1875
200	0.2	2	0.2	0.4		200	0.2	200	0.2
200	0.2125	2	0.2125	0.425		200	0.2125	200	0.2125
200	0.225	2	0.225	0.45		200	0.225	200	0.225
200	0.2375	2	0.2375	0.475		200	0.2375	200	0.2375
200	0.25	2	0.25	0.5		200	0.25	200	0.25
200	0.2625	2	0.2625	0.525		200	0.2625	200	0.2625
200	0.275	2	0.275	0.55		200	0.275	200	0.275
200	0.2875	2	0.2875	0.575		200	0.2875	200	0.2875
200	0.3	2	0.3	0.6	1000	200	0.3	200	0.3
200	0.3125	2	0.3125	0.625		200	0.3125	200	0.3125
200	0.325	2	0.325	0.65		200	0.325	200	0.325
200	0.3375	2	0.3375	0.675		200	0.3375	200	0.3375
200	0.35	2	0.35	0.7		200	0.35	200	0.35
200	0.3625	2	0.3625	0.725		200	0.3625	200	0.3625
200	0.375	2	0.375	0.75		200	0.375	200	0.375
200	0.3875	2	0.3875	0.775		200	0.3875	200	0.3875
200	0.4	2	0.4	0.8		200	0.4	200	0.4
200	0.4125	2	0.4125	0.825		200	0.4125	200	0.4125
200	0.425	2	0.425	0.85		200	0.425	200	0.425
200	0.4375	2	0.4375	0.875		200	0.4375	200	0.4375
200	0.45	2	0.45	0.9		200	0.45	200	0.45
200	0.4625	2	0.4625	0.925		200	0.4625	200	0.4625
200	0.475	2	0.475	0.95		200	0.475	200	0.475
200	0.4875	2	0.4875	0.975		200	0.4875	200	0.4875
200	0.5	2	0.5	1.0	1000	200	0.5	200	0.5

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# CORNER ROUNDING END MILLS

2 & 4 Flute - Flared (cont.)

Continued from previous page

PART NO.	N/C DIMENSIONS	FLUTES	SHANK DIMENSIONS	CORNER DIMENSIONS	MATERIALS		MSRP (US\$)	
					TCR 2	MS30	TCR 2	MS30
101	0.40	4	0.40	0.20	MS30	MS30	2000	2200
102	0.50	4	0.50	0.20	MS30	MS30	2000	2200
103	0.63	4	0.63	0.20	MS30	MS30	2000	2200
105	0.80	2	0.80	0.20	MS30	MS30	2000	2200
106	1.00	2	1.00	0.20	MS30	MS30	2000	2200
107	1.25	2	1.25	0.20	MS30	MS30	2000	2200
108	1.50	2	1.50	0.20	MS30	MS30	2000	2200
109	2.00	2	2.00	0.20	MS30	MS30	2000	2200
110	2.50	2	2.50	0.20	MS30	MS30	2000	2200
111	3.15	2	3.15	0.20	MS30	MS30	2000	2200
112	4.00	2	4.00	0.20	MS30	MS30	2000	2200
113	5.00	2	5.00	0.20	MS30	MS30	2000	2200
114	6.30	2	6.30	0.20	MS30	MS30	2000	2200
115	8.00	2	8.00	0.20	MS30	MS30	2000	2200
116	10.00	2	10.00	0.20	MS30	MS30	2000	2200
117	12.50	2	12.50	0.20	MS30	MS30	2000	2200
118	16.00	2	16.00	0.20	MS30	MS30	2000	2200
119	20.00	2	20.00	0.20	MS30	MS30	2000	2200
120	25.00	2	25.00	0.20	MS30	MS30	2000	2200
121	31.50	2	31.50	0.20	MS30	MS30	2000	2200
122	40.00	2	40.00	0.20	MS30	MS30	2000	2200
123	50.00	2	50.00	0.20	MS30	MS30	2000	2200
124	63.00	2	63.00	0.20	MS30	MS30	2000	2200
125	80.00	2	80.00	0.20	MS30	MS30	2000	2200
126	100.00	2	100.00	0.20	MS30	MS30	2000	2200
127	125.00	2	125.00	0.20	MS30	MS30	2000	2200
128	160.00	2	160.00	0.20	MS30	MS30	2000	2200
129	200.00	2	200.00	0.20	MS30	MS30	2000	2200
130	250.00	2	250.00	0.20	MS30	MS30	2000	2200
131	315.00	2	315.00	0.20	MS30	MS30	2000	2200
132	400.00	2	400.00	0.20	MS30	MS30	2000	2200
133	500.00	2	500.00	0.20	MS30	MS30	2000	2200
134	630.00	2	630.00	0.20	MS30	MS30	2000	2200
135	800.00	2	800.00	0.20	MS30	MS30	2000	2200
136	1000.00	2	1000.00	0.20	MS30	MS30	2000	2200
137	1250.00	2	1250.00	0.20	MS30	MS30	2000	2200
138	1600.00	2	1600.00	0.20	MS30	MS30	2000	2200
139	2000.00	2	2000.00	0.20	MS30	MS30	2000	2200
140	2500.00	2	2500.00	0.20	MS30	MS30	2000	2200
141	3150.00	2	3150.00	0.20	MS30	MS30	2000	2200
142	4000.00	2	4000.00	0.20	MS30	MS30	2000	2200
143	5000.00	2	5000.00	0.20	MS30	MS30	2000	2200
144	6300.00	2	6300.00	0.20	MS30	MS30	2000	2200
145	8000.00	2	8000.00	0.20	MS30	MS30	2000	2200
146	10000.00	2	10000.00	0.20	MS30	MS30	2000	2200
147	12500.00	2	12500.00	0.20	MS30	MS30	2000	2200
148	16000.00	2	16000.00	0.20	MS30	MS30	2000	2200
149	20000.00	2	20000.00	0.20	MS30	MS30	2000	2200
150	25000.00	2	25000.00	0.20	MS30	MS30	2000	2200
151	31500.00	2	31500.00	0.20	MS30	MS30	2000	2200
152	40000.00	2	40000.00	0.20	MS30	MS30	2000	2200
153	50000.00	2	50000.00	0.20	MS30	MS30	2000	2200
154	63000.00	2	63000.00	0.20	MS30	MS30	2000	2200
155	80000.00	2	80000.00	0.20	MS30	MS30	2000	2200
156	100000.00	2	100000.00	0.20	MS30	MS30	2000	2200
157	125000.00	2	125000.00	0.20	MS30	MS30	2000	2200
158	160000.00	2	160000.00	0.20	MS30	MS30	2000	2200
159	200000.00	2	200000.00	0.20	MS30	MS30	2000	2200
160	250000.00	2	250000.00	0.20	MS30	MS30	2000	2200
161	315000.00	2	315000.00	0.20	MS30	MS30	2000	2200
162	400000.00	2	400000.00	0.20	MS30	MS30	2000	2200
163	500000.00	2	500000.00	0.20	MS30	MS30	2000	2200
164	630000.00	2	630000.00	0.20	MS30	MS30	2000	2200
165	800000.00	2	800000.00	0.20	MS30	MS30	2000	2200
166	1000000.00	2	1000000.00	0.20	MS30	MS30	2000	2200
167	1250000.00	2	1250000.00	0.20	MS30	MS30	2000	2200
168	1600000.00	2	1600000.00	0.20	MS30	MS30	2000	2200
169	2000000.00	2	2000000.00	0.20	MS30	MS30	2000	2200
170	2500000.00	2	2500000.00	0.20	MS30	MS30	2000	2200
171	3150000.00	2	3150000.00	0.20	MS30	MS30	2000	2200
172	4000000.00	2	4000000.00	0.20	MS30	MS30	2000	2200
173	5000000.00	2	5000000.00	0.20	MS30	MS30	2000	2200
174	6300000.00	2	6300000.00	0.20	MS30	MS30	2000	2200
175	8000000.00	2	8000000.00	0.20	MS30	MS30	2000	2200
176	10000000.00	2	10000000.00	0.20	MS30	MS30	2000	2200
177	12500000.00	2	12500000.00	0.20	MS30	MS30	2000	2200
178	16000000.00	2	16000000.00	0.20	MS30	MS30	2000	2200
179	20000000.00	2	20000000.00	0.20	MS30	MS30	2000	2200
180	25000000.00	2	25000000.00	0.20	MS30	MS30	2000	2200

Continued on next page



2-Flute End Mill  
and Flat to Axial Depth  
of Workpiece



4-Flute End Mill for Drilling  
Increasing Strength and  
Reducing run-out



2-Flute End Mill  
for Hard  
Steel and Inconel



4-Flute End Mill  
allowing for Tight  
Tolerances

## CORNER ROUNDING END MILLS

2 & 4 Flute - Flare/Joint

continued from previous page

Model	Flute Inches	Flute	Diam Inches	Overall Length	Material		Application	
					Tool #	Price	Tool #	Price
90-1000	0.1	2	0.1	1.1	9001	65.00	9002-10	65.00
90-100	0.08	2	0.08	1.1	1100	45.00	1100-10	45.00
90-1000	0.08	4	0.08	1.1	9001	65.00	9002-10	65.00
90-100	0.08	4	0.08	1.1	1100	45.00	1100-10	45.00
90-1000	0.06	2	0.06	1.1	1100	45.00	1100-10	45.00
90-100	0.06	2	0.06	1.1	1100	45.00	1100-10	45.00
90-1000	0.06	4	0.06	1.1	9001	65.00	9002-10	65.00
90-100	0.06	4	0.06	1.1	9001	65.00	9002-10	65.00
90-1000	0.04	2	0.04	1.1	1100	45.00	1100-10	45.00
90-100	0.04	2	0.04	1.1	1100	45.00	1100-10	45.00
90-1000	0.04	4	0.04	1.1	9001	65.00	9002-10	65.00
90-100	0.04	4	0.04	1.1	9001	65.00	9002-10	65.00
90-1000	0.03	2	0.03	1.1	1100	45.00	1100-10	45.00
90-100	0.03	2	0.03	1.1	1100	45.00	1100-10	45.00
90-1000	0.03	4	0.03	1.1	9001	65.00	9002-10	65.00
90-100	0.03	4	0.03	1.1	9001	65.00	9002-10	65.00
90-1000	0.02	2	0.02	1.1	1100	45.00	1100-10	45.00
90-100	0.02	2	0.02	1.1	1100	45.00	1100-10	45.00
90-1000	0.02	4	0.02	1.1	9001	65.00	9002-10	65.00
90-100	0.02	4	0.02	1.1	9001	65.00	9002-10	65.00
90-1000	0.01	2	0.01	1.1	1100	45.00	1100-10	45.00
90-100	0.01	2	0.01	1.1	1100	45.00	1100-10	45.00
90-1000	0.01	4	0.01	1.1	9001	65.00	9002-10	65.00
90-100	0.01	4	0.01	1.1	9001	65.00	9002-10	65.00
90-1000	0.01	2	0.01	1.1	1100	45.00	1100-10	45.00
90-100	0.01	2	0.01	1.1	1100	45.00	1100-10	45.00
90-1000	0.01	4	0.01	1.1	9001	65.00	9002-10	65.00
90-100	0.01	4	0.01	1.1	9001	65.00	9002-10	65.00

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# CORNER ROUNDING END MILLS

2 &amp; 4 Flute - Flared Shank

(continued from previous page)

Model	W/FLAT SHANK	Flute	SHANK DIAMETER	SHANK LENGTH	TOTAL LENGTH	WEIGHTS		WARRANTY	
						W/FLAT	W/CR	W/CR	W/CR
10000	0.00	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10002	0.02	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10004	0.04	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10006	0.06	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10008	0.08	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10010	0.10	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10012	0.12	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10014	0.14	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10016	0.16	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10018	0.18	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10020	0.20	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10022	0.22	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10024	0.24	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10026	0.26	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10028	0.28	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10030	0.30	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10032	0.32	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10034	0.34	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10036	0.36	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10038	0.38	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10040	0.40	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10042	0.42	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10044	0.44	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10046	0.46	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10048	0.48	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10050	0.50	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10052	0.52	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10054	0.54	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10056	0.56	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10058	0.58	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10060	0.60	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10062	0.62	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10064	0.64	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10066	0.66	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10068	0.68	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10070	0.70	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10072	0.72	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10074	0.74	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10076	0.76	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10078	0.78	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10080	0.80	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10082	0.82	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10084	0.84	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10086	0.86	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10088	0.88	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10090	0.90	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10092	0.92	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10094	0.94	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10096	0.96	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10098	0.98	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	
10100	1.00	2	1.0	1.00	1.00	21.00	WARRANTY	5 YEAR	

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## CORNER ROUNDING END MILLS

2 & 4 Flute - Flared Shank

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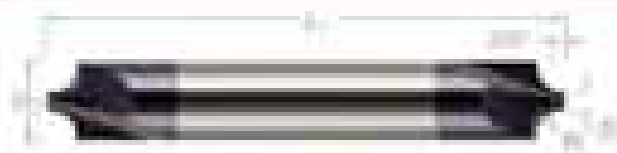
PART NO.	FLUTE NUMBER	FLUTES	SHANK DIAMETER	OVERALL LENGTH		WEIGHT		CUTTING SPEED	
						THEORY	ACTUAL	FEED	RPM
81100	2	2	1.00	3.00		1.70	40.00	1140.00	1000
81100	4	4	1.00	3.00	1.000	1.70	40.00	1140.00	1000
81100	2	2	1.125	3.125		1.80	40.00	1060.00	1100
81100	4	4	1.125	3.125		1.80	40.00	1060.00	1100
81100	2	2	1.25	3.25		1.90	40.00	980.00	1200
81100	4	4	1.25	3.25		1.90	40.00	980.00	1200
81100	2	2	1.375	3.375		2.00	40.00	900.00	1300
81100	4	4	1.375	3.375		2.00	40.00	900.00	1300
81100	2	2	1.50	3.50		2.10	40.00	820.00	1400
81100	4	4	1.50	3.50		2.10	40.00	820.00	1400
81100	2	2	1.625	3.625		2.20	40.00	740.00	1500
81100	4	4	1.625	3.625		2.20	40.00	740.00	1500
81100	2	2	1.75	3.75		2.30	40.00	660.00	1600
81100	4	4	1.75	3.75		2.30	40.00	660.00	1600
81100	2	2	1.875	3.875		2.40	40.00	580.00	1700
81100	4	4	1.875	3.875		2.40	40.00	580.00	1700
81100	2	2	2.00	4.00		2.50	40.00	500.00	1800
81100	4	4	2.00	4.00		2.50	40.00	500.00	1800
81100	2	2	2.125	4.125		2.60	40.00	420.00	1900
81100	4	4	2.125	4.125		2.60	40.00	420.00	1900
81100	2	2	2.25	4.25		2.70	40.00	340.00	2000
81100	4	4	2.25	4.25		2.70	40.00	340.00	2000
81100	2	2	2.375	4.375		2.80	40.00	260.00	2100
81100	4	4	2.375	4.375		2.80	40.00	260.00	2100
81100	2	2	2.50	4.50		2.90	40.00	180.00	2200
81100	4	4	2.50	4.50		2.90	40.00	180.00	2200
81100	2	2	2.625	4.625		3.00	40.00	100.00	2300
81100	4	4	2.625	4.625		3.00	40.00	100.00	2300
81100	2	2	2.75	4.75		3.10	40.00	20.00	2400
81100	4	4	2.75	4.75		3.10	40.00	20.00	2400
81100	2	2	2.875	4.875		3.20	40.00		2500
81100	4	4	2.875	4.875		3.20	40.00		2500
81100	2	2	3.00	5.00		3.30	40.00		2600
81100	4	4	3.00	5.00		3.30	40.00		2600

WEIGHTS ARE APPROXIMATE

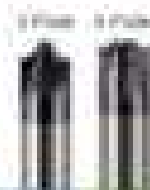


# CORNER ROUNDING END MILLS

2 & 4 Flute - Unfluted



- Unfluted shank and pilot for full radius form
- Flutes extend
- Flute depth of cut = 100% plus 0.05"
- Best cutting
- Safe operation
- 0.02 ground in the pilot



RADIUS	FLUTE DIA.	FLUTES	SHANK DIA.	LENGTH	UNCUTTING		2 FLUTE		4 FLUTE		UNFLUTED	
					TOOL#	PRICE	TOOL#	PRICE	TOOL#	PRICE	TOOL#	PRICE
0.01	0.01	2	1.0	1.10	81100	45.00	81102	45.00	81104	45.00		
0.01	0.02	2	1.0	1.10	81105	45.00	81107	45.00	81109	45.00	81111	45.00
0.01	0.03	2	1.0	1.10	81110	45.00	81112	45.00	81114	45.00		
0.01	0.04	2	1.0	1.10	81115	45.00	81117	45.00	81119	45.00	81121	45.00
0.01	0.05	2	1.0	1.10	81120	45.00			81122	45.00		
0.01	0.06	2	1.0	1.10	81125	45.00			81127	45.00		
0.01	0.08	2	1.0	1.10	81130	45.00	81132	45.00	81134	45.00		
0.01	0.10	2	1.0	1.10	81135	45.00	81137	45.00	81139	45.00		
0.01	0.12	2	1.0	1.10	81140	45.00	81142	45.00	81144	45.00		
0.01	0.15	2	1.0	1.10	81145	45.00	81147	45.00	81149	45.00	81151	45.00
0.01	0.20	2	1.0	1.10	81150	45.00	81152	45.00	81154	45.00	81156	45.00
0.01	0.25	2	1.0	1.10	81155	45.00	81157	45.00	81159	45.00	81161	45.00
0.01	0.30	2	1.0	1.10	81160	45.00	81162	45.00	81164	45.00	81166	45.00
0.01	0.40	2	1.0	1.10	81165	45.00	81167	45.00	81169	45.00	81171	45.00
0.01	0.50	2	1.0	1.10	81170	45.00	81172	45.00	81174	45.00	81176	45.00
0.01	0.60	2	1.0	1.10	81175	45.00	81177	45.00	81179	45.00	81181	45.00
0.01	0.80	2	1.0	1.10	81180	45.00	81182	45.00	81184	45.00	81186	45.00
0.01	1.00	2	1.0	1.10	81185	45.00	81187	45.00	81189	45.00	81191	45.00
0.01	1.20	2	1.0	1.10	81190	45.00	81192	45.00	81194	45.00	81196	45.00
0.01	1.50	2	1.0	1.10	81195	45.00	81197	45.00	81199	45.00	81201	45.00
0.01	2.00	2	1.0	1.10	81200	45.00	81202	45.00	81204	45.00	81206	45.00
0.01	2.50	2	1.0	1.10	81205	45.00	81207	45.00	81209	45.00	81211	45.00
0.01	3.00	2	1.0	1.10	81210	45.00	81212	45.00	81214	45.00	81216	45.00
0.01	4.00	2	1.0	1.10	81215	45.00	81217	45.00	81219	45.00	81221	45.00
0.01	5.00	2	1.0	1.10	81220	45.00	81222	45.00	81224	45.00	81226	45.00
0.01	6.00	2	1.0	1.10	81225	45.00	81227	45.00	81229	45.00	81231	45.00
0.01	8.00	2	1.0	1.10	81230	45.00	81232	45.00	81234	45.00	81236	45.00
0.01	10.00	2	1.0	1.10	81235	45.00	81237	45.00	81239	45.00	81241	45.00
0.01	12.00	2	1.0	1.10	81240	45.00	81242	45.00	81244	45.00	81246	45.00
0.01	15.00	2	1.0	1.10	81245	45.00	81247	45.00	81249	45.00	81251	45.00
0.01	20.00	2	1.0	1.10	81250	45.00	81252	45.00	81254	45.00	81256	45.00
0.01	25.00	2	1.0	1.10	81255	45.00	81257	45.00	81259	45.00	81261	45.00
0.01	30.00	2	1.0	1.10	81260	45.00	81262	45.00	81264	45.00	81266	45.00
0.01	40.00	2	1.0	1.10	81265	45.00	81267	45.00	81269	45.00	81271	45.00
0.01	50.00	2	1.0	1.10	81270	45.00	81272	45.00	81274	45.00	81276	45.00
0.01	60.00	2	1.0	1.10	81275	45.00	81277	45.00	81279	45.00	81281	45.00
0.01	80.00	2	1.0	1.10	81280	45.00	81282	45.00	81284	45.00	81286	45.00
0.01	100.00	2	1.0	1.10	81285	45.00	81287	45.00	81289	45.00	81291	45.00

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## CORNER ROUNDING END MILLS

Long Reach - Fluted



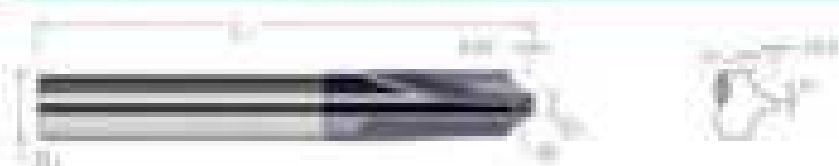
- Reduced Diameter for increased chip loads and to small features
- Shorter gear design for increased rigidity, longer life and small wheel cutting
- Flutes are tapered to reduce stress & needed to reduce maximum spindle force
- Max length of cut = radius plus 100% x 2 Flutes x Feed per Rev
- 2DC ground in the slots

SERIES	SHANK DIAMETER	OVERALL DIAMETER	OVERALL LENGTH	SHANK DIAMETER	FLUTE LENGTH	MATERIALS		CUTTING DATA	
						PCB	HPM	V.F.	FEED
.001	.001	.001	.100	.100	0.100	SAE52100	45.00		
	.001	.001	.150	.100	0.150	SAE52100	45.00	SAE52100	45.00
	.001	.001	.200	.100	0.200	SAE52100	45.00		
	.001	.001	.250	.100	0.250	SAE52100	45.00	SAE52100	45.00
	.001	.001	.300	.100	0.300	SAE52100	45.00	SAE52100	45.00
	.001	.001	.350	.100	0.350	SAE52100	45.00		
	.001	.001	.400	.100	0.400	SAE52100	45.00	SAE52100	45.00
	.001	.001	.450	.100	0.450	SAE52100	45.00	SAE52100	45.00
	.001	.001	.500	.100	0.500	SAE52100	45.00		
	.001	.001	.550	.100	0.550	SAE52100	45.00	SAE52100	45.00
.002	.002	.002	.100	.100	0.100	SAE52100	45.00	SAE52100	45.00
	.002	.002	.150	.100	0.150	SAE52100	45.00		
	.002	.002	.200	.100	0.200	SAE52100	45.00	SAE52100	45.00
.003	.003	.003	.100	.100	0.100	SAE52100	45.00	SAE52100	45.00
	.003	.003	.150	.100	0.150	SAE52100	45.00	SAE52100	45.00
	.003	.003	.200	.100	0.200	SAE52100	45.00		
	.003	.003	.250	.100	0.250	SAE52100	45.00	SAE52100	45.00
	.003	.003	.300	.100	0.300	SAE52100	45.00	SAE52100	45.00
	.003	.003	.350	.100	0.350	SAE52100	45.00		
	.003	.003	.400	.100	0.400	SAE52100	45.00	SAE52100	45.00
.005	.005	.005	.100	.100	0.100	SAE52100	45.00	SAE52100	45.00
	.005	.005	.150	.100	0.150	SAE52100	45.00	SAE52100	45.00
	.005	.005	.200	.100	0.200	SAE52100	45.00		
	.005	.005	.250	.100	0.250	SAE52100	45.00	SAE52100	45.00
	.005	.005	.300	.100	0.300	SAE52100	45.00	SAE52100	45.00
.007	.007	.007	.100	.100	0.100	SAE52100	45.00	SAE52100	45.00
	.007	.007	.150	.100	0.150	SAE52100	45.00	SAE52100	45.00
	.007	.007	.200	.100	0.200	SAE52100	45.00		
	.007	.007	.250	.100	0.250	SAE52100	45.00	SAE52100	45.00
.010	.010	.010	.100	.100	0.100	SAE52100	45.00	SAE52100	45.00
	.010	.010	.150	.100	0.150	SAE52100	45.00	SAE52100	45.00
.015	.015	.015	.100	.100	0.100	SAE52100	45.00	SAE52100	45.00
	.015	.015	.150	.100	0.150	SAE52100	45.00	SAE52100	45.00

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## CORNER ROUNDING END MILLS

### 3 Flute - Flared



- Straight end - Chamfered radius, chamfer and chamfer with chamfer setting
- D1 Flute diameter at point and diameter to avoid chips
- Chamfer depth of top of radius plus 0.05" → 3 Flutes → Chamfer corner → CNC ground to the size

Radius	D1 (inches)	D2 (inches)	Length (inches)	Overall (inches)	Material		MSRP (USD)	
					17	PM5	17	PM5
0.125 (1/8")	0.125	0.125	1.125	1.125	150.00	85.00	150.00 (17)	85.00 (PM5)
0.1875 (3/16")	0.1875	0.1875	1.1875	1.1875	200.00	100.00	200.00 (17)	100.00 (PM5)
0.25 (1/4")	0.25	0.25	1.25	1.25	250.00	125.00	250.00 (17)	125.00 (PM5)
0.3125 (5/16")	0.3125	0.3125	1.3125	1.3125	300.00	150.00	300.00 (17)	150.00 (PM5)
0.375 (3/8")	0.375	0.375	1.375	1.375	350.00	175.00	350.00 (17)	175.00 (PM5)
0.4375 (7/16")	0.4375	0.4375	1.4375	1.4375	400.00	200.00	400.00 (17)	200.00 (PM5)
0.5 (1/2")	0.5	0.5	1.5	1.5	450.00	225.00	450.00 (17)	225.00 (PM5)
0.5625 (9/16")	0.5625	0.5625	1.5625	1.5625	500.00	250.00	500.00 (17)	250.00 (PM5)
0.625 (5/8")	0.625	0.625	1.625	1.625	550.00	275.00	550.00 (17)	275.00 (PM5)
0.6875 (11/16")	0.6875	0.6875	1.6875	1.6875	600.00	300.00	600.00 (17)	300.00 (PM5)
0.75 (3/4")	0.75	0.75	1.75	1.75	650.00	325.00	650.00 (17)	325.00 (PM5)
0.8125 (13/16")	0.8125	0.8125	1.8125	1.8125	700.00	350.00	700.00 (17)	350.00 (PM5)
0.875 (7/8")	0.875	0.875	1.875	1.875	750.00	375.00	750.00 (17)	375.00 (PM5)

## CORNER ROUNDING END MILLS

### 3 Flute - Flared - Carbide Tipped

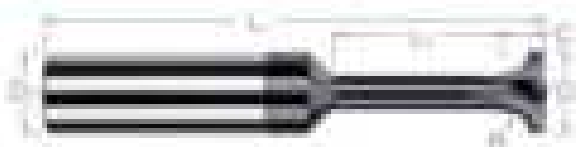


- Carbide tipped - cutting by radius and chamfer end
- D1 Flute diameter to radius at point and diameter to avoid chips
- 3 Flutes → Chamfer tip → CNC ground to the size

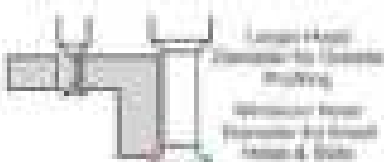
Radius	D1 (inches)	D2 (inches)	Length (inches)	Overall (inches)	Material		MSRP (USD)	
					17	PM5	17	PM5
0.125 (1/8")	0.125	0.125	1.125	1.125	100.00	50.00	100.00 (17)	50.00 (PM5)
0.1875 (3/16")	0.1875	0.1875	1.1875	1.1875	150.00	75.00	150.00 (17)	75.00 (PM5)
0.25 (1/4")	0.25	0.25	1.25	1.25	200.00	100.00	200.00 (17)	100.00 (PM5)
0.3125 (5/16")	0.3125	0.3125	1.3125	1.3125	250.00	125.00	250.00 (17)	125.00 (PM5)
0.375 (3/8")	0.375	0.375	1.375	1.375	300.00	150.00	300.00 (17)	150.00 (PM5)
0.4375 (7/16")	0.4375	0.4375	1.4375	1.4375	350.00	175.00	350.00 (17)	175.00 (PM5)
0.5 (1/2")	0.5	0.5	1.5	1.5	400.00	200.00	400.00 (17)	200.00 (PM5)
0.5625 (9/16")	0.5625	0.5625	1.5625	1.5625	450.00	225.00	450.00 (17)	225.00 (PM5)
0.625 (5/8")	0.625	0.625	1.625	1.625	500.00	250.00	500.00 (17)	250.00 (PM5)

# CORNER ROUNDING END MILLS

## Back Corner Rounding End Mills - Fluted



- Designed to mill corners or radiuses of workpiece
- 5° Flank angle and chamfered edge
- Flutes are tapered to reduce stress it should be used to prevent possible break
- Noting for center and tapering
- Solid carbide
- Bore ground to H7/h6



HORN CODE	DIA	L	R	R	FLUTE	MATERIAL	LENGTH	COATING		HORN CODE		
								TYPE	THICK	TYPE	MM	
H110001	10	100	0.5	0.5	0	SK	1100	SK	10	100	H110001	11.00
H110002	12	120	0.5	0.5	0	SK	1200	SK	12	120	H110002	12.00
H110003	16	160	0.5	0.5	0	SK	1600	SK	16	160	H110003	16.00
H110004	20	200	0.5	0.5	0	SK	2000	SK	20	200	H110004	20.00
H110005	25	250	0.5	0.5	0	SK	2500	SK	25	250	H110005	25.00
H110006	32	320	0.5	0.5	0	SK	3200	SK	32	320	H110006	32.00
H110007	40	400	0.5	0.5	0	SK	4000	SK	40	400	H110007	40.00
H110008	50	500	0.5	0.5	0	SK	5000	SK	50	500	H110008	50.00
H110009	63	630	0.5	0.5	0	SK	6300	SK	63	630	H110009	63.00
H110010	80	800	0.5	0.5	0	SK	8000	SK	80	800	H110010	80.00
H110011	100	1000	0.5	0.5	0	SK	10000	SK	100	1000	H110011	100.00
H110012	125	1250	0.5	0.5	0	SK	12500	SK	125	1250	H110012	125.00
H110013	160	1600	0.5	0.5	0	SK	16000	SK	160	1600	H110013	160.00
H110014	200	2000	0.5	0.5	0	SK	20000	SK	200	2000	H110014	200.00
H110015	250	2500	0.5	0.5	0	SK	25000	SK	250	2500	H110015	250.00
H110016	315	3150	0.5	0.5	0	SK	31500	SK	315	3150	H110016	315.00
H110017	400	4000	0.5	0.5	0	SK	40000	SK	400	4000	H110017	400.00
H110018	500	5000	0.5	0.5	0	SK	50000	SK	500	5000	H110018	500.00
H110019	630	6300	0.5	0.5	0	SK	63000	SK	630	6300	H110019	630.00
H110020	800	8000	0.5	0.5	0	SK	80000	SK	800	8000	H110020	800.00
H110021	1000	10000	0.5	0.5	0	SK	100000	SK	1000	10000	H110021	1000.00
H110022	1250	12500	0.5	0.5	0	SK	125000	SK	1250	12500	H110022	1250.00
H110023	1600	16000	0.5	0.5	0	SK	160000	SK	1600	16000	H110023	1600.00
H110024	2000	20000	0.5	0.5	0	SK	200000	SK	2000	20000	H110024	2000.00
H110025	2500	25000	0.5	0.5	0	SK	250000	SK	2500	25000	H110025	2500.00
H110026	3150	31500	0.5	0.5	0	SK	315000	SK	3150	31500	H110026	3150.00
H110027	4000	40000	0.5	0.5	0	SK	400000	SK	4000	40000	H110027	4000.00
H110028	5000	50000	0.5	0.5	0	SK	500000	SK	5000	50000	H110028	5000.00
H110029	6300	63000	0.5	0.5	0	SK	630000	SK	6300	63000	H110029	6300.00
H110030	8000	80000	0.5	0.5	0	SK	800000	SK	8000	80000	H110030	8000.00
H110031	10000	100000	0.5	0.5	0	SK	1000000	SK	10000	100000	H110031	10000.00
H110032	12500	125000	0.5	0.5	0	SK	1250000	SK	12500	125000	H110032	12500.00
H110033	16000	160000	0.5	0.5	0	SK	1600000	SK	16000	160000	H110033	16000.00
H110034	20000	200000	0.5	0.5	0	SK	2000000	SK	20000	200000	H110034	20000.00
H110035	25000	250000	0.5	0.5	0	SK	2500000	SK	25000	250000	H110035	25000.00
H110036	31500	315000	0.5	0.5	0	SK	3150000	SK	31500	315000	H110036	31500.00
H110037	40000	400000	0.5	0.5	0	SK	4000000	SK	40000	400000	H110037	40000.00
H110038	50000	500000	0.5	0.5	0	SK	5000000	SK	50000	500000	H110038	50000.00
H110039	63000	630000	0.5	0.5	0	SK	6300000	SK	63000	630000	H110039	63000.00
H110040	80000	800000	0.5	0.5	0	SK	8000000	SK	80000	800000	H110040	80000.00

\*Horn Code is a 14 digit code: 1st 10 digits are for the tool number, 11th and 12th digits are for the length, 13th and 14th digits are for the diameter.

continued on next page

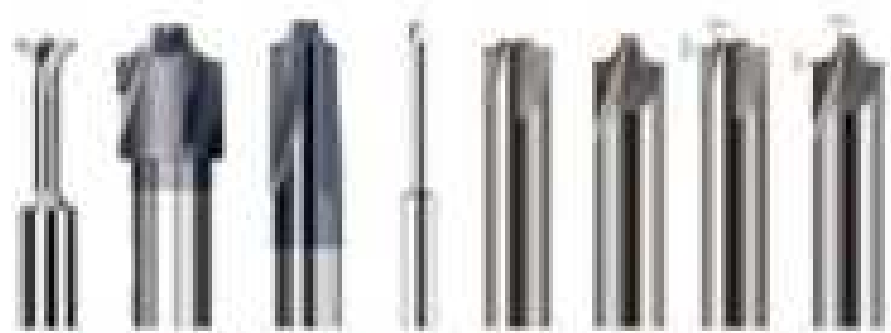
## CORNER ROUNDING END MILLS

Mark Corner Rounding End Mills - Flared (cont.)

(continued from previous page)

ITEM #	HEAD DIAMETER	NECK DIAMETER	NECK LENGTH	RADIUS (R)	FLUTE	SHANK DIAMETER	OVERALL LENGTH	UNFINISHED		FINISHED	
								TYPE 1	TYPE 2	TYPE 1	TYPE 2
9000000	.200	.150	.200	.050	2	.170	2.100	90000	90000	9000000	90000
9000001	.250	.150	.200	.050	2	.170	2.100	90000	90000	9000001	90000
9000002	.300	.150	.200	.050	2	.170	2.100	90000	90000	9000002	90000
9000003	.350	.150	.200	.050	2	.170	2.100	90000	90000	9000003	90000
9000004	.400	.150	.200	.050	2	.170	2.100	90000	90000	9000004	90000
9000005	.450	.150	.200	.050	2	.170	2.100	90000	90000	9000005	90000
9000006	.500	.150	.200	.050	2	.170	2.100	90000	90000	9000006	90000
9000007	.550	.150	.200	.050	2	.170	2.100	90000	90000	9000007	90000
9000008	.600	.150	.200	.050	2	.170	2.100	90000	90000	9000008	90000
9000009	.650	.150	.200	.050	2	.170	2.100	90000	90000	9000009	90000
9000010	.700	.150	.200	.050	2	.170	2.100	90000	90000	9000010	90000
9000011	.750	.150	.200	.050	2	.170	2.100	90000	90000	9000011	90000
9000012	.800	.150	.200	.050	2	.170	2.100	90000	90000	9000012	90000
9000013	.850	.150	.200	.050	2	.170	2.100	90000	90000	9000013	90000
9000014	.900	.150	.200	.050	2	.170	2.100	90000	90000	9000014	90000
9000015	.950	.150	.200	.050	2	.170	2.100	90000	90000	9000015	90000
9000016	1.000	.150	.200	.050	2	.170	2.100	90000	90000	9000016	90000
9000017	1.050	.150	.200	.050	2	.170	2.100	90000	90000	9000017	90000
9000018	1.100	.150	.200	.050	2	.170	2.100	90000	90000	9000018	90000
9000019	1.150	.150	.200	.050	2	.170	2.100	90000	90000	9000019	90000
9000020	1.200	.150	.200	.050	2	.170	2.100	90000	90000	9000020	90000
9000021	1.250	.150	.200	.050	2	.170	2.100	90000	90000	9000021	90000
9000022	1.300	.150	.200	.050	2	.170	2.100	90000	90000	9000022	90000
9000023	1.350	.150	.200	.050	2	.170	2.100	90000	90000	9000023	90000
9000024	1.400	.150	.200	.050	2	.170	2.100	90000	90000	9000024	90000
9000025	1.450	.150	.200	.050	2	.170	2.100	90000	90000	9000025	90000
9000026	1.500	.150	.200	.050	2	.170	2.100	90000	90000	9000026	90000
9000027	1.550	.150	.200	.050	2	.170	2.100	90000	90000	9000027	90000
9000028	1.600	.150	.200	.050	2	.170	2.100	90000	90000	9000028	90000
9000029	1.650	.150	.200	.050	2	.170	2.100	90000	90000	9000029	90000
9000030	1.700	.150	.200	.050	2	.170	2.100	90000	90000	9000030	90000
9000031	1.750	.150	.200	.050	2	.170	2.100	90000	90000	9000031	90000
9000032	1.800	.150	.200	.050	2	.170	2.100	90000	90000	9000032	90000
9000033	1.850	.150	.200	.050	2	.170	2.100	90000	90000	9000033	90000
9000034	1.900	.150	.200	.050	2	.170	2.100	90000	90000	9000034	90000
9000035	1.950	.150	.200	.050	2	.170	2.100	90000	90000	9000035	90000
9000036	2.000	.150	.200	.050	2	.170	2.100	90000	90000	9000036	90000

\*Refer to our website for more information on our products and services. © 2014 Sandvik Corrosion



Check Out All of Our Corner Rounding Solutions!

## BORING BARS



- Bored both ends with chamfered corners and flat top
- Square ends ensures rigidity and maximum performance
- No re-ground in stock corner
- 10% stronger than standard design
- ISO 4034
- CNC ground to the 1000

### Vertical Bore Bar Design

BAR CODE DIAMETER	MAX BORE DIAMETER	Length DIAMETER	TOTAL LENGTH	MATERIAL		PRICE (PER BAR)	
				TYPE 1	TYPE 2	TYPE 1	TYPE 2
311	Ø1.00	1.0	1.100	3040	3040	3040.00	41.00
312	Ø1.00	1.0	1.100	3040	3040		
314	1.0	1.0	1.100	3040	3040	3040.00	33.00
315	Ø1.00	1.0	1.100	3040	3040	3040.00	37.00
317	Ø1.00	1.0	1.100	3040	3040		
320	Ø1.0	1.0	1.100	3040	3040	3040.00	37.00
321	1.0	1.0	1.100	3040	3040	3040.00	39.00
322	Ø1.00	1.0	1.100	3040	3040	3040.00	33.00
323	1.0	1.0	1.100	3040	3040		
324	Ø1.0	1.0	1.100	3040	3040		
325	Ø1.0	1.0	1.100	3040	3040		
326	Ø1.0	1.0	1.100	3040	3040		
327	Ø1.0	1.0	1.100	3040	3040		
328	Ø1.0	1.0	1.100	3040	3040		
329	Ø1.0	1.0	1.100	3040	3040		
330	Ø1.0	1.0	1.100	3040	3040		
331	Ø1.0	1.0	1.100	3040	3040		
332	Ø1.0	1.0	1.100	3040	3040		
333	Ø1.0	1.0	1.100	3040	3040		
334	Ø1.0	1.0	1.100	3040	3040		
335	Ø1.0	1.0	1.100	3040	3040		
336	Ø1.0	1.0	1.100	3040	3040		
337	Ø1.0	1.0	1.100	3040	3040		
338	Ø1.0	1.0	1.100	3040	3040		
339	Ø1.0	1.0	1.100	3040	3040		
340	Ø1.0	1.0	1.100	3040	3040		
341	Ø1.0	1.0	1.100	3040	3040		
342	Ø1.0	1.0	1.100	3040	3040		
343	Ø1.0	1.0	1.100	3040	3040		
344	Ø1.0	1.0	1.100	3040	3040		
345	Ø1.0	1.0	1.100	3040	3040		
346	Ø1.0	1.0	1.100	3040	3040		
347	Ø1.0	1.0	1.100	3040	3040		
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349	Ø1.0	1.0	1.100	3040	3040		
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353	Ø1.0	1.0	1.100	3040	3040		
354	Ø1.0	1.0	1.100	3040	3040		
355	Ø1.0	1.0	1.100	3040	3040		
356	Ø1.0	1.0	1.100	3040	3040		
357	Ø1.0	1.0	1.100	3040	3040		
358	Ø1.0	1.0	1.100	3040	3040		
359	Ø1.0	1.0	1.100	3040	3040		
360	Ø1.0	1.0	1.100	3040	3040		
361	Ø1.0	1.0	1.100	3040	3040		
362	Ø1.0	1.0	1.100	3040	3040		
363	Ø1.0	1.0	1.100	3040	3040		
364	Ø1.0	1.0	1.100	3040	3040		
365	Ø1.0	1.0	1.100	3040	3040		
366	Ø1.0	1.0	1.100	3040	3040		
367	Ø1.0	1.0	1.100	3040	3040		
368	Ø1.0	1.0	1.100	3040	3040		
369	Ø1.0	1.0	1.100	3040	3040		
370	Ø1.0	1.0	1.100	3040	3040		
371	Ø1.0	1.0	1.100	3040	3040		
372	Ø1.0	1.0	1.100	3040	3040		
373	Ø1.0	1.0	1.100	3040	3040		
374	Ø1.0	1.0	1.100	3040	3040		
375	Ø1.0	1.0	1.100	3040	3040		
376	Ø1.0	1.0	1.100	3040	3040		
377	Ø1.0	1.0	1.100	3040	3040		
378	Ø1.0	1.0	1.100	3040	3040		
379	Ø1.0	1.0	1.100	3040	3040		
380	Ø1.0	1.0	1.100	3040	3040		
381	Ø1.0	1.0	1.100	3040	3040		
382	Ø1.0	1.0	1.100	3040	3040		
383	Ø1.0	1.0	1.100	3040	3040		
384	Ø1.0	1.0	1.100	3040	3040		
385	Ø1.0	1.0	1.100	3040	3040		
386	Ø1.0	1.0	1.100	3040	3040		
387	Ø1.0	1.0	1.100	3040	3040		
388	Ø1.0	1.0	1.100	3040	3040		
389	Ø1.0	1.0	1.100	3040	3040		
390	Ø1.0	1.0	1.100	3040	3040		
391	Ø1.0	1.0	1.100	3040	3040		
392	Ø1.0	1.0	1.100	3040	3040		
393	Ø1.0	1.0	1.100	3040	3040		
394	Ø1.0	1.0	1.100	3040	3040		
395	Ø1.0	1.0	1.100	3040	3040		
396	Ø1.0	1.0	1.100	3040	3040		
397	Ø1.0	1.0	1.100	3040	3040		
398	Ø1.0	1.0	1.100	3040	3040		
399	Ø1.0	1.0	1.100	3040	3040		
400	Ø1.0	1.0	1.100	3040	3040		

1000

## BACKDRAFT CUTTERS

### Square



- Designed to clear up before corner of workpiece while backdraft
- High strength cutting
- Threaded holes (20° angle)
- Square cutting
- Safe cutting
- ISO 9001 certified



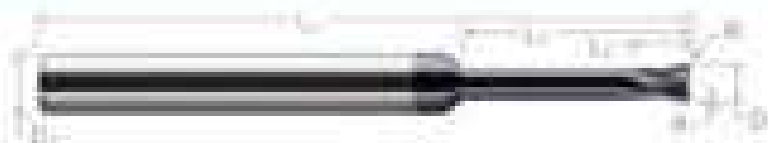
ISO 9001:2015  
 EN 10204 3.1  
 Material:  
 SAE A2-70

APPROX. PER SIDE	APPROX. DIA.	L	WELD DIA.	TYPICAL REACH	SHANK DIA.	L	APPROX. WT.		APPROX. PRICE	
							gms	lbs/oz	gms	lbs/oz
1/8"	1/8"	1.00	1/8"	0.10 (in)	1/8"	0.10	11000	24.24	11000000	24.24
	3/16"	1.00	3/16"	0.10 (in)	3/16"	0.10	11000	24.24	11000000	24.24
	1/4"	1.00	1/4"	0.10 (in)	1/4"	0.10	11000	24.24	11000000	24.24
1/4"	1/4"	1.00	1/4"	0.10 (in)	1/4"	0.10	11000	24.24	11000000	24.24
	3/8"	1.00	3/8"	0.10 (in)	3/8"	0.10	11000	24.24	11000000	24.24
	1/2"	1.00	1/2"	0.10 (in)	1/2"	0.10	11000	24.24	11000000	24.24
3/8"	3/8"	1.00	3/8"	0.10 (in)	3/8"	0.10	11000	24.24	11000000	24.24
	1/2"	1.00	1/2"	0.10 (in)	1/2"	0.10	11000	24.24	11000000	24.24
	5/8"	1.00	5/8"	0.10 (in)	5/8"	0.10	11000	24.24	11000000	24.24
1/2"	1/2"	1.00	1/2"	0.10 (in)	1/2"	0.10	11000	24.24	11000000	24.24
	3/4"	1.00	3/4"	0.10 (in)	3/4"	0.10	11000	24.24	11000000	24.24
	1"	1.00	1"	0.10 (in)	1"	0.10	11000	24.24	11000000	24.24



## BACKDRAFT CUTTERS

Corner Radius



- Designed to allow us to form round of corners with backdraft angle minimum cutting
- Special design for improved strength and wear resistance
- 4 Flutes (with 20° angle)
- Center cutting
- Balance type
- ISO grade is H6-K8



$D_1 = 100, 120, 150, 180, 200, 220, 250, 280, 300, 320, 350, 380, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000$   
 $D_2 = 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 220, 240, 260, 280, 300, 320, 340, 360, 380, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000$   
 $L_1 = 100, 120, 150, 180, 200, 220, 250, 280, 300, 320, 350, 380, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000$   
 $L_2 = 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200, 220, 240, 260, 280, 300, 320, 340, 360, 380, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000$   
 $R = 0.5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100$

Outer Diameter D1 (mm)	Inner Diameter D2 (mm)	Tapered Length L1 (mm)	Total Length L2 (mm)	Outer Dia. D1 (mm)	Inner Dia. D2 (mm)	Tapered Length L1 (mm)	Total Length L2 (mm)	DIN 6350		DIN 6350	
								1.2	1.4	1.2	1.4
100	50	100	150	100	50	100	150	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
120	60	120	170	120	60	120	170	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
150	75	150	210	150	75	150	210	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
180	90	180	250	180	90	180	250	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
200	100	200	280	200	100	200	280	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
220	110	220	310	220	110	220	310	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
250	125	250	350	250	125	250	350	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
280	140	280	400	280	140	280	400	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
300	150	300	430	300	150	300	430	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
320	160	320	460	320	160	320	460	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
350	175	350	510	350	175	350	510	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
380	190	380	560	380	190	380	560	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
400	200	400	600	400	200	400	600	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
450	225	450	675	450	225	450	675	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
500	250	500	750	500	250	500	750	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
550	275	550	825	550	275	550	825	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
600	300	600	900	600	300	600	900	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
650	325	650	975	650	325	650	975	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
700	350	700	1050	700	350	700	1050	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
750	375	750	1125	750	375	750	1125	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
800	400	800	1200	800	400	800	1200	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
850	425	850	1275	850	425	850	1275	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
900	450	900	1350	900	450	900	1350	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
950	475	950	1425	950	475	950	1425	1.2	1.4	100000	100000
								1.2	1.4	100000	100000
1000	500	1000	1500	1000	500	1000	1500	1.2	1.4	100000	100000
								1.2	1.4	100000	100000

## DOVETAIL CUTTERS



- Offered with shank diameters: 1/2", 3/8", 5/16", 3/16" or 1/8" (shown below)
- Stock condition
- 1/2" ground to the 1/8"



Shown in 1/2" diameter shank diameter

Shank Size	Overall Length	Length of Cut	Shank Dia.	Cutting Edge	Flutes	Shank Dia.	Overall Length	Material		Price (each)	
								Stock	1/2" Dia.	Stock	1/2" Dia.
1/8"	1.0	.25	.125	.125	2	1/8	1.12	SS304	12.00	SS304-1/8	10.00
	1.25	.31	.125	.125	2	1/8	1.37	SS304	14.00	SS304-1/8	12.00
	1.5	.37	.125	.125	2	1/8	1.62	SS304	16.00	SS304-1/8	14.00
	1.75	.43	.125	.125	2	1/8	1.87	SS304	18.00	SS304-1/8	16.00
	2.0	.49	.125	.125	2	1/8	2.12	SS304	20.00	SS304-1/8	18.00
	2.25	.55	.125	.125	2	1/8	2.37	SS304	22.00	SS304-1/8	20.00
	2.5	.61	.125	.125	2	1/8	2.62	SS304	24.00	SS304-1/8	22.00
	2.75	.67	.125	.125	2	1/8	2.87	SS304	26.00	SS304-1/8	24.00
	3.0	.73	.125	.125	2	1/8	3.12	SS304	28.00	SS304-1/8	26.00
	3.25	.79	.125	.125	2	1/8	3.37	SS304	30.00	SS304-1/8	28.00
3/16"	1.0	.25	.187	.187	2	3/16	1.12	SS304	14.00	SS304-3/16	12.00
	1.25	.31	.187	.187	2	3/16	1.37	SS304	16.00	SS304-3/16	14.00
	1.5	.37	.187	.187	2	3/16	1.62	SS304	18.00	SS304-3/16	16.00
	1.75	.43	.187	.187	2	3/16	1.87	SS304	20.00	SS304-3/16	18.00
	2.0	.49	.187	.187	2	3/16	2.12	SS304	22.00	SS304-3/16	20.00
	2.25	.55	.187	.187	2	3/16	2.37	SS304	24.00	SS304-3/16	22.00
	2.5	.61	.187	.187	2	3/16	2.62	SS304	26.00	SS304-3/16	24.00
	2.75	.67	.187	.187	2	3/16	2.87	SS304	28.00	SS304-3/16	26.00
	3.0	.73	.187	.187	2	3/16	3.12	SS304	30.00	SS304-3/16	28.00
	3.25	.79	.187	.187	2	3/16	3.37	SS304	32.00	SS304-3/16	30.00
1/2"	1.0	.25	.375	.375	2	1/2	1.12	SS304	24.00	SS304-1/2	24.00
	1.25	.31	.375	.375	2	1/2	1.37	SS304	26.00	SS304-1/2	26.00
	1.5	.37	.375	.375	2	1/2	1.62	SS304	28.00	SS304-1/2	28.00

\*Standard material is not subject to heat treating and stress.

(continued on next page)

# DOVETAIL CUTTERS

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FINISH SERIES	CUTTER DIA.	LENGTH OF CUT	WAVE DIA.	CUTTER FINISH	FORM	WAVE DIA.	CYCLES PER MIN.	CONTACT		WAVE-DIA./IN.	
								TYPE A	TYPE	TYPE A	TYPE
10'	14	37	36	AAAA	2	14	110	2100	2100	2100-15	2100
	16	47	46	AA	2	16	110	2104	2100	2100-16	2100
	21.4	59	58	AAAA	2	21.4	2	20112	2000	20112-15	2000
	21.4	59	58	AA	2	21.4	2	2101	2000	2101-15	2000
	24	69	68	AAAA	2	24	2	20114	2000	20114-15	2000
	24	69	68	AA	2	24	2	2101	2000	2101-15	2000
	31.4	79	78	AAAA	2	31.4	2100	2000	2000	2000-15	2000
	31.4	79	78	AA	2	31.4	2100	2100	2100	2100-15	2100
	36	89	88	AAAA	2	36	2100	2000	2000	2000-15	2000
	36	89	88	AA	2	36	2100	2100	2100	2100-15	2100
	42	99	98	AAAA	2	42	2	2101	2000	2101-15	2000
14'	11.0	30	29	AA	2	11	110	2100	2100	2100-10	2100
	12.0	33	32	AA	2	12	110	2100	2100	2100-10	2100
	14	37	36	AA	2	14	110	2100	2100	2100-10	2100
	17.4	47	46	AA	2	17.4	2	2101	2000	2101-10	2000
	21	53	52	AA	2	21	2	20112	2000	20112-10	2000
	21	53	52	AA	2	21	2100	2100	2100	2100-10	2100
	24	59	58	AA	2	24	2100	2100	2100	2100-10	2100
	27	65	64	AA	2	27	2100	2100	2100	2100-10	2100
18'	12.0	33	32	AAAA	2	12	110	2000	2000	2000-12	2000
	12.0	33	32	AAAA	2	12	110	2004	2000	2004-12	2000
	12.0	33	32	AA	2	12	110	2001	2000	2001-12	2000
	12.0	33	32	AA	2	12	110	2001	2000	2001-12	2000
	12.0	33	32	AAAA	2	12	110	2001	2000	2001-12	2000
	12.0	33	32	AA	2	12	110	2001	2000	2001-12	2000
	14	37	36	AAAA	2	14	110	2001	2000	2001-12	2000
	14	37	36	AA	2	14	110	2101	2000	2101-12	2000
	17.4	47	46	AAAA	2	17.4	2	20112	2000	20112-12	2000
	17.4	47	46	AA	2	17.4	2	2101	2000	2101-12	2000
	21	53	52	AAAA	2	21	2	20112	2000	20112-12	2000
	21	53	52	AA	2	21	2	2101	2000	2101-12	2000
	24	59	58	AAAA	2	24	2100	2000	2000	2000-12	2000
	24	59	58	AA	2	24	2100	2100	2100	2100-12	2100
	27	65	64	AAAA	2	27	2100	2000	2000	2000-12	2000
	27	65	64	AA	2	27	2100	2100	2100	2100-12	2100
	30	71	70	AAAA	2	30	2100	2000	2000	2000-12	2000
	30	71	70	AA	2	30	2100	2100	2100	2100-12	2100
	36	89	88	AAAA	2	36	2	20112	2000	20112-12	2000
	36	89	88	AA	2	36	2	2101	2000	2101-12	2000
	42	99	98	AAAA	2	42	2	20112	2000	20112-12	2000

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# DOVETAIL CUTTERS

continued

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FINISH GRADE	CUTTER DIA.	LENGTH OF TOOL	HARD END	TOOTH SHAPE	FLUTES	SHANK DIA.	OVERALL LENGTH	WEIGHTS		APPROX. COST		
								TOOL	PKG.	TOOL P.	PKG.	
A-1	1.18	1.00	1.00	SHARP	2	1.18	1.18	0.0002	01.00	00000100	01.00	
	1.18	1.00	1.00	SHARP	2	1.18	1.18	0.0004	70.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SHARP	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	B-1	1.18	1.00	1.00	SHARP	2	1.18	1.18	0.0004	01.00	00000100	01.00
		1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SHARP	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
1.18		1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
C-1		1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00
		1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00
		1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	
	1.18	1.00	1.00	SH.	2	1.18	1.18	0.0004	01.00	00000100	01.00	

\*Specials require minimum lot and/or minimum lead time.

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PHOTO COURTESY OF PRECISION PRODUCTS

## DOVETAIL CUTTERS

(Cont'd.)

(continued from previous page)

MILLING SERIES	CUTTER DIA.	LENGTH OF CUT	HOLE DIA.	CUTTER RADIUS	FLUTES	SHAFT DIA.	OVERALL LENGTH	UNFINISHED		FINISHED	
								TOOL #	PRICE	TOOL #	PRICE
40	1.125	1.00	.000	.000	2	1.00	1.125	80000	25.00	80004-02	25.00
	1.250	1.00	.000	.000	2	1.00	1.250	80000	25.00	80004-02	25.00
	1.375	1.00	.000	.000	2	1.00	1.375	80000	25.00	80004-02	25.00
	1.500	1.00	.000	.000	2	1.00	1.500	80000	25.00	80004-02	25.00
	1.625	1.00	.000	.000	2	1.00	1.625	80000	25.00	80004-02	25.00
	1.750	1.00	.000	.000	2	1.00	1.750	80000	25.00	80004-02	25.00
	1.875	1.00	.000	.000	2	1.00	1.875	80000	25.00	80004-02	25.00
	2.000	1.00	.000	.000	2	1.00	2.000	80000	25.00	80004-02	25.00
	2.125	1.00	.000	.000	2	1.00	2.125	80000	25.00	80004-02	25.00
	2.250	1.00	.000	.000	2	1.00	2.250	80000	25.00	80004-02	25.00
45	1.125	1.00	.000	.000	2	1.00	1.125	80000	25.00	80004-02	25.00
	1.250	1.00	.000	.000	2	1.00	1.250	80000	25.00	80004-02	25.00
	1.375	1.00	.000	.000	2	1.00	1.375	80000	25.00	80004-02	25.00
	1.500	1.00	.000	.000	2	1.00	1.500	80000	25.00	80004-02	25.00
50	1.125	1.00	.000	.000	2	1.00	1.125	80000	25.00	80004-02	25.00
	1.250	1.00	.000	.000	2	1.00	1.250	80000	25.00	80004-02	25.00
	1.375	1.00	.000	.000	2	1.00	1.375	80000	25.00	80004-02	25.00
	1.500	1.00	.000	.000	2	1.00	1.500	80000	25.00	80004-02	25.00
60	1.125	1.00	.000	.000	2	1.00	1.125	80000	25.00	80004-02	25.00
	1.250	1.00	.000	.000	2	1.00	1.250	80000	25.00	80004-02	25.00
	1.375	1.00	.000	.000	2	1.00	1.375	80000	25.00	80004-02	25.00
	1.500	1.00	.000	.000	2	1.00	1.500	80000	25.00	80004-02	25.00
	1.625	1.00	.000	.000	2	1.00	1.625	80000	25.00	80004-02	25.00
	1.750	1.00	.000	.000	2	1.00	1.750	80000	25.00	80004-02	25.00
	1.875	1.00	.000	.000	2	1.00	1.875	80000	25.00	80004-02	25.00
	2.000	1.00	.000	.000	2	1.00	2.000	80000	25.00	80004-02	25.00
	2.125	1.00	.000	.000	2	1.00	2.125	80000	25.00	80004-02	25.00
	2.250	1.00	.000	.000	2	1.00	2.250	80000	25.00	80004-02	25.00
	2.375	1.00	.000	.000	2	1.00	2.375	80000	25.00	80004-02	25.00
	2.500	1.00	.000	.000	2	1.00	2.500	80000	25.00	80004-02	25.00
	2.625	1.00	.000	.000	2	1.00	2.625	80000	25.00	80004-02	25.00
	2.750	1.00	.000	.000	2	1.00	2.750	80000	25.00	80004-02	25.00
	2.875	1.00	.000	.000	2	1.00	2.875	80000	25.00	80004-02	25.00
	3.000	1.00	.000	.000	2	1.00	3.000	80000	25.00	80004-02	25.00
	3.125	1.00	.000	.000	2	1.00	3.125	80000	25.00	80004-02	25.00
	3.250	1.00	.000	.000	2	1.00	3.250	80000	25.00	80004-02	25.00
	3.375	1.00	.000	.000	2	1.00	3.375	80000	25.00	80004-02	25.00

Always consult our catalog for detailed specifications.

(continued on next page)

## DOVETAIL CUTTERS

(cont.)

Continued from previous page

MILLING CODE	CUTTER DIA.	LENGTH OF CUT	HOLE DIA.	CUTTER MATERIAL	FLUTES	SHAFT DIA.	TOTAL LENGTH	WEIGHTS		MSRP (USD)	
								TOOL A	PK10	TOOL A	PK10
60°	1/8	1/8	1/8	W8020	2	1/8	3	00010	0010	00010-00	10000
	1/8	1/8	1/8	W810	2	1/8	3	01110	0010	01110-00	10000
	3/16	3/16	3/16	W810	2	3/16	3	02110	0010	02110-00	10000
	1/4	1/4	1/4	W810	2	1/4	4	03110	0010	03110-00	10000
	5/16	5/16	5/16	W810	2	5/16	4	04110	0010	04110-00	10000
	3/8	3/8	3/8	W810	2	3/8	5	05110	0010	05110-00	10000
	7/16	7/16	7/16	W810	2	7/16	5	06110	0010	06110-00	10000
	1/2	1/2	1/2	W810	2	1/2	6	07110	0010	07110-00	10000
	5/8	5/8	5/8	W810	2	5/8	6	08110	0010	08110-00	10000
	3/4	3/4	3/4	W810	2	3/4	7	09110	0010	09110-00	10000
	7/8	7/8	7/8	W810	2	7/8	7	10110	0010	10110-00	10000
	1	1	1	W810	2	1	8	11110	0010	11110-00	10000
	1 1/8	1 1/8	1 1/8	W810	2	1 1/8	8	12110	0010	12110-00	10000
	1 1/4	1 1/4	1 1/4	W810	2	1 1/4	9	13110	0010	13110-00	10000
	1 3/8	1 3/8	1 3/8	W810	2	1 3/8	9	14110	0010	14110-00	10000
	1 1/2	1 1/2	1 1/2	W810	2	1 1/2	10	15110	0010	15110-00	10000
	1 3/4	1 3/4	1 3/4	W810	2	1 3/4	10	16110	0010	16110-00	10000
	1 7/8	1 7/8	1 7/8	W810	2	1 7/8	11	17110	0010	17110-00	10000
	2	2	2	W810	2	2	11	18110	0010	18110-00	10000
	90°	1/8	1/8	1/8	W810	2	1/8	3	00110	0010	00110-00
1/8		1/8	1/8	W810	2	1/8	3	01110	0010	01110-00	10000
3/16		3/16	3/16	W810	2	3/16	3	02110	0010	02110-00	10000
1/4		1/4	1/4	W810	2	1/4	4	03110	0010	03110-00	10000
5/16		5/16	5/16	W810	2	5/16	4	04110	0010	04110-00	10000
3/8		3/8	3/8	W810	2	3/8	5	05110	0010	05110-00	10000
7/16		7/16	7/16	W810	2	7/16	5	06110	0010	06110-00	10000
1/2		1/2	1/2	W810	2	1/2	6	07110	0010	07110-00	10000
5/8		5/8	5/8	W810	2	5/8	6	08110	0010	08110-00	10000
3/4		3/4	3/4	W810	2	3/4	7	09110	0010	09110-00	10000
7/8		7/8	7/8	W810	2	7/8	7	10110	0010	10110-00	10000
1		1	1	W810	2	1	8	11110	0010	11110-00	10000
1 1/8		1 1/8	1 1/8	W810	2	1 1/8	8	12110	0010	12110-00	10000
1 1/4		1 1/4	1 1/4	W810	2	1 1/4	9	13110	0010	13110-00	10000
1 3/8		1 3/8	1 3/8	W810	2	1 3/8	9	14110	0010	14110-00	10000
1 1/2	1 1/2	1 1/2	W810	2	1 1/2	10	15110	0010	15110-00	10000	

Always consult our catalog for technical specifications.

Continued on next page

## DOVETAIL CUTTERS

(cont.)

(continued from previous page)

MACHINE TYPE	CUTTER DIA.	LENGTH OF CUT	RMS DIA.	CORNER RADIUS	FLUTE DEPTH	SHANK DIA.	OVERALL LENGTH	WEIGHT		VIBR. TEST RES.	
								TOOL A	PP10	TOOL B	PP10
60°	1/8	1/8	1/8	0.000	0	1/8	2.10	00004	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	2.17	00001	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	2.40	00002	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	2.70	00003	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	2.94	00000	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	3	00000	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	3	00000	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	3	00000	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	3	00000	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	3	00000	100.00	00000.00	100.00
80°	1/8	1/8	1/8	0.000	0	1/8	2.10	00004	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	2.40	00001	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	2.70	00002	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	3	00003	100.00	00000.00	100.00
100°	1/8	1/8	1/8	0.000	0	1/8	2.10	00004	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	2.40	00001	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	2.70	00002	100.00	00000.00	100.00
	1/8	1/8	1/8	0.000	0	1/8	3	00003	100.00	00000.00	100.00

\*Always consult our website to check for stock.



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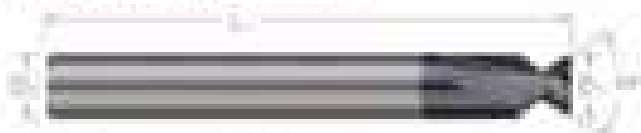
HarveyTool.com/DownloadSimulationFiles



## DOVETAIL CUTTERS

### Parker Hanfman O-Ring Dovetail Cutters

#### With Drop Hole Allowance



- Designed for milling full dovetail grooves with Drop Hole Allowance
- Designed to the standards suggested for the O-Ring Grooves of Parker-Hanfman Corporation (ISO 2701 USA, ISO 2700)
- Unthreaded cutter design allows direct milling in both faces of groove for tapered thread
- Mills both top and bottom ends
- 90° lead angle, 60° included
- Straight flutes
- Ground cutting
- Steel bodies
- ISO ground in the USA



CUTTER PART NO.	CUTTER SIZE		CUTTER LENGTH IN.	CUTTER LENGTH MM	CUTTER LENGTH IN.	CUTTER LENGTH MM	CUTTER LENGTH IN.	CUTTER LENGTH MM	CUTTER LENGTH		CUTTER LENGTH		CUTTER LENGTH	
	IN.	MM							IN.	MM	IN.	MM	IN.	MM
101	0.75	19.0	0.75	19.0	0.75	19.0	0.75	19.0	0.75	19.0	0.75	19.0	0.75	19.0
102	0.875	22.1	0.875	22.1	0.875	22.1	0.875	22.1	0.875	22.1	0.875	22.1	0.875	22.1
103	1.0	25.4	1.0	25.4	1.0	25.4	1.0	25.4	1.0	25.4	1.0	25.4	1.0	25.4
104	1.125	28.6	1.125	28.6	1.125	28.6	1.125	28.6	1.125	28.6	1.125	28.6	1.125	28.6
105	1.25	31.8	1.25	31.8	1.25	31.8	1.25	31.8	1.25	31.8	1.25	31.8	1.25	31.8
106	1.375	34.9	1.375	34.9	1.375	34.9	1.375	34.9	1.375	34.9	1.375	34.9	1.375	34.9
107	1.5	38.1	1.5	38.1	1.5	38.1	1.5	38.1	1.5	38.1	1.5	38.1	1.5	38.1
108	1.625	41.3	1.625	41.3	1.625	41.3	1.625	41.3	1.625	41.3	1.625	41.3	1.625	41.3
109	1.75	44.5	1.75	44.5	1.75	44.5	1.75	44.5	1.75	44.5	1.75	44.5	1.75	44.5

For more information on Parker-Hanfman products, visit [www.parker.com](http://www.parker.com) or call 1-800-451-5000.

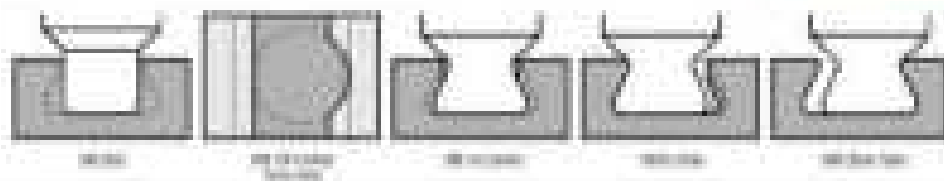
## RECOMMENDED O-RING DOVETAIL MILLING TECHNIQUES

### With Drop Hole Allowance

1. Rough out part with appropriate O-ring geometry (M) and relief features to suit your manufacturing method
2. Mill outer ring face
3. Mill O-ring Groove through diameter of M and depth and end chamfers from outer diameter. **Remember the relief is counterbored into of part and it may be necessary to reduce the face run in (R1).**
4. Mill outer groove with decreasing radii diameter on the side of part.
5. Mill outer groove with decreasing radii diameter on the side of part.



For more information, visit the O-ring page at [parker.com/hanfman](http://parker.com/hanfman)



### O-Ring Slotting End Mill



See page 419

- Used for milling O-ring dovetail grooves
- Allows for tight slot width and shape without relief chamfers





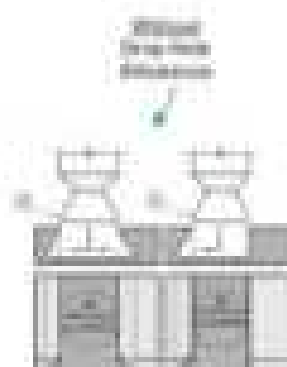
## DOVETAIL CUTTERS

### Parker Harnett O-Ring Dovetail Cutters

#### Without Drop Hole Allowance



- Designed for milling half dovetails or full dovetails **with** no drop hole allowance
- Designed for the operations suggested by the Cutting Director of Parker Machine
- Generation made steel from series: QM1-1130/1204, QM1-1700
- 0.005 inch radius only
- 20° per side, 40° included
- 2 straight flutes
- Center cutting
- Right use only
- QM1 ground to the QM1



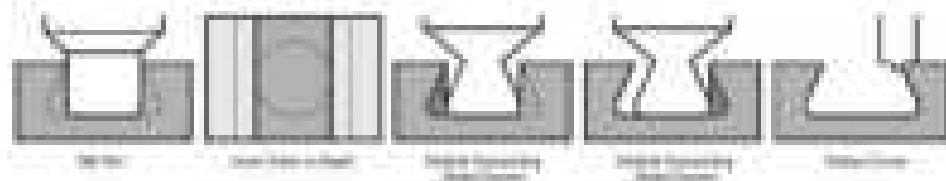
Overall Length Inches	Overall Length mm	Shank Length Inches	Shank Length mm	Shank Dia. Inches	Shank Dia. mm	Dia. at End Inches	CUTTING DIRECTOR		PERFORMANCE		
							Feed, in./rev	Speed, RPM	Feed, in./rev	Speed, RPM	
1.00	25.4	0.75	19.0	0.375	9.5	0.375	1200	0.005	1500	0.005	1500
1.25	31.75	0.90	22.8	0.375	9.5	0.375	1200	0.005	1500	0.005	1500
1.50	38.1	1.10	27.9	0.375	9.5	0.375	1200	0.005	1500	0.005	1500
1.75	44.45	1.30	33.0	0.375	9.5	0.375	1200	0.005	1500	0.005	1500
2.00	50.8	1.50	38.1	0.375	9.5	0.375	1200	0.005	1500	0.005	1500
2.25	57.15	1.70	43.2	0.375	9.5	0.375	1200	0.005	1500	0.005	1500
2.50	63.5	1.90	48.3	0.375	9.5	0.375	1200	0.005	1500	0.005	1500
2.75	69.85	2.10	53.4	0.375	9.5	0.375	1200	0.005	1500	0.005	1500

\*Metric dimensions given in parentheses only. †Specify a length only.

## RECOMMENDED O-RING DOVETAIL MILLING TECHNIQUES

### Without Drop Hole Allowance

- Tools too long (flute), featured with profile and great cutting geometry result in excessive heat for the difficult application. Always remember the potential to use the MCH drop hole allowance.
- Rough out the slots with standard O-ring finishing and drill out the hole in follow or use other appropriate tool.
- Avoid O-Ring Cutter chatter or chisel load both.
- Mill in steps (down) with decreasing radii (down) on one side of part.
- Mill in steps (down) with increasing radii (down) on other side of part.
- These tools are able to cut both the standard O-ring groove. As such, a variety of drops are the permitted to manufacture top groove (see table 3/Flute).



### O-Ring Corner Rounding End Mill



➔ See page 419

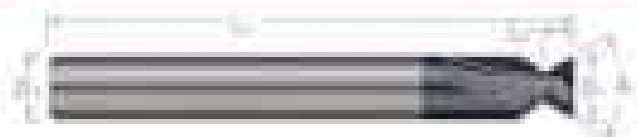
- Used for creating radius on top part of a ring dovetail groove
- Design allows smooth, finished form on part



For more information, visit the QR code or our technical information page.

## DOVETAIL CUTTERS

### Tight Groove Dovetail Cutters



- Designed for cutting dovetail grooves for tight tolerances
- Standard finish and tolerance of 0.0004
- Offset with sharp corner
- Built-in flute
- 150° ground to the edge



Chamfered Dovetail Groove  
D17 80 - 24.00  
D17 100 - 24.00

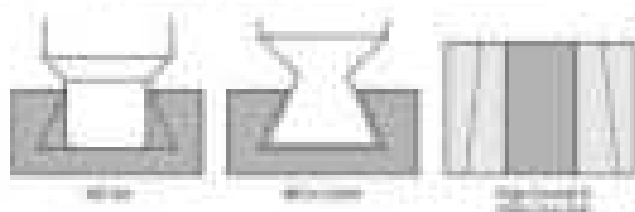


Ground to 150° chamfered angle

DIA. (MM)	DIA. (IN)	LENGTH (MM)	LENGTH (IN)	WAVE DIA.	WAVE DIA. (IN)	WAVE DIA. (IN)	RECOMMENDED		RECOMMENDED	
							FEED (mm/rev)	SPINDL. (RPM)	TOOL A.	TOOL B.
100	3.937	100	3.937	0	0.00	0.00	0.0001	1000	0.0001 (2)	1000
							0.0002	1000	0.0001 (2)	1000
							0.0003	1000	0.0001 (2)	1000
125	4.921	125	4.921	0	0.00	0.00	0.0001	1000	0.0001 (2)	1000
							0.0002	1000	0.0001 (2)	1000
							0.0003	1000	0.0001 (2)	1000
150	5.906	150	5.906	0	0.00	0.00	0.0001	1000	0.0001 (2)	1000
							0.0002	1000	0.0001 (2)	1000
							0.0003	1000	0.0001 (2)	1000

### RECOMMENDED RIGHT GROOVE DOVETAIL MILLING TECHNIQUE

1. Use an offset that is smaller than the top of the groove width to cut.
2. 200° tapered dovetail - set groove down the appropriate cut to shape the rest of the dovetail groove.
3. Ground end up to the groove then, flip or additional adjustments may be required to correct angle right fit.
4. Shape the dovetail outer edges to create a slightly larger width on one side of the groove.
5. Double check finish on work surface on other side of the groove to create a chamfered shaped end.
6. The right that can be adjusted by using an appropriate file to shape each dovetail end across the top.



## DOVETAIL CUTTERS

### O-Ring Slotted End Mills



Ideal for Slotted

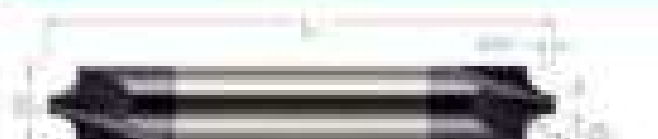
- ← O-Ring Dovetail Grooves

- Material for drilling grooves
- Flutes are designed to grind with capacity
- Flute face length for improved life
- Groove radius to resist Power Hammer problems
- High face and serrated grinding for improved performance
- 2 Flutes - 13mm cutting
- Solid carbide - 13mm ground in the USA

Overall Length L	Shank Diameter D	Flute Diameter D1	Flute Length L1	13mm		19mm		25mm	
				2 Fl.	13mm	2 Fl.	19mm	2 Fl.	25mm
100	10	10	10	1110	1120	180000	1840	180000	1830
150	10	10	10	1110	1120	180000	1840	180000	1830
200	10	10	10	1110	1120	180000	1840	180000	1830
100	15	15	15	1110	1120	180000	1840	180000	1830
150	15	15	15	1110	1120	180000	1840	180000	1830
200	15	15	15	1110	1120	180000	1840	180000	1830

## DOVETAIL CUTTERS

### O-Ring Corner Rounding End Mills



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

- Positive material Power Hammer clearance
- Square ends
- Flutes are tapered to center
- Design allows smooth, rounded face on part
- Depth of cut - varies over 100%
- 2 Flutes
- Solid carbide
- 13mm ground in the USA

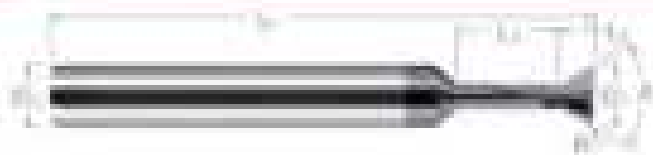


2 Flutes in Groove  
and Flute to Slot  
Made in USA

Overall Length L	Shank Diameter D	Flute Diameter D1	Flute Length L1	13mm		19mm	
				2 Fl.	13mm	2 Fl.	19mm
100	10	10	10	1110	1120	180000	1830
150	10	10	10	1110	1120	180000	1830
200	10	10	10	1110	1120	180000	1830
100	15	15	15	1110	1120	180000	1830
150	15	15	15	1110	1120	180000	1830
200	15	15	15	1110	1120	180000	1830

## DOVETAIL CUTTERS

### Long Reach



Ø100 - Ø120  
Ø120 - Ø140

- Reduced weight for long reach machining
- Carved cutting for improved strength
- Hole diameter = 100 ground in the shaft













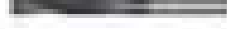






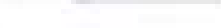


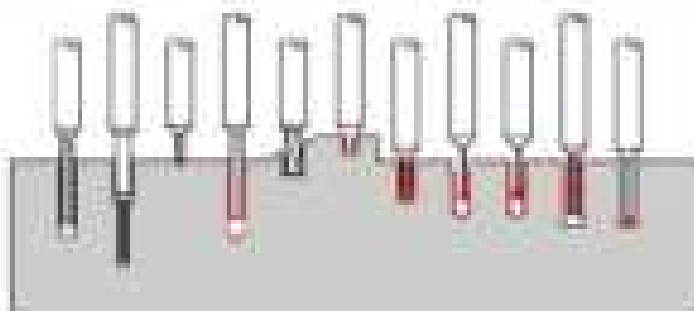
Ø100 Ø120 Ø140	Ø100		Ø120		Ø140		Ø160		Ø180		Ø200		Ø220	
	L1	L2	L1	L2	L1	L2	L1	L2	L1	L2	L1	L2	L1	L2
10°	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	140	140	140	140	140	140	140	140	140	140	140	140	140	140
20°	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	140	140	140	140	140	140	140	140	140	140	140	140	140	140
30°	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	140	140	140	140	140	140	140	140	140	140	140	140	140	140
40°	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	140	140	140	140	140	140	140	140	140	140	140	140	140	140
50°	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	140	140	140	140	140	140	140	140	140	140	140	140	140	140
60°	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	140	140	140	140	140	140	140	140	140	140	140	140	140	140
70°	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	140	140	140	140	140	140	140	140	140	140	140	140	140	140
80°	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	140	140	140	140	140	140	140	140	140	140	140	140	140	140
90°	100	100	100	100	100	100	100	100	100	100	100	100	100	100
	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	140	140	140	140	140	140	140	140	140	140	140	140	140	140

\* Always consult our website for the latest technical specifications.

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**Dozens of Solutions from Spotting to Threading!**

# MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels - Metric



Available for 7x, 8x, 9x, 10x, & 12x Flute Design



Double-Flute Design for Exceptional Hole Accuracy

- Optimized for drilling hardened tool, die, and mold steels (HRC to 65HRC) with outstanding performance in high temperature alloys and difficult-to-machine steels
- 1.87 gear ratio
- Specialized flute design for improved chip evacuation and maximum rigidity
- Double-flute design for exceptional hole accuracy and finish
- Latent generation M76 form coating offers superior performance and tool life
- 60, 65, and 68 HRC to high precision tool steels
- Special coating used for maximum tool life
- 100% ground to the USA

DIA. (mm)		DIA. (in)		DIA. (mm)		DIA. (in)		DIA. (mm)		DIA. (in)	
DIA. (mm)				DIA. (in)				DIA. (mm)		DIA. (in)	
Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.
270	4.0	270	4.0	270	4.0	270	4.0	270	4.0	270	4.0
271	4.5	271	4.5	271	4.5	271	4.5	271	4.5	271	4.5
272	5.0	272	5.0	272	5.0	272	5.0	272	5.0	272	5.0
273	5.5	273	5.5	273	5.5	273	5.5	273	5.5	273	5.5
274	6.0	274	6.0	274	6.0	274	6.0	274	6.0	274	6.0
275	6.5	275	6.5	275	6.5	275	6.5	275	6.5	275	6.5
276	7.0	276	7.0	276	7.0	276	7.0	276	7.0	276	7.0
277	7.5	277	7.5	277	7.5	277	7.5	277	7.5	277	7.5
278	8.0	278	8.0	278	8.0	278	8.0	278	8.0	278	8.0
279	8.5	279	8.5	279	8.5	279	8.5	279	8.5	279	8.5
280	9.0	280	9.0	280	9.0	280	9.0	280	9.0	280	9.0
281	9.5	281	9.5	281	9.5	281	9.5	281	9.5	281	9.5
282	10.0	282	10.0	282	10.0	282	10.0	282	10.0	282	10.0
283	10.5	283	10.5	283	10.5	283	10.5	283	10.5	283	10.5
284	11.0	284	11.0	284	11.0	284	11.0	284	11.0	284	11.0
285	11.5	285	11.5	285	11.5	285	11.5	285	11.5	285	11.5
286	12.0	286	12.0	286	12.0	286	12.0	286	12.0	286	12.0
287	12.5	287	12.5	287	12.5	287	12.5	287	12.5	287	12.5
288	13.0	288	13.0	288	13.0	288	13.0	288	13.0	288	13.0
289	13.5	289	13.5	289	13.5	289	13.5	289	13.5	289	13.5
290	14.0	290	14.0	290	14.0	290	14.0	290	14.0	290	14.0
291	14.5	291	14.5	291	14.5	291	14.5	291	14.5	291	14.5
292	15.0	292	15.0	292	15.0	292	15.0	292	15.0	292	15.0
293	15.5	293	15.5	293	15.5	293	15.5	293	15.5	293	15.5
294	16.0	294	16.0	294	16.0	294	16.0	294	16.0	294	16.0
295	16.5	295	16.5	295	16.5	295	16.5	295	16.5	295	16.5
296	17.0	296	17.0	296	17.0	296	17.0	296	17.0	296	17.0
297	17.5	297	17.5	297	17.5	297	17.5	297	17.5	297	17.5
298	18.0	298	18.0	298	18.0	298	18.0	298	18.0	298	18.0
299	18.5	299	18.5	299	18.5	299	18.5	299	18.5	299	18.5
300	19.0	300	19.0	300	19.0	300	19.0	300	19.0	300	19.0
301	19.5	301	19.5	301	19.5	301	19.5	301	19.5	301	19.5
302	20.0	302	20.0	302	20.0	302	20.0	302	20.0	302	20.0
303	20.5	303	20.5	303	20.5	303	20.5	303	20.5	303	20.5
304	21.0	304	21.0	304	21.0	304	21.0	304	21.0	304	21.0
305	21.5	305	21.5	305	21.5	305	21.5	305	21.5	305	21.5
306	22.0	306	22.0	306	22.0	306	22.0	306	22.0	306	22.0
307	22.5	307	22.5	307	22.5	307	22.5	307	22.5	307	22.5
308	23.0	308	23.0	308	23.0	308	23.0	308	23.0	308	23.0
309	23.5	309	23.5	309	23.5	309	23.5	309	23.5	309	23.5
310	24.0	310	24.0	310	24.0	310	24.0	310	24.0	310	24.0
311	24.5	311	24.5	311	24.5	311	24.5	311	24.5	311	24.5
312	25.0	312	25.0	312	25.0	312	25.0	312	25.0	312	25.0
313	25.5	313	25.5	313	25.5	313	25.5	313	25.5	313	25.5
314	26.0	314	26.0	314	26.0	314	26.0	314	26.0	314	26.0
315	26.5	315	26.5	315	26.5	315	26.5	315	26.5	315	26.5
316	27.0	316	27.0	316	27.0	316	27.0	316	27.0	316	27.0
317	27.5	317	27.5	317	27.5	317	27.5	317	27.5	317	27.5
318	28.0	318	28.0	318	28.0	318	28.0	318	28.0	318	28.0
319	28.5	319	28.5	319	28.5	319	28.5	319	28.5	319	28.5
320	29.0	320	29.0	320	29.0	320	29.0	320	29.0	320	29.0
321	29.5	321	29.5	321	29.5	321	29.5	321	29.5	321	29.5
322	30.0	322	30.0	322	30.0	322	30.0	322	30.0	322	30.0
323	30.5	323	30.5	323	30.5	323	30.5	323	30.5	323	30.5
324	31.0	324	31.0	324	31.0	324	31.0	324	31.0	324	31.0
325	31.5	325	31.5	325	31.5	325	31.5	325	31.5	325	31.5
326	32.0	326	32.0	326	32.0	326	32.0	326	32.0	326	32.0
327	32.5	327	32.5	327	32.5	327	32.5	327	32.5	327	32.5
328	33.0	328	33.0	328	33.0	328	33.0	328	33.0	328	33.0
329	33.5	329	33.5	329	33.5	329	33.5	329	33.5	329	33.5
330	34.0	330	34.0	330	34.0	330	34.0	330	34.0	330	34.0
331	34.5	331	34.5	331	34.5	331	34.5	331	34.5	331	34.5
332	35.0	332	35.0	332	35.0	332	35.0	332	35.0	332	35.0
333	35.5	333	35.5	333	35.5	333	35.5	333	35.5	333	35.5
334	36.0	334	36.0	334	36.0	334	36.0	334	36.0	334	36.0
335	36.5	335	36.5	335	36.5	335	36.5	335	36.5	335	36.5
336	37.0	336	37.0	336	37.0	336	37.0	336	37.0	336	37.0
337	37.5	337	37.5	337	37.5	337	37.5	337	37.5	337	37.5
338	38.0	338	38.0	338	38.0	338	38.0	338	38.0	338	38.0
339	38.5	339	38.5	339	38.5	339	38.5	339	38.5	339	38.5
340	39.0	340	39.0	340	39.0	340	39.0	340	39.0	340	39.0
341	39.5	341	39.5	341	39.5	341	39.5	341	39.5	341	39.5
342	40.0	342	40.0	342	40.0	342	40.0	342	40.0	342	40.0
343	40.5	343	40.5	343	40.5	343	40.5	343	40.5	343	40.5
344	41.0	344	41.0	344	41.0	344	41.0	344	41.0	344	41.0
345	41.5	345	41.5	345	41.5	345	41.5	345	41.5	345	41.5
346	42.0	346	42.0	346	42.0	346	42.0	346	42.0	346	42.0
347	42.5	347	42.5	347	42.5	347	42.5	347	42.5	347	42.5
348	43.0	348	43.0	348	43.0	348	43.0	348	43.0	348	43.0
349	43.5	349	43.5	349	43.5	349	43.5	349	43.5	349	43.5
350	44.0	350	44.0	350	44.0	350	44.0	350	44.0	350	44.0
351	44.5	351	44.5	351	44.5	351	44.5	351	44.5	351	44.5
352	45.0	352	45.0	352	45.0	352	45.0	352	45.0	352	45.0
353	45.5	353	45.5	353	45.5	353	45.5	353	45.5	353	45.5
354	46.0	354	46.0	354	46.0	354	46.0	354	46.0	354	46.0
355	46.5	355	46.5	355	46.5	355	46.5	355	46.5	355	46.5
356	47.0	356	47.0	356	47.0	356	47.0	356	47.0	356	47.0
357	47.5	357	47.5	357	47.5	357	47.5	357	47.5	357	47.5
358	48.0	358	48.0	358	48.0	358	48.0	358	48.0	358	48.0
359	48.5	359	48.5	359	48.5	359	48.5	359	48.5	359	48.5
360	49.0	360	49.0	360	49.0	360	49.0	360	49.0	360	49.0
361	49.5	361	49.5	361	49.5	361	49.5	361	49.5	361	49.5
362	50.0	362	50.0	362	50.0	362	50.0	362	50.0	362	50.0
363	50.5	363	50.5	363	50.5	363	50.5	363	50.5	363	50.5
364	51.0	364	51.0	364	51.0	364	51.0	364	51.0	364	51.0
365	51.5	365	51.5	365	51.5	365	51.5	365	51		

## MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels – Metric (mm)

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ITEM	DRILL SHANK DIA.		ITEM	FLUTE LENGTH		SHANK LENGTH	TOTAL LENGTH	APPLICABLE MATERIALS	
	MM	INCH		MM	INCH			MM	INCH
1000	0.5	0.0197	100	1.0000	1.0	1.50	0.059	Aluminum	4000
1001	0.5	0.0197	101	1.0000	1.0	1.50	0.059	Aluminum	4000
1002	0.5	0.0197	102	1.0000	1.0	1.50	0.059	Aluminum	4000
1003	0.5	0.0197	103	1.0000	1.0	1.50	0.059	Aluminum	4000
1004		0.0197	104	1.2500	1.25	1.75	0.059	Aluminum	4000
1005		0.0197	105	1.0000	1.0	1.50	0.059	Aluminum	4000
1006	0.5	0.0197	106	1.2500	1.25	1.75	0.059	Aluminum	4000
1007	0.5	0.0197	107	1.0000	1.0	1.50	0.059	Aluminum	4000
1008	0.5	0.0197	108	1.0000	1.0	1.50	0.059	Aluminum	4000
1009	0.5	0.0197	109	1.0000	1.0	1.50	0.059	Aluminum	4000
1010	0.5	0.0197	110	1.0000	1.0	1.50	0.059	Aluminum	4000
1011		0.0197	111	1.2500	1.25	1.75	0.059	Aluminum	4000
1012		0.0197	112	1.0000	1.0	1.50	0.059	Aluminum	4000
1013	0.5	0.0197	113	1.0000	1.0	1.50	0.059	Aluminum	4000
1014	0.5	0.0197	114	1.0000	1.0	1.50	0.059	Aluminum	4000
1015	0.5	0.0197	115	1.0000	1.0	1.50	0.059	Aluminum	4000
1016	0.5	0.0197	116	1.0000	1.0	1.50	0.059	Aluminum	4000
1017	0.5	0.0197	117	1.0000	1.0	1.50	0.059	Aluminum	4000
1018	0.5	0.0197	118	1.0000	1.0	1.50	0.059	Aluminum	4000
1019	0.5	0.0197	119	1.0000	1.0	1.50	0.059	Aluminum	4000
1020	0.5	0.0197	120	1.0000	1.0	1.50	0.059	Aluminum	4000
1021	0.5	0.0197	121	1.0000	1.0	1.50	0.059	Aluminum	4000
1022	0.5	0.0197	122	1.0000	1.0	1.50	0.059	Aluminum	4000
1023	0.5	0.0197	123	1.0000	1.0	1.50	0.059	Aluminum	4000
1024	0.5	0.0197	124	1.0000	1.0	1.50	0.059	Aluminum	4000
1025	0.5	0.0197	125	1.0000	1.0	1.50	0.059	Aluminum	4000
1026	0.5	0.0197	126	1.0000	1.0	1.50	0.059	Aluminum	4000
1027	0.5	0.0197	127	1.0000	1.0	1.50	0.059	Aluminum	4000
1028	0.5	0.0197	128	1.0000	1.0	1.50	0.059	Aluminum	4000
1029	0.5	0.0197	129	1.0000	1.0	1.50	0.059	Aluminum	4000
1030	0.5	0.0197	130	1.0000	1.0	1.50	0.059	Aluminum	4000
1031	0.5	0.0197	131	1.0000	1.0	1.50	0.059	Aluminum	4000
1032	0.5	0.0197	132	1.0000	1.0	1.50	0.059	Aluminum	4000
1033	0.5	0.0197	133	1.0000	1.0	1.50	0.059	Aluminum	4000
1034	0.5	0.0197	134	1.0000	1.0	1.50	0.059	Aluminum	4000
1035	0.5	0.0197	135	1.0000	1.0	1.50	0.059	Aluminum	4000
1036	0.5	0.0197	136	1.0000	1.0	1.50	0.059	Aluminum	4000
1037	0.5	0.0197	137	1.0000	1.0	1.50	0.059	Aluminum	4000
1038	0.5	0.0197	138	1.0000	1.0	1.50	0.059	Aluminum	4000
1039	0.5	0.0197	139	1.0000	1.0	1.50	0.059	Aluminum	4000
1040	0.5	0.0197	140	1.0000	1.0	1.50	0.059	Aluminum	4000
1041	0.5	0.0197	141	1.0000	1.0	1.50	0.059	Aluminum	4000
1042	0.5	0.0197	142	1.0000	1.0	1.50	0.059	Aluminum	4000
1043	0.5	0.0197	143	1.0000	1.0	1.50	0.059	Aluminum	4000
1044	0.5	0.0197	144	1.0000	1.0	1.50	0.059	Aluminum	4000
1045	0.5	0.0197	145	1.0000	1.0	1.50	0.059	Aluminum	4000
1046	0.5	0.0197	146	1.0000	1.0	1.50	0.059	Aluminum	4000
1047	0.5	0.0197	147	1.0000	1.0	1.50	0.059	Aluminum	4000
1048	0.5	0.0197	148	1.0000	1.0	1.50	0.059	Aluminum	4000
1049	0.5	0.0197	149	1.0000	1.0	1.50	0.059	Aluminum	4000
1050	0.5	0.0197	150	1.0000	1.0	1.50	0.059	Aluminum	4000

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# MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels - Metric (mm)

(continued from previous page)

DRILL DIAMETER		FLUTE LENGTH			DRILL TO DEPTH		TOTAL LENGTH		NEW HAAS SYSTEM	
MM	INCH	MM	INCH	MM (MAX)	MM	INCH	MM	INCH	PC	FW
HSS										
HSS-Co										
HSS-M2										
HSS-Co-M2										
HSS-Co-M3										
HSS-Co-M4										
HSS-Co-M5										
HSS-Co-M6										
HSS-Co-M7										
HSS-Co-M8										
HSS-Co-M9										
HSS-Co-M10										
HSS-Co-M11										
HSS-Co-M12										
HSS-Co-M14										
HSS-Co-M16										
HSS-Co-M18										
HSS-Co-M20										
HSS-Co-M22										
HSS-Co-M25										
HSS-Co-M28										
HSS-Co-M32										
HSS-Co-M36										
HSS-Co-M40										
HSS-Co-M45										
HSS-Co-M50										
HSS-Co-M56										
HSS-Co-M63										
HSS-Co-M71										
HSS-Co-M80										
HSS-Co-M90										
HSS-Co-M100										
HSS-Co-M110										
HSS-Co-M125										
HSS-Co-M140										
HSS-Co-M160										
HSS-Co-M180										
HSS-Co-M200										
HSS-Co-M225										
HSS-Co-M250										
HSS-Co-M280										
HSS-Co-M315										
HSS-Co-M355										
HSS-Co-M400										
HSS-Co-M450										
HSS-Co-M500										
HSS-Co-M560										
HSS-Co-M630										
HSS-Co-M710										
HSS-Co-M800										
HSS-Co-M900										
HSS-Co-M1000										
HSS-Co-M1100										
HSS-Co-M1250										
HSS-Co-M1400										
HSS-Co-M1600										
HSS-Co-M1800										
HSS-Co-M2000										
HSS-Co-M2250										
HSS-Co-M2500										
HSS-Co-M2800										
HSS-Co-M3150										
HSS-Co-M3550										
HSS-Co-M4000										
HSS-Co-M4500										
HSS-Co-M5000										
HSS-Co-M5600										
HSS-Co-M6300										
HSS-Co-M7100										
HSS-Co-M8000										
HSS-Co-M9000										
HSS-Co-M10000										
HSS-Co-M11000										
HSS-Co-M12500										
HSS-Co-M14000										
HSS-Co-M16000										
HSS-Co-M18000										
HSS-Co-M20000										
HSS-Co-M22500										
HSS-Co-M25000										
HSS-Co-M28000										
HSS-Co-M31500										
HSS-Co-M35500										
HSS-Co-M40000										
HSS-Co-M45000										
HSS-Co-M50000										
HSS-Co-M56000										
HSS-Co-M63000										
HSS-Co-M71000										
HSS-Co-M80000										
HSS-Co-M90000										
HSS-Co-M100000										
HSS-Co-M110000										
HSS-Co-M125000										
HSS-Co-M140000										
HSS-Co-M160000										
HSS-Co-M180000										
HSS-Co-M200000										
HSS-Co-M225000										
HSS-Co-M250000										
HSS-Co-M280000										
HSS-Co-M315000										
HSS-Co-M355000										
HSS-Co-M400000										
HSS-Co-M450000										
HSS-Co-M500000										
HSS-Co-M560000										
HSS-Co-M630000										
HSS-Co-M710000										
HSS-Co-M800000										
HSS-Co-M900000										
HSS-Co-M1000000										
HSS-Co-M1100000										
HSS-Co-M1250000										
HSS-Co-M1400000										
HSS-Co-M1600000										
HSS-Co-M1800000										
HSS-Co-M2000000										
HSS-Co-M2250000										
HSS-Co-M2500000										
HSS-Co-M2800000										
HSS-Co-M3150000										
HSS-Co-M3550000										
HSS-Co-M4000000										
HSS-Co-M4500000										
HSS-Co-M5000000										
HSS-Co-M5600000										
HSS-Co-M6300000										
HSS-Co-M7100000										
HSS-Co-M8000000										
HSS-Co-M9000000										
HSS-Co-M10000000										
HSS-Co-M11000000										
HSS-Co-M12500000										
HSS-Co-M14000000										
HSS-Co-M16000000										
HSS-Co-M18000000										
HSS-Co-M20000000										
HSS-Co-M22500000										
HSS-Co-M25000000										
HSS-Co-M28000000										
HSS-Co-M31500000										
HSS-Co-M35500000										
HSS-Co-M40000000										
HSS-Co-M45000000										
HSS-Co-M50000000										
HSS-Co-M56000000										
HSS-Co-M63000000										
HSS-Co-M71000000										
HSS-Co-M80000000										
HSS-Co-M90000000										
HSS-Co-M100000000										
HSS-Co-M110000000										
HSS-Co-M125000000										
HSS-Co-M140000000										
HSS-Co-M160000000										
HSS-Co-M180000000										
HSS-Co-M200000000										
HSS-Co-M225000000										
HSS-Co-M250000000										
HSS-Co-M280000000										
HSS-Co-M315000000										
HSS-Co-M355000000										
HSS-Co-M400000000										
HSS-Co-M450000000										
HSS-Co-M500000000										
HSS-Co-M560000000										
HSS-Co-M630000000										
HSS-Co-M710000000										
HSS-Co-M800000000										
HSS-Co-M900000000										
HSS-Co-M1000000000										
HSS-Co-M1100000000										
HSS-Co-M1250000000										
HSS-Co-M1400000000										
HSS-Co-M1600000000										
HSS-Co-M1800000000										
HSS-Co-M2000000000										
HSS-Co-M2250000000										
HSS-Co-M2500000000										
HSS-Co-M2800000000										
HSS-Co-M3150000000										
HSS-Co-M3550000000										
HSS-Co-M4000000000										
HSS-Co-M4500000000										
HSS-Co-M5000000000										
HSS-Co-M5600000000										
HSS-Co-M6300000000										
HSS-Co-M7100000000										
HSS-Co-M8000000000										
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HSS-Co-M10000000000										
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# MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels - Metric only

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DRILL DIMENSIONS			FLUTE LENGTH			SHANK DIMENSIONS		TOTAL LENGTH		DIN 6350	
DRILL NO.	DRILL DIA.	DRILL LENGTH	DRILL DIA.	FLUTE LENGTH	FLUTE DIA.	SHANK DIA.	SHANK LENGTH	TOTAL LENGTH	DRILL DIA.	DRILL LENGTH	
1140	1.25	1.00	1.25	0.60	1.25	1.25	1.00	2.00	1.25	2.00	
1141	1.25	1.00	1.25	0.75	1.25	1.25	1.00	2.00	1.25	2.00	
1142	1.25	1.00	1.25	0.90	1.25	1.25	1.00	2.00	1.25	2.00	
1143	1.25	1.00	1.25	1.05	1.25	1.25	1.00	2.00	1.25	2.00	
1144	1.25	1.00	1.25	1.20	1.25	1.25	1.00	2.00	1.25	2.00	
1145	1.25	1.00	1.25	1.35	1.25	1.25	1.00	2.00	1.25	2.00	
1146	1.25	1.00	1.25	1.50	1.25	1.25	1.00	2.00	1.25	2.00	
1147	1.25	1.00	1.25	1.65	1.25	1.25	1.00	2.00	1.25	2.00	
1148	1.25	1.00	1.25	1.80	1.25	1.25	1.00	2.00	1.25	2.00	
1149	1.25	1.00	1.25	1.95	1.25	1.25	1.00	2.00	1.25	2.00	
1150	1.25	1.00	1.25	2.10	1.25	1.25	1.00	2.00	1.25	2.00	
1151	1.25	1.00	1.25	2.25	1.25	1.25	1.00	2.00	1.25	2.00	
1152	1.25	1.00	1.25	2.40	1.25	1.25	1.00	2.00	1.25	2.00	
1153	1.25	1.00	1.25	2.55	1.25	1.25	1.00	2.00	1.25	2.00	
1154	1.25	1.00	1.25	2.70	1.25	1.25	1.00	2.00	1.25	2.00	
1155	1.25	1.00	1.25	2.85	1.25	1.25	1.00	2.00	1.25	2.00	
1156	1.25	1.00	1.25	3.00	1.25	1.25	1.00	2.00	1.25	2.00	
1157	1.25	1.00	1.25	3.15	1.25	1.25	1.00	2.00	1.25	2.00	
1158	1.25	1.00	1.25	3.30	1.25	1.25	1.00	2.00	1.25	2.00	
1159	1.25	1.00	1.25	3.45	1.25	1.25	1.00	2.00	1.25	2.00	
1160	1.25	1.00	1.25	3.60	1.25	1.25	1.00	2.00	1.25	2.00	
1161	1.25	1.00	1.25	3.75	1.25	1.25	1.00	2.00	1.25	2.00	
1162	1.25	1.00	1.25	3.90	1.25	1.25	1.00	2.00	1.25	2.00	
1163	1.25	1.00	1.25	4.05	1.25	1.25	1.00	2.00	1.25	2.00	
1164	1.25	1.00	1.25	4.20	1.25	1.25	1.00	2.00	1.25	2.00	
1165	1.25	1.00	1.25	4.35	1.25	1.25	1.00	2.00	1.25	2.00	
1166	1.25	1.00	1.25	4.50	1.25	1.25	1.00	2.00	1.25	2.00	
1167	1.25	1.00	1.25	4.65	1.25	1.25	1.00	2.00	1.25	2.00	
1168	1.25	1.00	1.25	4.80	1.25	1.25	1.00	2.00	1.25	2.00	
1169	1.25	1.00	1.25	4.95	1.25	1.25	1.00	2.00	1.25	2.00	
1170	1.25	1.00	1.25	5.10	1.25	1.25	1.00	2.00	1.25	2.00	
1171	1.25	1.00	1.25	5.25	1.25	1.25	1.00	2.00	1.25	2.00	
1172	1.25	1.00	1.25	5.40	1.25	1.25	1.00	2.00	1.25	2.00	
1173	1.25	1.00	1.25	5.55	1.25	1.25	1.00	2.00	1.25	2.00	
1174	1.25	1.00	1.25	5.70	1.25	1.25	1.00	2.00	1.25	2.00	
1175	1.25	1.00	1.25	5.85	1.25	1.25	1.00	2.00	1.25	2.00	
1176	1.25	1.00	1.25	6.00	1.25	1.25	1.00	2.00	1.25	2.00	
1177	1.25	1.00	1.25	6.15	1.25	1.25	1.00	2.00	1.25	2.00	
1178	1.25	1.00	1.25	6.30	1.25	1.25	1.00	2.00	1.25	2.00	
1179	1.25	1.00	1.25	6.45	1.25	1.25	1.00	2.00	1.25	2.00	
1180	1.25	1.00	1.25	6.60	1.25	1.25	1.00	2.00	1.25	2.00	
1181	1.25	1.00	1.25	6.75	1.25	1.25	1.00	2.00	1.25	2.00	
1182	1.25	1.00	1.25	6.90	1.25	1.25	1.00	2.00	1.25	2.00	
1183	1.25	1.00	1.25	7.05	1.25	1.25	1.00	2.00	1.25	2.00	
1184	1.25	1.00	1.25	7.20	1.25	1.25	1.00	2.00	1.25	2.00	
1185	1.25	1.00	1.25	7.35	1.25	1.25	1.00	2.00	1.25	2.00	
1186	1.25	1.00	1.25	7.50	1.25	1.25	1.00	2.00	1.25	2.00	
1187	1.25	1.00	1.25	7.65	1.25	1.25	1.00	2.00	1.25	2.00	
1188	1.25	1.00	1.25	7.80	1.25	1.25	1.00	2.00	1.25	2.00	
1189	1.25	1.00	1.25	7.95	1.25	1.25	1.00	2.00	1.25	2.00	
1190	1.25	1.00	1.25	8.10	1.25	1.25	1.00	2.00	1.25	2.00	
1191	1.25	1.00	1.25	8.25	1.25	1.25	1.00	2.00	1.25	2.00	
1192	1.25	1.00	1.25	8.40	1.25	1.25	1.00	2.00	1.25	2.00	
1193	1.25	1.00	1.25	8.55	1.25	1.25	1.00	2.00	1.25	2.00	
1194	1.25	1.00	1.25	8.70	1.25	1.25	1.00	2.00	1.25	2.00	
1195	1.25	1.00	1.25	8.85	1.25	1.25	1.00	2.00	1.25	2.00	
1196	1.25	1.00	1.25	9.00	1.25	1.25	1.00	2.00	1.25	2.00	
1197	1.25	1.00	1.25	9.15	1.25	1.25	1.00	2.00	1.25	2.00	
1198	1.25	1.00	1.25	9.30	1.25	1.25	1.00	2.00	1.25	2.00	
1199	1.25	1.00	1.25	9.45	1.25	1.25	1.00	2.00	1.25	2.00	
1200	1.25	1.00	1.25	9.60	1.25	1.25	1.00	2.00	1.25	2.00	

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11/04/04

**MINIATURE HIGH PERFORMANCE DRILLS**

Hardened Steels - Metric (mm)

Continued from previous page

DIN	DRILL DIAMETER		DIN	DRILL LENGTH		DRILL FLUTE	DRILL POINT	TOTAL LENGTH	MINIMUM STOCK	
	Ø	Holes		Ø	Holes				Ø	Holes
2934	4.0	1.57 (mm)	29	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	45.00
2934	5.0	1.57 (mm)	34	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	51.00
2934	6.0	1.57 (mm)	39	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	57.00
2934	8.0	1.57 (mm)	47	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	75.00
2934	10.0	1.57 (mm)	55	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	93.00
2934	12.0	1.57 (mm)	63	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	111.00
2934	16.0	1.57 (mm)	81	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	145.00
2934	20.0	1.57 (mm)	99	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	179.00
2934	25.0	1.57 (mm)	117	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	225.00
2934	32.0	1.57 (mm)	147	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	285.00
2934	40.0	1.57 (mm)	183	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	357.00
2934	50.0	1.57 (mm)	227	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	447.00
2934	63.0	1.57 (mm)	281	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	555.00
2934	80.0	1.57 (mm)	349	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	699.00
2934	100.0	1.57 (mm)	433	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	879.00
2934	125.0	1.57 (mm)	527	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	1095.00
2934	160.0	1.57 (mm)	671	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	1395.00
2934	200.0	1.57 (mm)	831	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	1725.00
2934	250.0	1.57 (mm)	1019	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	2085.00
2934	320.0	1.57 (mm)	1271	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	2679.00
2934	400.0	1.57 (mm)	1583	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	3399.00
2934	500.0	1.57 (mm)	1967	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	4359.00
2934	630.0	1.57 (mm)	2431	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	5451.00
2934	800.0	1.57 (mm)	2983	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	6765.00
2934	1000.0	1.57 (mm)	3719	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	8391.00
2934	1250.0	1.57 (mm)	4539	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	10329.00
2934	1600.0	1.57 (mm)	5639	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	12981.00
2934	2000.0	1.57 (mm)	6919	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	15921.00
2934	2500.0	1.57 (mm)	8379	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	19161.00
2934	3200.0	1.57 (mm)	10119	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	22701.00
2934	4000.0	1.57 (mm)	12139	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	27541.00
2934	5000.0	1.57 (mm)	14439	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	32681.00
2934	6300.0	1.57 (mm)	17019	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	38121.00
2934	8000.0	1.57 (mm)	20879	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	44861.00
2934	10000.0	1.57 (mm)	25019	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	52901.00
2934	12500.0	1.57 (mm)	29439	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	62241.00
2934	16000.0	1.57 (mm)	35159	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	73881.00
2934	20000.0	1.57 (mm)	42179	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	87921.00
2934	25000.0	1.57 (mm)	50499	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	104361.00
2934	32000.0	1.57 (mm)	60119	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	123201.00
2934	40000.0	1.57 (mm)	71139	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	144541.00
2934	50000.0	1.57 (mm)	83559	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	168381.00
2934	63000.0	1.57 (mm)	97379	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	194721.00
2934	80000.0	1.57 (mm)	112599	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	223561.00
2934	100000.0	1.57 (mm)	129219	1.57 (mm)	10	2.00	0.00	3.57 (mm)	12.00	254901.00

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## MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels – Metric (cont.)

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HSA Diameter			HSS Length			HSS Diameter		HSS Length		SINAMAX Metric	
Part No.	Size	Length	Part No.	Size	Length	Part No.	Size	Part No.	Size	Part No.	Size
<b>Series 1000</b>											
1000		1.00 mm	1000	1.00 mm	50	1000	1.00 mm	1000	1.00 mm	1000	1.00 mm
1001		1.25 mm	1001	1.25 mm	50	1001	1.25 mm	1001	1.25 mm	1001	1.25 mm
1002	1.50	1.50 mm	1002	1.50 mm	50	1002	1.50 mm	1002	1.50 mm	1002	1.50 mm
1003	2.00	2.00 mm	1003	2.00 mm	50	1003	2.00 mm	1003	2.00 mm	1003	2.00 mm
1004	2.50	2.50 mm	1004	2.50 mm	50	1004	2.50 mm	1004	2.50 mm	1004	2.50 mm
1005	3.00	3.00 mm	1005	3.00 mm	50	1005	3.00 mm	1005	3.00 mm	1005	3.00 mm
1006	4.00	4.00 mm	1006	4.00 mm	50	1006	4.00 mm	1006	4.00 mm	1006	4.00 mm
1007	5.00	5.00 mm	1007	5.00 mm	50	1007	5.00 mm	1007	5.00 mm	1007	5.00 mm
1008	6.00	6.00 mm	1008	6.00 mm	50	1008	6.00 mm	1008	6.00 mm	1008	6.00 mm
1009	8.00	8.00 mm	1009	8.00 mm	50	1009	8.00 mm	1009	8.00 mm	1009	8.00 mm
1010	10.00	10.00 mm	1010	10.00 mm	50	1010	10.00 mm	1010	10.00 mm	1010	10.00 mm
1011	12.00	12.00 mm	1011	12.00 mm	50	1011	12.00 mm	1011	12.00 mm	1011	12.00 mm
1012	15.00	15.00 mm	1012	15.00 mm	50	1012	15.00 mm	1012	15.00 mm	1012	15.00 mm
1013	20.00	20.00 mm	1013	20.00 mm	50	1013	20.00 mm	1013	20.00 mm	1013	20.00 mm
1014	25.00	25.00 mm	1014	25.00 mm	50	1014	25.00 mm	1014	25.00 mm	1014	25.00 mm
1015	30.00	30.00 mm	1015	30.00 mm	50	1015	30.00 mm	1015	30.00 mm	1015	30.00 mm
1016	40.00	40.00 mm	1016	40.00 mm	50	1016	40.00 mm	1016	40.00 mm	1016	40.00 mm
1017	50.00	50.00 mm	1017	50.00 mm	50	1017	50.00 mm	1017	50.00 mm	1017	50.00 mm
1018	60.00	60.00 mm	1018	60.00 mm	50	1018	60.00 mm	1018	60.00 mm	1018	60.00 mm
1019	80.00	80.00 mm	1019	80.00 mm	50	1019	80.00 mm	1019	80.00 mm	1019	80.00 mm
1020	100.00	100.00 mm	1020	100.00 mm	50	1020	100.00 mm	1020	100.00 mm	1020	100.00 mm
1021	120.00	120.00 mm	1021	120.00 mm	50	1021	120.00 mm	1021	120.00 mm	1021	120.00 mm
1022	150.00	150.00 mm	1022	150.00 mm	50	1022	150.00 mm	1022	150.00 mm	1022	150.00 mm
1023	200.00	200.00 mm	1023	200.00 mm	50	1023	200.00 mm	1023	200.00 mm	1023	200.00 mm
1024	250.00	250.00 mm	1024	250.00 mm	50	1024	250.00 mm	1024	250.00 mm	1024	250.00 mm
1025	300.00	300.00 mm	1025	300.00 mm	50	1025	300.00 mm	1025	300.00 mm	1025	300.00 mm
1026	400.00	400.00 mm	1026	400.00 mm	50	1026	400.00 mm	1026	400.00 mm	1026	400.00 mm
1027	500.00	500.00 mm	1027	500.00 mm	50	1027	500.00 mm	1027	500.00 mm	1027	500.00 mm
1028	600.00	600.00 mm	1028	600.00 mm	50	1028	600.00 mm	1028	600.00 mm	1028	600.00 mm
1029	800.00	800.00 mm	1029	800.00 mm	50	1029	800.00 mm	1029	800.00 mm	1029	800.00 mm
1030	1000.00	1000.00 mm	1030	1000.00 mm	50	1030	1000.00 mm	1030	1000.00 mm	1030	1000.00 mm
1031	1200.00	1200.00 mm	1031	1200.00 mm	50	1031	1200.00 mm	1031	1200.00 mm	1031	1200.00 mm
1032	1500.00	1500.00 mm	1032	1500.00 mm	50	1032	1500.00 mm	1032	1500.00 mm	1032	1500.00 mm
1033	2000.00	2000.00 mm	1033	2000.00 mm	50	1033	2000.00 mm	1033	2000.00 mm	1033	2000.00 mm
1034	2500.00	2500.00 mm	1034	2500.00 mm	50	1034	2500.00 mm	1034	2500.00 mm	1034	2500.00 mm
1035	3000.00	3000.00 mm	1035	3000.00 mm	50	1035	3000.00 mm	1035	3000.00 mm	1035	3000.00 mm
1036	4000.00	4000.00 mm	1036	4000.00 mm	50	1036	4000.00 mm	1036	4000.00 mm	1036	4000.00 mm
1037	5000.00	5000.00 mm	1037	5000.00 mm	50	1037	5000.00 mm	1037	5000.00 mm	1037	5000.00 mm
1038	6000.00	6000.00 mm	1038	6000.00 mm	50	1038	6000.00 mm	1038	6000.00 mm	1038	6000.00 mm
1039	8000.00	8000.00 mm	1039	8000.00 mm	50	1039	8000.00 mm	1039	8000.00 mm	1039	8000.00 mm
1040	10000.00	10000.00 mm	1040	10000.00 mm	50	1040	10000.00 mm	1040	10000.00 mm	1040	10000.00 mm

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## MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels - Metric (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER	DRILL LENGTH	KOLSKOP® GAUGE	
MM	INCH	MM	MM	INCH	MM	MM	INCH	MM	INCH
<b>0.1 - 0.25</b>			<b>1 - 1.25</b>			<b>0.1 - 0.2</b>	<b>1</b>	<b>1.0</b>	<b>0.012</b>
0.100	0.004	0.125	1.000	0.040	0.100	0.100	10.000	0.004	0.157
0.125	0.005	0.150	1.250	0.049	0.125	0.125	12.500	0.005	0.197
0.150	0.006	0.175	1.500	0.059	0.150	0.150	15.000	0.006	0.236
0.175	0.007	0.200	1.750	0.069	0.175	0.175	17.500	0.007	0.276
0.200	0.008	0.225	2.000	0.079	0.200	0.200	20.000	0.008	0.315
0.225	0.009	0.250	2.250	0.089	0.225	0.225	22.500	0.009	0.354
0.250	0.010	0.275	2.500	0.099	0.250	0.250	25.000	0.010	0.394
0.275	0.011	0.300	2.750	0.109	0.275	0.275	27.500	0.011	0.433
0.300	0.012	0.325	3.000	0.119	0.300	0.300	30.000	0.012	0.473
0.325	0.013	0.350	3.250	0.129	0.325	0.325	32.500	0.013	0.512
0.350	0.014	0.375	3.500	0.139	0.350	0.350	35.000	0.014	0.552
0.375	0.015	0.400	3.750	0.149	0.375	0.375	37.500	0.015	0.592
0.400	0.016	0.425	4.000	0.159	0.400	0.400	40.000	0.016	0.631
0.425	0.017	0.450	4.250	0.169	0.425	0.425	42.500	0.017	0.671
0.450	0.018	0.475	4.500	0.179	0.450	0.450	45.000	0.018	0.710
0.475	0.019	0.500	4.750	0.189	0.475	0.475	47.500	0.019	0.750
0.500	0.020	0.525	5.000	0.199	0.500	0.500	50.000	0.020	0.789
0.525	0.021	0.550	5.250	0.209	0.525	0.525	52.500	0.021	0.829
0.550	0.022	0.575	5.500	0.219	0.550	0.550	55.000	0.022	0.868
0.575	0.023	0.600	5.750	0.229	0.575	0.575	57.500	0.023	0.908
0.600	0.024	0.625	6.000	0.239	0.600	0.600	60.000	0.024	0.947
0.625	0.025	0.650	6.250	0.249	0.625	0.625	62.500	0.025	0.987
0.650	0.026	0.675	6.500	0.259	0.650	0.650	65.000	0.026	1.026
0.675	0.027	0.700	6.750	0.269	0.675	0.675	67.500	0.027	1.066
0.700	0.028	0.725	7.000	0.279	0.700	0.700	70.000	0.028	1.105
0.725	0.029	0.750	7.250	0.289	0.725	0.725	72.500	0.029	1.145
0.750	0.030	0.775	7.500	0.299	0.750	0.750	75.000	0.030	1.184
0.775	0.031	0.800	7.750	0.309	0.775	0.775	77.500	0.031	1.224
0.800	0.032	0.825	8.000	0.319	0.800	0.800	80.000	0.032	1.263
0.825	0.033	0.850	8.250	0.329	0.825	0.825	82.500	0.033	1.303
0.850	0.034	0.875	8.500	0.339	0.850	0.850	85.000	0.034	1.342
0.875	0.035	0.900	8.750	0.349	0.875	0.875	87.500	0.035	1.382
0.900	0.036	0.925	9.000	0.359	0.900	0.900	90.000	0.036	1.421
0.925	0.037	0.950	9.250	0.369	0.925	0.925	92.500	0.037	1.461
0.950	0.038	0.975	9.500	0.379	0.950	0.950	95.000	0.038	1.500
0.975	0.039	1.000	9.750	0.389	0.975	0.975	97.500	0.039	1.540
1.000	0.040	1.025	10.000	0.399	1.000	1.000	100.000	0.040	1.579

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# MINIATURE HIGH PERFORMANCE DRILLS

Hardened Steels - Metric (mm)

(continued from previous page)

DRILL DIAMETER	DRILL LENGTH	DRILL WEIGHT	FLUTE LENGTH			SHAFT Diameter	TOTAL LENGTH	ITEM NO.	
			TYPE	STANDARD	MAXIMUM			PT	PT-1
<b>Ø 1.00</b>									
1000	Ø 10	4.000 gms	100	20.00 mm	100	Ø 1.00	50 mm	1000000-10	41-10
1000	Ø 10	4.000 gms	1000	20.00 mm	100	Ø 1.00	100 mm	1000000-10	70-10
1100 (1.00)		4.000 gms	800	20.00 mm	100	Ø 1.00	50 mm	1000100-10	61-10
1100 (1.00)		4.000 gms	1100	20.00 mm	100	Ø 1.00	100 mm	1000100-10	62-10
1100 (1.00)		4.000 gms	1000	20.00 mm	100	Ø 1.00	100 mm	1000100-10	70-10
1200	Ø 12	4.800 gms	800	21.00 mm	100	Ø 1.00	50 mm	1000120-10	61-12
1200	Ø 12	4.800 gms	1000	21.00 mm	100	Ø 1.00	100 mm	1000120-10	70-12
1300	Ø 13	5.200 gms	800	22.00 mm	100	Ø 1.00	50 mm	1000130-10	61-13
1300	Ø 13	5.200 gms	1000	22.00 mm	100	Ø 1.00	100 mm	1000130-10	70-13
1400	Ø 14	5.600 gms	800	23.00 mm	100	Ø 1.00	50 mm	1000140-10	61-14
1400	Ø 14	5.600 gms	1000	23.00 mm	100	Ø 1.00	100 mm	1000140-10	70-14
1500	Ø 15	6.000 gms	800	24.00 mm	100	Ø 1.00	50 mm	1000150-10	61-15
1500	Ø 15	6.000 gms	1000	24.00 mm	100	Ø 1.00	100 mm	1000150-10	70-15
1600	Ø 16	6.400 gms	800	25.00 mm	100	Ø 1.00	50 mm	1000160-10	61-16
1600	Ø 16	6.400 gms	1000	25.00 mm	100	Ø 1.00	100 mm	1000160-10	70-16
1700	Ø 17	6.800 gms	800	26.00 mm	100	Ø 1.00	50 mm	1000170-10	61-17
1700	Ø 17	6.800 gms	1000	26.00 mm	100	Ø 1.00	100 mm	1000170-10	70-17
1800	Ø 18	7.200 gms	800	27.00 mm	100	Ø 1.00	50 mm	1000180-10	61-18
1800	Ø 18	7.200 gms	1000	27.00 mm	100	Ø 1.00	100 mm	1000180-10	70-18
1900	Ø 19	7.600 gms	800	28.00 mm	100	Ø 1.00	50 mm	1000190-10	61-19
1900	Ø 19	7.600 gms	1000	28.00 mm	100	Ø 1.00	100 mm	1000190-10	70-19
2000	Ø 20	8.000 gms	800	29.00 mm	100	Ø 1.00	50 mm	1000200-10	61-20
2000	Ø 20	8.000 gms	1000	29.00 mm	100	Ø 1.00	100 mm	1000200-10	70-20
2100	Ø 21	8.400 gms	800	30.00 mm	100	Ø 1.00	50 mm	1000210-10	61-21
2100	Ø 21	8.400 gms	1000	30.00 mm	100	Ø 1.00	100 mm	1000210-10	70-21
2200	Ø 22	8.800 gms	800	31.00 mm	100	Ø 1.00	50 mm	1000220-10	61-22
2200	Ø 22	8.800 gms	1000	31.00 mm	100	Ø 1.00	100 mm	1000220-10	70-22
2300	Ø 23	9.200 gms	800	32.00 mm	100	Ø 1.00	50 mm	1000230-10	61-23
2300	Ø 23	9.200 gms	1000	32.00 mm	100	Ø 1.00	100 mm	1000230-10	70-23
2400	Ø 24	9.600 gms	800	33.00 mm	100	Ø 1.00	50 mm	1000240-10	61-24
2400	Ø 24	9.600 gms	1000	33.00 mm	100	Ø 1.00	100 mm	1000240-10	70-24
2500	Ø 25	10.000 gms	800	34.00 mm	100	Ø 1.00	50 mm	1000250-10	61-25
2500	Ø 25	10.000 gms	1000	34.00 mm	100	Ø 1.00	100 mm	1000250-10	70-25
2600	Ø 26	10.400 gms	800	35.00 mm	100	Ø 1.00	50 mm	1000260-10	61-26
2600	Ø 26	10.400 gms	1000	35.00 mm	100	Ø 1.00	100 mm	1000260-10	70-26
2700	Ø 27	10.800 gms	800	36.00 mm	100	Ø 1.00	50 mm	1000270-10	61-27
2700	Ø 27	10.800 gms	1000	36.00 mm	100	Ø 1.00	100 mm	1000270-10	70-27
2800	Ø 28	11.200 gms	800	37.00 mm	100	Ø 1.00	50 mm	1000280-10	61-28
2800	Ø 28	11.200 gms	1000	37.00 mm	100	Ø 1.00	100 mm	1000280-10	70-28
2900	Ø 29	11.600 gms	800	38.00 mm	100	Ø 1.00	50 mm	1000290-10	61-29
2900	Ø 29	11.600 gms	1000	38.00 mm	100	Ø 1.00	100 mm	1000290-10	70-29
3000	Ø 30	12.000 gms	800	39.00 mm	100	Ø 1.00	50 mm	1000300-10	61-30
3000	Ø 30	12.000 gms	1000	39.00 mm	100	Ø 1.00	100 mm	1000300-10	70-30

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**MINIATURE HIGH PERFORMANCE DRILLS**

Hardened Steels - Metric (mm)

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DRILL DIAMETER			DRILL LENGTH			SHAFT DIAMETER		DRILL POINT		MAXIMUM SPEED	
MM	INCH	METRIC	MM	INCH	MM DIA.	Ø INCH	INCH	RPM	FM	FPM	
2.00	1/16	5.08 mm	1.00	24.99 mm	1/16	2.00	7 mm	24000	75	44 ft	
2.25	1/8	5.71 mm	1.25	27.43 mm	1/8	2.25	7 mm	18000	60	33 ft	
2.50	1/8	6.35 mm	1.50	29.87 mm	1/8	2.50	8 mm	12000	45	25 ft	
2.75	1/8	6.99 mm	1.75	32.31 mm	1/8	2.75	8 mm	9000	34	18 ft	
3.00	1/8	7.62 mm	2.00	34.75 mm	1/8	3.00	9 mm	7500	28	16 ft	
3.25	1/8	8.26 mm	2.25	37.19 mm	1/8	3.25	9 mm	6000	22	13 ft	
3.50	1/8	8.89 mm	2.50	39.63 mm	1/8	3.50	9 mm	4500	16	10 ft	
3.75	1/8	9.53 mm	2.75	42.07 mm	1/8	3.75	9 mm	3000	11	7 ft	
4.00	1/8	10.16 mm	3.00	44.51 mm	1/8	4.00	9 mm	1500	6	4 ft	
4.25	1/8	10.79 mm	3.25	46.95 mm	1/8	4.25	9 mm	900	4	2 ft	
4.50	1/8	11.43 mm	3.50	49.39 mm	1/8	4.50	9 mm	600	3	2 ft	
4.75	1/8	12.07 mm	3.75	51.83 mm	1/8	4.75	9 mm	450	2	1 ft	
5.00	1/8	12.70 mm	4.00	54.27 mm	1/8	5.00	9 mm	300	1	1 ft	
5.25	1/8	13.34 mm	4.25	56.71 mm	1/8	5.25	9 mm	225	1	1 ft	
5.50	1/8	13.97 mm	4.50	59.15 mm	1/8	5.50	9 mm	150	1	1 ft	
5.75	1/8	14.61 mm	4.75	61.59 mm	1/8	5.75	9 mm	112	1	1 ft	
6.00	1/8	15.24 mm	5.00	64.03 mm	1/8	6.00	9 mm	75	1	1 ft	
6.25	1/8	15.88 mm	5.25	66.47 mm	1/8	6.25	9 mm	60	1	1 ft	
6.50	1/8	16.51 mm	5.50	68.91 mm	1/8	6.50	9 mm	45	1	1 ft	
6.75	1/8	17.15 mm	5.75	71.35 mm	1/8	6.75	9 mm	34	1	1 ft	
7.00	1/8	17.78 mm	6.00	73.79 mm	1/8	7.00	9 mm	22	1	1 ft	
7.25	1/8	18.42 mm	6.25	76.23 mm	1/8	7.25	9 mm	16	1	1 ft	
7.50	1/8	19.05 mm	6.50	78.67 mm	1/8	7.50	9 mm	11	1	1 ft	
7.75	1/8	19.69 mm	6.75	81.11 mm	1/8	7.75	9 mm	8	1	1 ft	
8.00	1/8	20.32 mm	7.00	83.55 mm	1/8	8.00	9 mm	6	1	1 ft	
8.25	1/8	20.96 mm	7.25	85.99 mm	1/8	8.25	9 mm	4	1	1 ft	
8.50	1/8	21.59 mm	7.50	88.43 mm	1/8	8.50	9 mm	3	1	1 ft	
8.75	1/8	22.23 mm	7.75	90.87 mm	1/8	8.75	9 mm	2	1	1 ft	
9.00	1/8	22.86 mm	8.00	93.31 mm	1/8	9.00	9 mm	1	1	1 ft	
9.25	1/8	23.50 mm	8.25	95.75 mm	1/8	9.25	9 mm	1	1	1 ft	
9.50	1/8	24.13 mm	8.50	98.19 mm	1/8	9.50	9 mm	1	1	1 ft	
9.75	1/8	24.77 mm	8.75	100.63 mm	1/8	9.75	9 mm	1	1	1 ft	
10.00	1/8	25.40 mm	9.00	103.07 mm	1/8	10.00	9 mm	1	1	1 ft	

**SIZES & RPM | Miniature High Performance Drills - Hardened Steels - Metric**

**Important Note:** Surface roughness, tooling and accuracy of standards are subject to change. The design length, when indicated, is the maximum length advised for use with the spindle RPM. For the full performance, the spindle RPM should be increased to match the surface roughness. The minimum of RPM is the slowest speed shown on the RPM column with full effectiveness for 3-1/2 diameters. It is not advised to use RPM above the indicated RPM. For complete speed and feed data, consult the product literature.

Metric	Inches	RPM	Feed and Withdrawal Rate (mm/min) by Drill Diameter											
			3.2	4.0	5.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	32.0	
Standard Steel	0.015 in	100	0.05	0.06	0.08	0.10	0.12	0.15	0.18	0.22	0.28	0.35		
	0.030 in	50	0.10	0.12	0.16	0.20	0.25	0.30	0.36	0.45	0.55	0.70		
	0.060 in	25	0.20	0.24	0.32	0.40	0.50	0.60	0.72	0.90	1.10	1.40		

## MINIATURE HIGH PERFORMANCE DRILLS

### Prehardened Steels - Metric



Available for 3x, 5x, 6x,  
10x, & 12x Hole Depth

- Optimized for drilling prehardened steels, alloy steels, stainless steels and cast steels up to 40%
- 100° point angle
- Reinforced flute design for increased chip evacuation and increased rigidity
- MTA coated for increased longevity and feed resistance
- All sharp corners for high precision hole finishing
- Flute system - 1-DNC ground to the 100%



Optimized Flute Design for  
Improved Chip Evacuation

Part No.	DRILL DIAMETER		Length	DRILL LENGTH		HEAD DIAMETER	SHANK LENGTH	DRILL RANGE	
	mm	Inch		mm	Inch			mm	Inch
0001	0.5	0.0197	33	1.3000	30	1.50	30.00	0.2000-0.20	40-70
0002	0.6	0.0236	33	1.3000	30	1.50	30.00	0.2500-0.25	40-70
0003	0.8	0.0315	33	1.3000	30	1.50	30.00	0.3000-0.30	40-70
0004	0.9	0.0354	33	1.3000	30	1.50	30.00	0.3500-0.35	40-70
0005	1.0	0.0394	33	1.3000	30	1.50	30.00	0.4000-0.40	40-70
0006	1.2	0.0472	33	1.3000	30	1.50	30.00	0.4500-0.45	40-70
0007	1.4	0.0551	33	1.3000	30	1.50	30.00	0.5000-0.50	40-70
0008	1.5	0.0591	33	1.3000	30	1.50	30.00	0.5500-0.55	40-70
0009	1.6	0.0630	33	1.3000	30	1.50	30.00	0.6000-0.60	40-70
0010	1.8	0.0709	33	1.3000	30	1.50	30.00	0.6500-0.65	40-70
0011	2.0	0.0787	33	1.3000	30	1.50	30.00	0.7000-0.70	40-70
0012	2.2	0.0866	33	1.3000	30	1.50	30.00	0.7500-0.75	40-70
0013	2.4	0.0945	33	1.3000	30	1.50	30.00	0.8000-0.80	40-70
0014	2.5	0.0984	33	1.3000	30	1.50	30.00	0.8500-0.85	40-70
0015	2.8	0.1102	33	1.3000	30	1.50	30.00	0.9000-0.90	40-70
0016	3.0	0.1181	33	1.3000	30	1.50	30.00	1.0000-1.00	40-70
0017	3.2	0.1260	33	1.3000	30	1.50	30.00	1.1000-1.10	40-70
0018	3.6	0.1417	33	1.3000	30	1.50	30.00	1.2000-1.20	40-70
0019	4.0	0.1575	33	1.3000	30	1.50	30.00	1.3000-1.30	40-70
0020	4.5	0.1772	33	1.3000	30	1.50	30.00	1.4000-1.40	40-70
0021	5.0	0.1969	33	1.3000	30	1.50	30.00	1.5000-1.50	40-70
0022	5.5	0.2166	33	1.3000	30	1.50	30.00	1.6000-1.60	40-70
0023	6.0	0.2363	33	1.3000	30	1.50	30.00	1.7000-1.70	40-70
0024	6.5	0.2560	33	1.3000	30	1.50	30.00	1.8000-1.80	40-70
0025	7.0	0.2757	33	1.3000	30	1.50	30.00	1.9000-1.90	40-70
0026	8.0	0.3150	33	1.3000	30	1.50	30.00	2.0000-2.00	40-70
0027	9.0	0.3543	33	1.3000	30	1.50	30.00	2.1000-2.10	40-70
0028	10.0	0.3936	33	1.3000	30	1.50	30.00	2.2000-2.20	40-70
0029	11.0	0.4330	33	1.3000	30	1.50	30.00	2.3000-2.30	40-70
0030	12.0	0.4723	33	1.3000	30	1.50	30.00	2.4000-2.40	40-70
0031	14.0	0.5512	33	1.3000	30	1.50	30.00	2.5000-2.50	40-70
0032	16.0	0.6302	33	1.3000	30	1.50	30.00	2.6000-2.60	40-70
0033	18.0	0.7092	33	1.3000	30	1.50	30.00	2.7000-2.70	40-70
0034	20.0	0.7883	33	1.3000	30	1.50	30.00	2.8000-2.80	40-70
0035	22.0	0.8673	33	1.3000	30	1.50	30.00	2.9000-2.90	40-70
0036	24.0	0.9464	33	1.3000	30	1.50	30.00	3.0000-3.00	40-70
0037	28.0	1.1024	33	1.3000	30	1.50	30.00	3.1000-3.10	40-70
0038	32.0	1.2584	33	1.3000	30	1.50	30.00	3.2000-3.20	40-70
0039	36.0	1.4144	33	1.3000	30	1.50	30.00	3.3000-3.30	40-70
0040	40.0	1.5704	33	1.3000	30	1.50	30.00	3.4000-3.40	40-70
0041	45.0	1.7697	33	1.3000	30	1.50	30.00	3.5000-3.50	40-70
0042	50.0	1.9689	33	1.3000	30	1.50	30.00	3.6000-3.60	40-70
0043	55.0	2.1682	33	1.3000	30	1.50	30.00	3.7000-3.70	40-70
0044	60.0	2.3675	33	1.3000	30	1.50	30.00	3.8000-3.80	40-70
0045	65.0	2.5668	33	1.3000	30	1.50	30.00	3.9000-3.90	40-70
0046	70.0	2.7660	33	1.3000	30	1.50	30.00	4.0000-4.00	40-70
0047	75.0	2.9653	33	1.3000	30	1.50	30.00	4.1000-4.10	40-70
0048	80.0	3.1646	33	1.3000	30	1.50	30.00	4.2000-4.20	40-70
0049	85.0	3.3639	33	1.3000	30	1.50	30.00	4.3000-4.30	40-70
0050	90.0	3.5632	33	1.3000	30	1.50	30.00	4.4000-4.40	40-70
0051	100.0	3.9370	33	1.3000	30	1.50	30.00	4.5000-4.50	40-70
0052	110.0	4.3108	33	1.3000	30	1.50	30.00	4.6000-4.60	40-70
0053	120.0	4.6846	33	1.3000	30	1.50	30.00	4.7000-4.70	40-70
0054	130.0	5.0584	33	1.3000	30	1.50	30.00	4.8000-4.80	40-70
0055	140.0	5.4322	33	1.3000	30	1.50	30.00	4.9000-4.90	40-70
0056	150.0	5.8060	33	1.3000	30	1.50	30.00	5.0000-5.00	40-70
0057	160.0	6.1798	33	1.3000	30	1.50	30.00	5.1000-5.10	40-70
0058	170.0	6.5536	33	1.3000	30	1.50	30.00	5.2000-5.20	40-70
0059	180.0	6.9274	33	1.3000	30	1.50	30.00	5.3000-5.30	40-70
0060	190.0	7.3012	33	1.3000	30	1.50	30.00	5.4000-5.40	40-70
0061	200.0	7.6750	33	1.3000	30	1.50	30.00	5.5000-5.50	40-70
0062	220.0	8.4328	33	1.3000	30	1.50	30.00	5.6000-5.60	40-70
0063	240.0	9.1906	33	1.3000	30	1.50	30.00	5.7000-5.70	40-70
0064	260.0	9.9484	33	1.3000	30	1.50	30.00	5.8000-5.80	40-70
0065	280.0	10.7062	33	1.3000	30	1.50	30.00	5.9000-5.90	40-70
0066	300.0	11.4640	33	1.3000	30	1.50	30.00	6.0000-6.00	40-70
0067	320.0	12.2218	33	1.3000	30	1.50	30.00	6.1000-6.10	40-70
0068	340.0	12.9796	33	1.3000	30	1.50	30.00	6.2000-6.20	40-70
0069	360.0	13.7374	33	1.3000	30	1.50	30.00	6.3000-6.30	40-70
0070	380.0	14.4952	33	1.3000	30	1.50	30.00	6.4000-6.40	40-70
0071	400.0	15.2530	33	1.3000	30	1.50	30.00	6.5000-6.50	40-70
0072	420.0	16.0108	33	1.3000	30	1.50	30.00	6.6000-6.60	40-70
0073	440.0	16.7686	33	1.3000	30	1.50	30.00	6.7000-6.70	40-70
0074	460.0	17.5264	33	1.3000	30	1.50	30.00	6.8000-6.80	40-70
0075	480.0	18.2842	33	1.3000	30	1.50	30.00	6.9000-6.90	40-70
0076	500.0	19.0420	33	1.3000	30	1.50	30.00	7.0000-7.00	40-70

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### MINIATURE HIGH PERFORMANCE DRILLS

Prehardened Steels - Metric sizes

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DRILL DIMENSIONS			FLUTE LENGTH			SHANK DIMENSIONS		SYMBOLS		ITEM NUMBER	
DRILL SIZE	DRILL SIZE	DRILL SIZE	DRILL SIZE	DRILL SIZE	DRILL SIZE	DRILL SIZE	DRILL SIZE	DRILL SIZE	DRILL SIZE	DRILL SIZE	DRILL SIZE
Φ (mm)			L (mm)			Φ (mm)	L (mm)	Φ (mm)	L (mm)	Φ (mm)	Φ (mm)
0.8	0.8	0.8	10	2.00	10	0.8	10.0	0.8	10.0	0.8	0.8
1.0	1.0	1.0	14	2.00	14	1.0	14.0	1.0	14.0	1.0	1.0
1.2	1.2	1.2	18	2.00	18	1.2	18.0	1.2	18.0	1.2	1.2
1.5	1.5	1.5	22	2.00	22	1.5	22.0	1.5	22.0	1.5	1.5
1.8	1.8	1.8	26	2.00	26	1.8	26.0	1.8	26.0	1.8	1.8
2.0	2.0	2.0	30	2.00	30	2.0	30.0	2.0	30.0	2.0	2.0
2.2	2.2	2.2	34	2.00	34	2.2	34.0	2.2	34.0	2.2	2.2
2.5	2.5	2.5	38	2.00	38	2.5	38.0	2.5	38.0	2.5	2.5
2.8	2.8	2.8	42	2.00	42	2.8	42.0	2.8	42.0	2.8	2.8
3.0	3.0	3.0	46	2.00	46	3.0	46.0	3.0	46.0	3.0	3.0
3.2	3.2	3.2	50	2.00	50	3.2	50.0	3.2	50.0	3.2	3.2
3.5	3.5	3.5	54	2.00	54	3.5	54.0	3.5	54.0	3.5	3.5
3.8	3.8	3.8	58	2.00	58	3.8	58.0	3.8	58.0	3.8	3.8
4.0	4.0	4.0	62	2.00	62	4.0	62.0	4.0	62.0	4.0	4.0
4.2	4.2	4.2	66	2.00	66	4.2	66.0	4.2	66.0	4.2	4.2
4.5	4.5	4.5	70	2.00	70	4.5	70.0	4.5	70.0	4.5	4.5
4.8	4.8	4.8	74	2.00	74	4.8	74.0	4.8	74.0	4.8	4.8
5.0	5.0	5.0	78	2.00	78	5.0	78.0	5.0	78.0	5.0	5.0
5.2	5.2	5.2	82	2.00	82	5.2	82.0	5.2	82.0	5.2	5.2
5.5	5.5	5.5	86	2.00	86	5.5	86.0	5.5	86.0	5.5	5.5
5.8	5.8	5.8	90	2.00	90	5.8	90.0	5.8	90.0	5.8	5.8
6.0	6.0	6.0	94	2.00	94	6.0	94.0	6.0	94.0	6.0	6.0
6.2	6.2	6.2	98	2.00	98	6.2	98.0	6.2	98.0	6.2	6.2
6.5	6.5	6.5	102	2.00	102	6.5	102.0	6.5	102.0	6.5	6.5
6.8	6.8	6.8	106	2.00	106	6.8	106.0	6.8	106.0	6.8	6.8
7.0	7.0	7.0	110	2.00	110	7.0	110.0	7.0	110.0	7.0	7.0
7.2	7.2	7.2	114	2.00	114	7.2	114.0	7.2	114.0	7.2	7.2
7.5	7.5	7.5	118	2.00	118	7.5	118.0	7.5	118.0	7.5	7.5
7.8	7.8	7.8	122	2.00	122	7.8	122.0	7.8	122.0	7.8	7.8
8.0	8.0	8.0	126	2.00	126	8.0	126.0	8.0	126.0	8.0	8.0
8.2	8.2	8.2	130	2.00	130	8.2	130.0	8.2	130.0	8.2	8.2
8.5	8.5	8.5	134	2.00	134	8.5	134.0	8.5	134.0	8.5	8.5
8.8	8.8	8.8	138	2.00	138	8.8	138.0	8.8	138.0	8.8	8.8
9.0	9.0	9.0	142	2.00	142	9.0	142.0	9.0	142.0	9.0	9.0
9.2	9.2	9.2	146	2.00	146	9.2	146.0	9.2	146.0	9.2	9.2
9.5	9.5	9.5	150	2.00	150	9.5	150.0	9.5	150.0	9.5	9.5
9.8	9.8	9.8	154	2.00	154	9.8	154.0	9.8	154.0	9.8	9.8
10.0	10.0	10.0	158	2.00	158	10.0	158.0	10.0	158.0	10.0	10.0
10.2	10.2	10.2	162	2.00	162	10.2	162.0	10.2	162.0	10.2	10.2
10.5	10.5	10.5	166	2.00	166	10.5	166.0	10.5	166.0	10.5	10.5
10.8	10.8	10.8	170	2.00	170	10.8	170.0	10.8	170.0	10.8	10.8
11.0	11.0	11.0	174	2.00	174	11.0	174.0	11.0	174.0	11.0	11.0
11.2	11.2	11.2	178	2.00	178	11.2	178.0	11.2	178.0	11.2	11.2
11.5	11.5	11.5	182	2.00	182	11.5	182.0	11.5	182.0	11.5	11.5

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## MINIATURE HIGH PERFORMANCE DRILLS

Prehardened Steels - Metric Units

Drill Sizes 1.0mm - 10mm

DRILL SIZE			DRILL LENGTH			DRILL WEIGHT	TOTAL LENGTH	DIN 5462	
mm	inch	mm	mm	inch	mm			inch	PS
1.0	.04	60mm	1.0	3.94	1.0	1.0	71mm	PSM100.1	1.0
1.0	.04	60mm	2.0	7.87	1.0	1.0	71mm	PSM100.2	2.0
1.0	.04	60mm	3.0	11.81	1.0	1.0	71mm	PSM100.3	3.0
1.0	.04	60mm	4.0	15.75	1.0	1.0	71mm	PSM100.4	4.0
1.0	.04	60mm	5.0	19.69	1.0	1.0	71mm	PSM100.5	5.0
1.0	.04	60mm	6.0	23.62	1.0	1.0	71mm	PSM100.6	6.0
1.0	.04	60mm	7.0	27.56	1.0	1.0	71mm	PSM100.7	7.0
1.0	.04	60mm	8.0	31.50	1.0	1.0	71mm	PSM100.8	8.0
1.0	.04	60mm	9.0	35.44	1.0	1.0	71mm	PSM100.9	9.0
1.0	.04	60mm	10.0	39.37	1.0	1.0	71mm	PSM100.10	10.0
1.0	.04	75mm	1.0	3.94	1.0	1.0	81mm	PSM100.11	1.0
1.0	.04	75mm	2.0	7.87	1.0	1.0	81mm	PSM100.12	2.0
1.0	.04	75mm	3.0	11.81	1.0	1.0	81mm	PSM100.13	3.0
1.0	.04	75mm	4.0	15.75	1.0	1.0	81mm	PSM100.14	4.0
1.0	.04	75mm	5.0	19.69	1.0	1.0	81mm	PSM100.15	5.0
1.0	.04	75mm	6.0	23.62	1.0	1.0	81mm	PSM100.16	6.0
1.0	.04	75mm	7.0	27.56	1.0	1.0	81mm	PSM100.17	7.0
1.0	.04	75mm	8.0	31.50	1.0	1.0	81mm	PSM100.18	8.0
1.0	.04	75mm	9.0	35.44	1.0	1.0	81mm	PSM100.19	9.0
1.0	.04	75mm	10.0	39.37	1.0	1.0	81mm	PSM100.20	10.0
1.0	.04	90mm	1.0	3.94	1.0	1.0	91mm	PSM100.21	1.0
1.0	.04	90mm	2.0	7.87	1.0	1.0	91mm	PSM100.22	2.0
1.0	.04	90mm	3.0	11.81	1.0	1.0	91mm	PSM100.23	3.0
1.0	.04	90mm	4.0	15.75	1.0	1.0	91mm	PSM100.24	4.0
1.0	.04	90mm	5.0	19.69	1.0	1.0	91mm	PSM100.25	5.0
1.0	.04	90mm	6.0	23.62	1.0	1.0	91mm	PSM100.26	6.0
1.0	.04	90mm	7.0	27.56	1.0	1.0	91mm	PSM100.27	7.0
1.0	.04	90mm	8.0	31.50	1.0	1.0	91mm	PSM100.28	8.0
1.0	.04	90mm	9.0	35.44	1.0	1.0	91mm	PSM100.29	9.0
1.0	.04	90mm	10.0	39.37	1.0	1.0	91mm	PSM100.30	10.0
1.0	.04	105mm	1.0	3.94	1.0	1.0	106mm	PSM100.31	1.0
1.0	.04	105mm	2.0	7.87	1.0	1.0	106mm	PSM100.32	2.0
1.0	.04	105mm	3.0	11.81	1.0	1.0	106mm	PSM100.33	3.0
1.0	.04	105mm	4.0	15.75	1.0	1.0	106mm	PSM100.34	4.0
1.0	.04	105mm	5.0	19.69	1.0	1.0	106mm	PSM100.35	5.0
1.0	.04	105mm	6.0	23.62	1.0	1.0	106mm	PSM100.36	6.0
1.0	.04	105mm	7.0	27.56	1.0	1.0	106mm	PSM100.37	7.0
1.0	.04	105mm	8.0	31.50	1.0	1.0	106mm	PSM100.38	8.0
1.0	.04	105mm	9.0	35.44	1.0	1.0	106mm	PSM100.39	9.0
1.0	.04	105mm	10.0	39.37	1.0	1.0	106mm	PSM100.40	10.0
1.0	.04	120mm	1.0	3.94	1.0	1.0	121mm	PSM100.41	1.0
1.0	.04	120mm	2.0	7.87	1.0	1.0	121mm	PSM100.42	2.0
1.0	.04	120mm	3.0	11.81	1.0	1.0	121mm	PSM100.43	3.0
1.0	.04	120mm	4.0	15.75	1.0	1.0	121mm	PSM100.44	4.0
1.0	.04	120mm	5.0	19.69	1.0	1.0	121mm	PSM100.45	5.0
1.0	.04	120mm	6.0	23.62	1.0	1.0	121mm	PSM100.46	6.0
1.0	.04	120mm	7.0	27.56	1.0	1.0	121mm	PSM100.47	7.0
1.0	.04	120mm	8.0	31.50	1.0	1.0	121mm	PSM100.48	8.0
1.0	.04	120mm	9.0	35.44	1.0	1.0	121mm	PSM100.49	9.0
1.0	.04	120mm	10.0	39.37	1.0	1.0	121mm	PSM100.50	10.0

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## MINIATURE HIGH PERFORMANCE DRILLS

Prehardened Steels - Metric sizes

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DRILL DIAMETER			FLUTE LENGTH			SHAPE IN PROFILE		TYPICAL LENGTH		ITEM NUMBER	
MM	INCH	CODE	MM	INCH	LENGTH	FLUTE	CHISEL	FLUTE	CHISEL	JTB	MTL
D1			L1			S		C		JTB	MTL
1.00	3/64	DD101	40	1.5748	150	1/2	1/2	400	1/2	030010-10	0225
1.00	3/64	DD102	40	1.5748	175	1/2	1/2	450	1/2	030010-20	0413
1.00	3/64	DD103	40	1.5748	200	1/2	1/2	500	1/2	030010-30	0712
1.00	3/64	DD104	40	1.5748	225	1/2	1/2	550	1/2	030010-40	0911
1.00	3/64	DD105	40	1.5748	250	1/2	1/2	600	1/2	030010-50	1210
1.00	3/64	DD106	40	1.5748	275	1/2	1/2	650	1/2	030010-60	1509
1.00	3/64	DD107	40	1.5748	300	1/2	1/2	700	1/2	030010-70	1808
1.00	3/64	DD108	40	1.5748	325	1/2	1/2	750	1/2	030010-80	2107
1.00	3/64	DD109	40	1.5748	350	1/2	1/2	800	1/2	030010-90	2406
1.00	3/64	DD110	40	1.5748	375	1/2	1/2	850	1/2	030010-01	2705
1.00	3/64	DD111	40	1.5748	400	1/2	1/2	900	1/2	030010-11	3004
1.00	3/64	DD112	40	1.5748	425	1/2	1/2	950	1/2	030010-21	3303
1.00	3/64	DD113	40	1.5748	450	1/2	1/2	1000	1/2	030010-31	3602
1.00	3/64	DD114	40	1.5748	475	1/2	1/2	1050	1/2	030010-41	3901
1.00	3/64	DD115	40	1.5748	500	1/2	1/2	1100	1/2	030010-51	4200
1.00	3/64	DD116	40	1.5748	525	1/2	1/2	1150	1/2	030010-61	4500
1.00	3/64	DD117	40	1.5748	550	1/2	1/2	1200	1/2	030010-71	4800
1.00	3/64	DD118	40	1.5748	575	1/2	1/2	1250	1/2	030010-81	5100
1.00	3/64	DD119	40	1.5748	600	1/2	1/2	1300	1/2	030010-91	5400
1.00	3/64	DD120	40	1.5748	625	1/2	1/2	1350	1/2	030010-02	5700
1.00	3/64	DD121	40	1.5748	650	1/2	1/2	1400	1/2	030010-12	6000
1.00	3/64	DD122	40	1.5748	675	1/2	1/2	1450	1/2	030010-22	6300
1.00	3/64	DD123	40	1.5748	700	1/2	1/2	1500	1/2	030010-32	6600
1.00	3/64	DD124	40	1.5748	725	1/2	1/2	1550	1/2	030010-42	6900
1.00	3/64	DD125	40	1.5748	750	1/2	1/2	1600	1/2	030010-52	7200
1.00	3/64	DD126	40	1.5748	775	1/2	1/2	1650	1/2	030010-62	7500
1.00	3/64	DD127	40	1.5748	800	1/2	1/2	1700	1/2	030010-72	7800
1.00	3/64	DD128	40	1.5748	825	1/2	1/2	1750	1/2	030010-82	8100
1.00	3/64	DD129	40	1.5748	850	1/2	1/2	1800	1/2	030010-92	8400
1.00	3/64	DD130	40	1.5748	875	1/2	1/2	1850	1/2	030010-03	8700
1.00	3/64	DD131	40	1.5748	900	1/2	1/2	1900	1/2	030010-13	9000
1.00	3/64	DD132	40	1.5748	925	1/2	1/2	1950	1/2	030010-23	9300
1.00	3/64	DD133	40	1.5748	950	1/2	1/2	2000	1/2	030010-33	9600
1.00	3/64	DD134	40	1.5748	975	1/2	1/2	2050	1/2	030010-43	9900
1.00	3/64	DD135	40	1.5748	1000	1/2	1/2	2100	1/2	030010-53	1000
1.00	3/64	DD136	40	1.5748	1025	1/2	1/2	2150	1/2	030010-63	1000
1.00	3/64	DD137	40	1.5748	1050	1/2	1/2	2200	1/2	030010-73	1000
1.00	3/64	DD138	40	1.5748	1075	1/2	1/2	2250	1/2	030010-83	1000
1.00	3/64	DD139	40	1.5748	1100	1/2	1/2	2300	1/2	030010-93	1000
1.00	3/64	DD140	40	1.5748	1125	1/2	1/2	2350	1/2	030010-04	1000
1.00	3/64	DD141	40	1.5748	1150	1/2	1/2	2400	1/2	030010-14	1000
1.00	3/64	DD142	40	1.5748	1175	1/2	1/2	2450	1/2	030010-24	1000
1.00	3/64	DD143	40	1.5748	1200	1/2	1/2	2500	1/2	030010-34	1000
1.00	3/64	DD144	40	1.5748	1225	1/2	1/2	2550	1/2	030010-44	1000
1.00	3/64	DD145	40	1.5748	1250	1/2	1/2	2600	1/2	030010-54	1000
1.00	3/64	DD146	40	1.5748	1275	1/2	1/2	2650	1/2	030010-64	1000
1.00	3/64	DD147	40	1.5748	1300	1/2	1/2	2700	1/2	030010-74	1000
1.00	3/64	DD148	40	1.5748	1325	1/2	1/2	2750	1/2	030010-84	1000
1.00	3/64	DD149	40	1.5748	1350	1/2	1/2	2800	1/2	030010-94	1000
1.00	3/64	DD150	40	1.5748	1375	1/2	1/2	2850	1/2	030010-05	1000
1.00	3/64	DD151	40	1.5748	1400	1/2	1/2	2900	1/2	030010-15	1000
1.00	3/64	DD152	40	1.5748	1425	1/2	1/2	2950	1/2	030010-25	1000
1.00	3/64	DD153	40	1.5748	1450	1/2	1/2	3000	1/2	030010-35	1000
1.00	3/64	DD154	40	1.5748	1475	1/2	1/2	3050	1/2	030010-45	1000
1.00	3/64	DD155	40	1.5748	1500	1/2	1/2	3100	1/2	030010-55	1000
1.00	3/64	DD156	40	1.5748	1525	1/2	1/2	3150	1/2	030010-65	1000
1.00	3/64	DD157	40	1.5748	1550	1/2	1/2	3200	1/2	030010-75	1000
1.00	3/64	DD158	40	1.5748	1575	1/2	1/2	3250	1/2	030010-85	1000
1.00	3/64	DD159	40	1.5748	1600	1/2	1/2	3300	1/2	030010-95	1000
1.00	3/64	DD160	40	1.5748	1625	1/2	1/2	3350	1/2	030010-06	1000
1.00	3/64	DD161	40	1.5748	1650	1/2	1/2	3400	1/2	030010-16	1000
1.00	3/64	DD162	40	1.5748	1675	1/2	1/2	3450	1/2	030010-26	1000
1.00	3/64	DD163	40	1.5748	1700	1/2	1/2	3500	1/2	030010-36	1000
1.00	3/64	DD164	40	1.5748	1725	1/2	1/2	3550	1/2	030010-46	1000
1.00	3/64	DD165	40	1.5748	1750	1/2	1/2	3600	1/2	030010-56	1000
1.00	3/64	DD166	40	1.5748	1775	1/2	1/2	3650	1/2	030010-66	1000
1.00	3/64	DD167	40	1.5748	1800	1/2	1/2	3700	1/2	030010-76	1000
1.00	3/64	DD168	40	1.5748	1825	1/2	1/2	3750	1/2	030010-86	1000
1.00	3/64	DD169	40	1.5748	1850	1/2	1/2	3800	1/2	030010-96	1000
1.00	3/64	DD170	40	1.5748	1875	1/2	1/2	3850	1/2	030010-07	1000
1.00	3/64	DD171	40	1.5748	1900	1/2	1/2	3900	1/2	030010-17	1000
1.00	3/64	DD172	40	1.5748	1925	1/2	1/2	3950	1/2	030010-27	1000
1.00	3/64	DD173	40	1.5748	1950	1/2	1/2	4000	1/2	030010-37	1000
1.00	3/64	DD174	40	1.5748	1975	1/2	1/2	4050	1/2	030010-47	1000
1.00	3/64	DD175	40	1.5748	2000	1/2	1/2	4100	1/2	030010-57	1000
1.00	3/64	DD176	40	1.5748	2025	1/2	1/2	4150	1/2	030010-67	1000
1.00	3/64	DD177	40	1.5748	2050	1/2	1/2	4200	1/2	030010-77	1000
1.00	3/64	DD178	40	1.5748	2075	1/2	1/2	4250	1/2	030010-87	1000
1.00	3/64	DD179	40	1.5748	2100	1/2	1/2	4300	1/2	030010-97	1000
1.00	3/64	DD180	40	1.5748	2125	1/2	1/2	4350	1/2	030010-08	1000
1.00	3/64	DD181	40	1.5748	2150	1/2	1/2	4400	1/2	030010-18	1000
1.00	3/64	DD182	40	1.5748	2175	1/2	1/2	4450	1/2	030010-28	1000
1.00	3/64	DD183	40	1.5748	2200	1/2	1/2	4500	1/2	030010-38	1000
1.00	3/64	DD184	40	1.5748	2225	1/2	1/2	4550	1/2	030010-48	1000
1.00	3/64	DD185	40	1.5748	2250	1/2	1/2	4600	1/2	030010-58	1000
1.00	3/64	DD186	40	1.5748	2275	1/2	1/2	4650	1/2	030010-68	1000
1.00	3/64	DD187	40	1.5748	2300	1/2	1/2	4700	1/2	030010-78	1000
1.00	3/64	DD188	40	1.5748	2325	1/2	1/2	4750	1/2	030010-88	1000
1.00	3/64	DD189	40	1.5748	2350	1/2	1/2	4800	1/2	030010-98	1000
1.00	3/64	DD190	40	1.5748	2375	1/2	1/2	4850	1/2	030010-09	1000
1.00	3/64	DD191	40	1.5748	2400	1/2	1/2	4900	1/2	030010-19	1000
1.00	3/64	DD192	40	1.5748	2425	1/2	1/2	4950	1/2	030010-29	1000
1.00	3/64	DD193	40	1.5748	2450	1/2	1/2	5000	1/2	030010-39	1000
1.00	3/64	DD194	40	1.5748	2475	1/2	1/2	5050	1/2	030010-49	1000
1.00	3/64	DD195	40	1.5748	2500	1/2	1/2	5100	1/2	030010-59	1000
1.00	3/64	DD196	40	1.5748	2525	1/2	1/2	5150	1/2	030010-69	1000
1.00	3/64	DD197	40	1.5748	2550	1/2	1/2	5200	1/2	030010-79	1000
1.00	3/64	DD198	40	1.5748	2575	1/2	1/2	5250	1/2	030010-89	1000
1.00	3/64	DD199	40	1.5748	2600	1/2	1/2	5300	1/2	030010-99	1000
1.00	3/64	DD200	40	1.5748	2625	1/2	1/2	5350	1/2	030010-10	1000

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## MINIATURE HIGH PERFORMANCE DRILLS

Prehardened Steels - Metric (cont.)

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ITEM NO.	DRILL SIZE (mm)	LENGTH (mm)	PARTS LOCATION			LENGTH (mm)	DRILL SIZE (mm)	LENGTH (mm)	ITEM WEIGHT	
			NO.	DRILL	DRILL POINT				DRILL	DRILL POINT
100	1.0mm	115mm	101	3.00mm	101	3.00	30.00	10000000	21.00	
100	1.0mm	115mm	102	3.00mm	102	3.00	30.00	10000000	21.00	
100	1.0	115mm	103	3.00mm	103	3.00	30.00	10000000	21.00	
100	1.0	115mm	104	3.00mm	104	3.00	30.00	10000000	21.00	
100	1.0	115mm	105	3.00mm	105	3.00	30.00	10000000	21.00	
100	1.0	115mm	106	3.00mm	106	3.00	30.00	10000000	21.00	
100	1.0mm	115mm	107	3.00mm	107	3.00	30.00	10000000	21.00	
100	1.0mm	115mm	108	3.00mm	108	3.00	30.00	10000000	21.00	
100	1.0mm	115mm	109	3.00mm	109	3.00	30.00	10000000	21.00	
100	1.0mm	115mm	110	3.00mm	110	3.00	30.00	10000000	21.00	
100	1.0mm	115mm	111	3.00mm	111	3.00	30.00	10000000	21.00	
100	1.0mm	115mm	112	3.00mm	112	3.00	30.00	10000000	21.00	
100	1.0mm	115mm	113	3.00mm	113	3.00	30.00	10000000	21.00	
100	1.0mm	115mm	114	3.00mm	114	3.00	30.00	10000000	21.00	
100	1.0	115mm	115	3.00mm	115	3.00	30.00	10000000	21.00	
100	1.0	115mm	116	3.00mm	116	3.00	30.00	10000000	21.00	
100	1.0	115mm	117	3.00mm	117	3.00	30.00	10000000	21.00	
100	1.0	115mm	118	3.00mm	118	3.00	30.00	10000000	21.00	
100	1.0	115mm	119	3.00mm	119	3.00	30.00	10000000	21.00	
100	1.0	115mm	120	3.00mm	120	3.00	30.00	10000000	21.00	
100	1.0	115mm	121	3.00mm	121	3.00	30.00	10000000	21.00	
100	1.0	115mm	122	3.00mm	122	3.00	30.00	10000000	21.00	
100	1.0	115mm	123	3.00mm	123	3.00	30.00	10000000	21.00	
100	1.0	115mm	124	3.00mm	124	3.00	30.00	10000000	21.00	
100	1.0	115mm	125	3.00mm	125	3.00	30.00	10000000	21.00	
100	1.0	115mm	126	3.00mm	126	3.00	30.00	10000000	21.00	
100	1.0	115mm	127	3.00mm	127	3.00	30.00	10000000	21.00	
100	1.0	115mm	128	3.00mm	128	3.00	30.00	10000000	21.00	
100	1.0	115mm	129	3.00mm	129	3.00	30.00	10000000	21.00	
100	1.0	115mm	130	3.00mm	130	3.00	30.00	10000000	21.00	
100	1.0	115mm	131	3.00mm	131	3.00	30.00	10000000	21.00	
100	1.0	115mm	132	3.00mm	132	3.00	30.00	10000000	21.00	
100	1.0	115mm	133	3.00mm	133	3.00	30.00	10000000	21.00	
100	1.0	115mm	134	3.00mm	134	3.00	30.00	10000000	21.00	
100	1.0	115mm	135	3.00mm	135	3.00	30.00	10000000	21.00	
100	1.0	115mm	136	3.00mm	136	3.00	30.00	10000000	21.00	
100	1.0	115mm	137	3.00mm	137	3.00	30.00	10000000	21.00	
100	1.0	115mm	138	3.00mm	138	3.00	30.00	10000000	21.00	
100	1.0	115mm	139	3.00mm	139	3.00	30.00	10000000	21.00	
100	1.0	115mm	140	3.00mm	140	3.00	30.00	10000000	21.00	
100	1.0	115mm	141	3.00mm	141	3.00	30.00	10000000	21.00	
100	1.0	115mm	142	3.00mm	142	3.00	30.00	10000000	21.00	
100	1.0	115mm	143	3.00mm	143	3.00	30.00	10000000	21.00	
100	1.0	115mm	144	3.00mm	144	3.00	30.00	10000000	21.00	
100	1.0	115mm	145	3.00mm	145	3.00	30.00	10000000	21.00	
100	1.0	115mm	146	3.00mm	146	3.00	30.00	10000000	21.00	
100	1.0	115mm	147	3.00mm	147	3.00	30.00	10000000	21.00	
100	1.0	115mm	148	3.00mm	148	3.00	30.00	10000000	21.00	
100	1.0	115mm	149	3.00mm	149	3.00	30.00	10000000	21.00	
100	1.0	115mm	150	3.00mm	150	3.00	30.00	10000000	21.00	

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## MINIATURE HIGH PERFORMANCE DRILLS

Prehardened Steels - Metric (cont.)

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DRILL QUANTITY			PART LENGTH			DRILL DIAMETER	TOTAL LENGTH	ITEM NUMBER	
DRILL	DRILL	DRILL	DRILL	DRILL	DRILL			DRILL	PKT
mm			mm			mm	mm		
1000	837	2.00 mm	100	14.00 mm	30°	6.00	6.00	HT7000-12	1000
1000	840	2.00 mm	100	14.00 mm	50°	6.00	6.00	HT7000-12	1000
1000	843	2.00 mm	100	14.00 mm	60°	6.00	6.00	HT7000-12	1000
1000	846	2.00 mm	100	14.00 mm	75°	6.00	6.00	HT7000-12	1000
1000	849	2.00 mm	100	14.00 mm	90°	6.00	6.00	HT7000-12	1000
1000	852	2.00 mm	100	14.00 mm	30°	6.00	6.00	HT7000-12	1000
1000	855	2.00 mm	100	14.00 mm	50°	6.00	6.00	HT7000-12	1000
1000	858	2.00 mm	100	14.00 mm	60°	6.00	6.00	HT7000-12	1000
1000	861	2.00 mm	100	14.00 mm	75°	6.00	6.00	HT7000-12	1000
1000	864	2.00 mm	100	14.00 mm	90°	6.00	6.00	HT7000-12	1000
1000	867	2.00 mm	100	14.00 mm	30°	6.00	6.00	HT7000-12	1000
1000	870	2.00 mm	100	14.00 mm	50°	6.00	6.00	HT7000-12	1000
1000	873	2.00 mm	100	14.00 mm	60°	6.00	6.00	HT7000-12	1000
1000	876	2.00 mm	100	14.00 mm	75°	6.00	6.00	HT7000-12	1000
1000	879	2.00 mm	100	14.00 mm	90°	6.00	6.00	HT7000-12	1000
1000	882	2.00 mm	100	14.00 mm	30°	6.00	6.00	HT7000-12	1000
1000	885	2.00 mm	100	14.00 mm	50°	6.00	6.00	HT7000-12	1000
1000	888	2.00 mm	100	14.00 mm	60°	6.00	6.00	HT7000-12	1000
1000	891	2.00 mm	100	14.00 mm	75°	6.00	6.00	HT7000-12	1000
1000	894	2.00 mm	100	14.00 mm	90°	6.00	6.00	HT7000-12	1000
1000	897	2.00 mm	100	14.00 mm	30°	6.00	6.00	HT7000-12	1000
1000	900	2.00 mm	100	14.00 mm	50°	6.00	6.00	HT7000-12	1000
1000	903	2.00 mm	100	14.00 mm	60°	6.00	6.00	HT7000-12	1000
1000	906	2.00 mm	100	14.00 mm	75°	6.00	6.00	HT7000-12	1000
1000	909	2.00 mm	100	14.00 mm	90°	6.00	6.00	HT7000-12	1000
1000	912	2.00 mm	100	14.00 mm	30°	6.00	6.00	HT7000-12	1000
1000	915	2.00 mm	100	14.00 mm	50°	6.00	6.00	HT7000-12	1000
1000	918	2.00 mm	100	14.00 mm	60°	6.00	6.00	HT7000-12	1000
1000	921	2.00 mm	100	14.00 mm	75°	6.00	6.00	HT7000-12	1000
1000	924	2.00 mm	100	14.00 mm	90°	6.00	6.00	HT7000-12	1000
1000	927	2.00 mm	100	14.00 mm	30°	6.00	6.00	HT7000-12	1000
1000	930	2.00 mm	100	14.00 mm	50°	6.00	6.00	HT7000-12	1000
1000	933	2.00 mm	100	14.00 mm	60°	6.00	6.00	HT7000-12	1000
1000	936	2.00 mm	100	14.00 mm	75°	6.00	6.00	HT7000-12	1000
1000	939	2.00 mm	100	14.00 mm	90°	6.00	6.00	HT7000-12	1000
1000	942	2.00 mm	100	14.00 mm	30°	6.00	6.00	HT7000-12	1000
1000	945	2.00 mm	100	14.00 mm	50°	6.00	6.00	HT7000-12	1000
1000	948	2.00 mm	100	14.00 mm	60°	6.00	6.00	HT7000-12	1000
1000	951	2.00 mm	100	14.00 mm	75°	6.00	6.00	HT7000-12	1000
1000	954	2.00 mm	100	14.00 mm	90°	6.00	6.00	HT7000-12	1000
1000	957	2.00 mm	100	14.00 mm	30°	6.00	6.00	HT7000-12	1000
1000	960	2.00 mm	100	14.00 mm	50°	6.00	6.00	HT7000-12	1000
1000	963	2.00 mm	100	14.00 mm	60°	6.00	6.00	HT7000-12	1000
1000	966	2.00 mm	100	14.00 mm	75°	6.00	6.00	HT7000-12	1000
1000	969	2.00 mm	100	14.00 mm	90°	6.00	6.00	HT7000-12	1000

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**MINIATURE HIGH PERFORMANCE DRILLS**

Prefinished Steel - Metric sizes

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ITEM	DRILL SIZE		TAP SIZE		DRILL LENGTH	DRILL TYPE	TOTAL LENGTH	CUTTING EDGE	
	INCH	METRIC	INCH	METRIC				INCH	METRIC
1050		0.1625 (4.127)	0.1475 (3.75)	1.00 (25.40)	5.00	0.1475	50.00	1000001-01	00.00
1051		0.1625 (4.127)	0.1500 (3.81)	1.00 (25.40)	5.00	0.1500	48.00	1000001-04	00.00
1052		0.1625 (4.127)	0.1500 (3.81)	1.00 (25.40)	5.00	0.1500	49.00	1000001-03	00.00
1053		0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	47.00	1000001-05	00.00
1054	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	46.00	1000001-02	00.00
1055	0.05	0.1625 (4.127)	0.1500 (3.81)	1.00 (25.40)	5.00	0.1500	45.00	1000001-08	00.00
1056	0.05	0.1625 (4.127)	0.1500 (3.81)	1.00 (25.40)	5.00	0.1500	45.00	1000001-06	00.00
1057	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	44.00	1000001-07	00.00
1058	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	44.00	1000001-09	00.00
1059	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	44.00	1000001-10	00.00
1060	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	44.00	1000001-11	00.00
1061	0.05	0.1625 (4.127)	0.1500 (3.81)	1.00 (25.40)	5.00	0.1500	43.00	1000001-12	00.00
1062	0.05	0.1625 (4.127)	0.1500 (3.81)	1.00 (25.40)	5.00	0.1500	43.00	1000001-13	00.00
1063	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-14	00.00
1064	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-15	00.00
1065	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-16	00.00
1066	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-17	00.00
1067	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-18	00.00
1068	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-19	00.00
1069	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-20	00.00
1070	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-21	00.00
1071	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-22	00.00
1072	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-23	00.00
1073	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-24	00.00
1074	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-25	00.00
1075	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-26	00.00
1076	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-27	00.00
1077	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-28	00.00
1078	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-29	00.00
1079	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-30	00.00
1080	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-31	00.00
1081	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-32	00.00
1082	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-33	00.00
1083	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-34	00.00
1084	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-35	00.00
1085	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-36	00.00
1086	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-37	00.00
1087	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-38	00.00
1088	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-39	00.00
1089	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-40	00.00
1090	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-41	00.00
1091	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-42	00.00
1092	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-43	00.00
1093	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-44	00.00
1094	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-45	00.00
1095	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-46	00.00
1096	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-47	00.00
1097	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-48	00.00
1098	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-49	00.00
1099	0.05	0.1625 (4.127)	0.1525 (3.86)	1.00 (25.40)	5.00	0.1525	42.00	1000001-50	00.00

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**MINIATURE HIGH PERFORMANCE DRILLS**

Prefinished Steels – Metric sizes

continued from previous page

DRILL DIAMETER		LENGTH	GROSS LENGTH		WEIGHT (g)	DIN SPECIFICATION	DIN SPECIFICATION	DIN CODE	
mm	inch		mm	inch				2-flute	3-flute
0.25	0.01	4.00 (1.57)	1.50	0.6 (0.24)	0.03	G 2.93	G 2.93	M35215-01	01.00
0.30	0.01	4.00 (1.57)	1.50	0.4 (0.16)	0.04	G 2.93	G 2.93	M35215-02	01.00
0.35	0.01	4.00 (1.57)	1.50	0.4 (0.16)	0.05	G 2.93	G 2.93	M35215-03	01.00
0.40	0.01	4.00 (1.57)	1.50	0.4 (0.16)	0.06	G 2.93	G 2.93	M35215-04	01.00
0.45	0.01	4.00 (1.57)	1.50	0.4 (0.16)	0.08	G 2.93	G 2.93	M35215-05	01.00
0.50	0.02	4.00 (1.57)	1.50	0.5 (0.20)	0.10	G 2.93	G 2.93	M35215-06	01.00
0.55	0.02	4.00 (1.57)	1.50	0.5 (0.20)	0.12	G 2.93	G 2.93	M35215-07	01.00
0.60	0.02	4.00 (1.57)	1.50	0.6 (0.24)	0.15	G 2.93	G 2.93	M35215-08	01.00
0.70	0.03	4.00 (1.57)	1.50	0.6 (0.24)	0.20	G 2.93	G 2.93	M35215-09	01.00
0.80	0.03	4.00 (1.57)	1.50	0.8 (0.31)	0.25	G 2.93	G 2.93	M35215-10	01.00
0.90	0.04	4.00 (1.57)	1.50	0.8 (0.31)	0.30	G 2.93	G 2.93	M35215-11	01.00
1.00	0.04	4.00 (1.57)	1.50	1.0 (0.39)	0.35	G 2.93	G 2.93	M35215-12	01.00
1.20	0.05	4.00 (1.57)	1.50	1.2 (0.47)	0.45	G 2.93	G 2.93	M35215-13	01.00
1.40	0.06	4.00 (1.57)	1.50	1.4 (0.55)	0.60	G 2.93	G 2.93	M35215-14	01.00
1.60	0.06	4.00 (1.57)	1.50	1.6 (0.63)	0.75	G 2.93	G 2.93	M35215-15	01.00
1.80	0.07	4.00 (1.57)	1.50	1.8 (0.71)	0.90	G 2.93	G 2.93	M35215-16	01.00
2.00	0.08	4.00 (1.57)	1.50	2.0 (0.79)	1.10	G 2.93	G 2.93	M35215-17	01.00
2.20	0.09	4.00 (1.57)	1.50	2.2 (0.87)	1.30	G 2.93	G 2.93	M35215-18	01.00
2.40	0.10	4.00 (1.57)	1.50	2.4 (0.95)	1.50	G 2.93	G 2.93	M35215-19	01.00
2.50	0.10	4.00 (1.57)	1.50	2.5 (0.98)	1.60	G 2.93	G 2.93	M35215-20	01.00
2.80	0.11	4.00 (1.57)	1.50	2.8 (1.10)	1.90	G 2.93	G 2.93	M35215-21	01.00
3.00	0.12	4.00 (1.57)	1.50	3.0 (1.18)	2.10	G 2.93	G 2.93	M35215-22	01.00
3.20	0.13	4.00 (1.57)	1.50	3.2 (1.26)	2.30	G 2.93	G 2.93	M35215-23	01.00
3.50	0.14	4.00 (1.57)	1.50	3.5 (1.38)	2.60	G 2.93	G 2.93	M35215-24	01.00
3.80	0.15	4.00 (1.57)	1.50	3.8 (1.50)	3.00	G 2.93	G 2.93	M35215-25	01.00
4.00	0.16	4.00 (1.57)	1.50	4.0 (1.57)	3.30	G 2.93	G 2.93	M35215-26	01.00
4.50	0.18	4.00 (1.57)	1.50	4.5 (1.77)	4.00	G 2.93	G 2.93	M35215-27	01.00
5.00	0.20	4.00 (1.57)	1.50	5.0 (1.97)	5.00	G 2.93	G 2.93	M35215-28	01.00
5.50	0.22	4.00 (1.57)	1.50	5.5 (2.17)	6.00	G 2.93	G 2.93	M35215-29	01.00
6.00	0.24	4.00 (1.57)	1.50	6.0 (2.36)	7.00	G 2.93	G 2.93	M35215-30	01.00
6.50	0.26	4.00 (1.57)	1.50	6.5 (2.56)	8.00	G 2.93	G 2.93	M35215-31	01.00
7.00	0.28	4.00 (1.57)	1.50	7.0 (2.76)	9.00	G 2.93	G 2.93	M35215-32	01.00
7.50	0.30	4.00 (1.57)	1.50	7.5 (2.95)	10.00	G 2.93	G 2.93	M35215-33	01.00
8.00	0.32	4.00 (1.57)	1.50	8.0 (3.15)	11.00	G 2.93	G 2.93	M35215-34	01.00
8.50	0.34	4.00 (1.57)	1.50	8.5 (3.35)	12.00	G 2.93	G 2.93	M35215-35	01.00
9.00	0.36	4.00 (1.57)	1.50	9.0 (3.54)	13.00	G 2.93	G 2.93	M35215-36	01.00
9.50	0.38	4.00 (1.57)	1.50	9.5 (3.74)	14.00	G 2.93	G 2.93	M35215-37	01.00
10.00	0.40	4.00 (1.57)	1.50	10.0 (3.94)	15.00	G 2.93	G 2.93	M35215-38	01.00
11.00	0.43	4.00 (1.57)	1.50	11.0 (4.33)	17.00	G 2.93	G 2.93	M35215-39	01.00
12.00	0.47	4.00 (1.57)	1.50	12.0 (4.72)	19.00	G 2.93	G 2.93	M35215-40	01.00
13.00	0.51	4.00 (1.57)	1.50	13.0 (5.11)	21.00	G 2.93	G 2.93	M35215-41	01.00
14.00	0.55	4.00 (1.57)	1.50	14.0 (5.50)	23.00	G 2.93	G 2.93	M35215-42	01.00
15.00	0.59	4.00 (1.57)	1.50	15.0 (5.89)	25.00	G 2.93	G 2.93	M35215-43	01.00
16.00	0.63	4.00 (1.57)	1.50	16.0 (6.28)	27.00	G 2.93	G 2.93	M35215-44	01.00
17.00	0.67	4.00 (1.57)	1.50	17.0 (6.67)	29.00	G 2.93	G 2.93	M35215-45	01.00
18.00	0.71	4.00 (1.57)	1.50	18.0 (7.06)	31.00	G 2.93	G 2.93	M35215-46	01.00
19.00	0.75	4.00 (1.57)	1.50	19.0 (7.45)	33.00	G 2.93	G 2.93	M35215-47	01.00
20.00	0.79	4.00 (1.57)	1.50	20.0 (7.84)	35.00	G 2.93	G 2.93	M35215-48	01.00
22.00	0.87	4.00 (1.57)	1.50	22.0 (8.66)	41.00	G 2.93	G 2.93	M35215-49	01.00
24.00	0.95	4.00 (1.57)	1.50	24.0 (9.48)	47.00	G 2.93	G 2.93	M35215-50	01.00
26.00	1.03	4.00 (1.57)	1.50	26.0 (10.30)	53.00	G 2.93	G 2.93	M35215-51	01.00
28.00	1.11	4.00 (1.57)	1.50	28.0 (11.12)	59.00	G 2.93	G 2.93	M35215-52	01.00
30.00	1.19	4.00 (1.57)	1.50	30.0 (11.94)	65.00	G 2.93	G 2.93	M35215-53	01.00
32.00	1.27	4.00 (1.57)	1.50	32.0 (12.76)	71.00	G 2.93	G 2.93	M35215-54	01.00
34.00	1.35	4.00 (1.57)	1.50	34.0 (13.58)	77.00	G 2.93	G 2.93	M35215-55	01.00
36.00	1.43	4.00 (1.57)	1.50	36.0 (14.40)	83.00	G 2.93	G 2.93	M35215-56	01.00
38.00	1.51	4.00 (1.57)	1.50	38.0 (15.22)	89.00	G 2.93	G 2.93	M35215-57	01.00
40.00	1.59	4.00 (1.57)	1.50	40.0 (16.04)	95.00	G 2.93	G 2.93	M35215-58	01.00
45.00	1.77	4.00 (1.57)	1.50	45.0 (17.72)	113.00	G 2.93	G 2.93	M35215-59	01.00
50.00	1.95	4.00 (1.57)	1.50	50.0 (19.40)	131.00	G 2.93	G 2.93	M35215-60	01.00
55.00	2.13	4.00 (1.57)	1.50	55.0 (21.08)	149.00	G 2.93	G 2.93	M35215-61	01.00
60.00	2.31	4.00 (1.57)	1.50	60.0 (22.76)	167.00	G 2.93	G 2.93	M35215-62	01.00
65.00	2.50	4.00 (1.57)	1.50	65.0 (24.44)	185.00	G 2.93	G 2.93	M35215-63	01.00
70.00	2.76	4.00 (1.57)	1.50	70.0 (27.09)	211.00	G 2.93	G 2.93	M35215-64	01.00
75.00	2.95	4.00 (1.57)	1.50	75.0 (29.13)	237.00	G 2.93	G 2.93	M35215-65	01.00
80.00	3.15	4.00 (1.57)	1.50	80.0 (31.17)	263.00	G 2.93	G 2.93	M35215-66	01.00
85.00	3.35	4.00 (1.57)	1.50	85.0 (33.21)	289.00	G 2.93	G 2.93	M35215-67	01.00
90.00	3.54	4.00 (1.57)	1.50	90.0 (35.25)	315.00	G 2.93	G 2.93	M35215-68	01.00
95.00	3.74	4.00 (1.57)	1.50	95.0 (37.29)	341.00	G 2.93	G 2.93	M35215-69	01.00
100.00	3.94	4.00 (1.57)	1.50	100.0 (39.33)	367.00	G 2.93	G 2.93	M35215-70	01.00
110.00	4.33	4.00 (1.57)	1.50	110.0 (43.30)	421.00	G 2.93	G 2.93	M35215-71	01.00
120.00	4.72	4.00 (1.57)	1.50	120.0 (47.27)	475.00	G 2.93	G 2.93	M35215-72	01.00
130.00	5.11	4.00 (1.57)	1.50	130.0 (51.24)	529.00	G 2.93	G 2.93	M35215-73	01.00
140.00	5.50	4.00 (1.57)	1.50	140.0 (55.21)	583.00	G 2.93	G 2.93	M35215-74	01.00
150.00	5.89	4.00 (1.57)	1.50	150.0 (59.18)	637.00	G 2.93	G 2.93	M35215-75	01.00
160.00	6.28	4.00 (1.57)	1.50	160.0 (63.15)	691.00	G 2.93	G 2.93	M35215-76	01.00
170.00	6.67	4.00 (1.57)	1.50	170.0 (67.12)	745.00	G 2.93	G 2.93	M35215-77	01.00
180.00	7.06	4.00 (1.57)	1.50	180.0 (71.09)	800.00	G 2.93	G 2.93	M35215-78	01.00
190.00	7.45	4.00 (1.57)	1.50	190.0 (75.06)	854.00	G 2.93	G 2.93	M35215-79	01.00
200.00	7.84	4.00 (1.57)	1.50	200.0 (79.03)	908.00	G 2.93	G 2.93	M35215-80	01.00

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## MINIATURE HIGH PERFORMANCE DRILLS

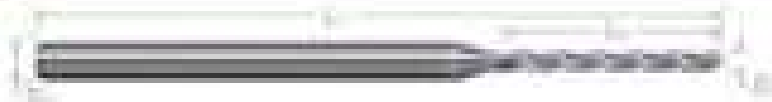
### Prehardened Steels - Metric (mm)

continued from previous page

DRILL DIAMETER		DRILL LENGTH			DRILL WEIGHT		DRILL PRICE	
MM	INCH	MM	INCH	MM	INCH	PER 1000	PER 1000	
<b>5 - 1/16</b>		<b>5 - 1/16</b>			<b>0.60</b>			
5.00	0.1969	1.00	0.0394	1.80	0.0709	10000	0.10	
5.00	0.1969	1.25	0.0492	1.80	0.0709	10000	0.15	
5.00	0.1969	1.50	0.0591	1.80	0.0709	10000	0.20	
5.00	0.1969	1.75	0.0689	1.80	0.0709	10000	0.25	
5.00	0.1969	2.00	0.0787	1.80	0.0709	10000	0.30	
5.00	0.1969	2.25	0.0886	1.80	0.0709	10000	0.35	
5.00	0.1969	2.50	0.0984	1.80	0.0709	10000	0.40	
5.00	0.1969	2.75	0.1083	1.80	0.0709	10000	0.45	
5.00	0.1969	3.00	0.1181	1.80	0.0709	10000	0.50	
5.00	0.1969	3.25	0.1279	1.80	0.0709	10000	0.55	
5.00	0.1969	3.50	0.1378	1.80	0.0709	10000	0.60	
5.00	0.1969	3.75	0.1476	1.80	0.0709	10000	0.65	
5.00	0.1969	4.00	0.1575	1.80	0.0709	10000	0.70	
5.00	0.1969	4.25	0.1673	1.80	0.0709	10000	0.75	
5.00	0.1969	4.50	0.1772	1.80	0.0709	10000	0.80	
5.00	0.1969	4.75	0.1870	1.80	0.0709	10000	0.85	
5.00	0.1969	5.00	0.1969	1.80	0.0709	10000	0.90	
5.00	0.1969	5.25	0.2067	1.80	0.0709	10000	0.95	
5.00	0.1969	5.50	0.2166	1.80	0.0709	10000	1.00	
5.00	0.1969	5.75	0.2264	1.80	0.0709	10000	1.05	
5.00	0.1969	6.00	0.2363	1.80	0.0709	10000	1.10	
5.00	0.1969	6.25	0.2461	1.80	0.0709	10000	1.15	
5.00	0.1969	6.50	0.2560	1.80	0.0709	10000	1.20	
5.00	0.1969	6.75	0.2658	1.80	0.0709	10000	1.25	
5.00	0.1969	7.00	0.2757	1.80	0.0709	10000	1.30	
5.00	0.1969	7.25	0.2855	1.80	0.0709	10000	1.35	
5.00	0.1969	7.50	0.2954	1.80	0.0709	10000	1.40	
5.00	0.1969	7.75	0.3052	1.80	0.0709	10000	1.45	
5.00	0.1969	8.00	0.3151	1.80	0.0709	10000	1.50	
5.00	0.1969	8.25	0.3249	1.80	0.0709	10000	1.55	
5.00	0.1969	8.50	0.3348	1.80	0.0709	10000	1.60	
5.00	0.1969	8.75	0.3446	1.80	0.0709	10000	1.65	
5.00	0.1969	9.00	0.3545	1.80	0.0709	10000	1.70	
5.00	0.1969	9.25	0.3643	1.80	0.0709	10000	1.75	
5.00	0.1969	9.50	0.3742	1.80	0.0709	10000	1.80	
5.00	0.1969	9.75	0.3840	1.80	0.0709	10000	1.85	
5.00	0.1969	10.00	0.3939	1.80	0.0709	10000	1.90	
5.00	0.1969	10.25	0.4037	1.80	0.0709	10000	1.95	
5.00	0.1969	10.50	0.4136	1.80	0.0709	10000	2.00	
5.00	0.1969	10.75	0.4234	1.80	0.0709	10000	2.05	
5.00	0.1969	11.00	0.4333	1.80	0.0709	10000	2.10	
5.00	0.1969	11.25	0.4431	1.80	0.0709	10000	2.15	
5.00	0.1969	11.50	0.4530	1.80	0.0709	10000	2.20	
5.00	0.1969	11.75	0.4628	1.80	0.0709	10000	2.25	
5.00	0.1969	12.00	0.4727	1.80	0.0709	10000	2.30	
5.00	0.1969	12.25	0.4825	1.80	0.0709	10000	2.35	
5.00	0.1969	12.50	0.4924	1.80	0.0709	10000	2.40	
5.00	0.1969	12.75	0.5022	1.80	0.0709	10000	2.45	
5.00	0.1969	13.00	0.5121	1.80	0.0709	10000	2.50	
5.00	0.1969	13.25	0.5219	1.80	0.0709	10000	2.55	
5.00	0.1969	13.50	0.5318	1.80	0.0709	10000	2.60	
5.00	0.1969	13.75	0.5416	1.80	0.0709	10000	2.65	
5.00	0.1969	14.00	0.5515	1.80	0.0709	10000	2.70	
5.00	0.1969	14.25	0.5613	1.80	0.0709	10000	2.75	
5.00	0.1969	14.50	0.5712	1.80	0.0709	10000	2.80	
5.00	0.1969	14.75	0.5810	1.80	0.0709	10000	2.85	
5.00	0.1969	15.00	0.5909	1.80	0.0709	10000	2.90	
5.00	0.1969	15.25	0.6007	1.80	0.0709	10000	2.95	
5.00	0.1969	15.50	0.6106	1.80	0.0709	10000	3.00	
5.00	0.1969	15.75	0.6204	1.80	0.0709	10000	3.05	
5.00	0.1969	16.00	0.6303	1.80	0.0709	10000	3.10	
5.00	0.1969	16.25	0.6401	1.80	0.0709	10000	3.15	
5.00	0.1969	16.50	0.6500	1.80	0.0709	10000	3.20	
5.00	0.1969	16.75	0.6598	1.80	0.0709	10000	3.25	
5.00	0.1969	17.00	0.6697	1.80	0.0709	10000	3.30	
5.00	0.1969	17.25	0.6795	1.80	0.0709	10000	3.35	
5.00	0.1969	17.50	0.6894	1.80	0.0709	10000	3.40	
5.00	0.1969	17.75	0.6992	1.80	0.0709	10000	3.45	
5.00	0.1969	18.00	0.7091	1.80	0.0709	10000	3.50	
5.00	0.1969	18.25	0.7189	1.80	0.0709	10000	3.55	
5.00	0.1969	18.50	0.7288	1.80	0.0709	10000	3.60	
5.00	0.1969	18.75	0.7386	1.80	0.0709	10000	3.65	
5.00	0.1969	19.00	0.7485	1.80	0.0709	10000	3.70	
5.00	0.1969	19.25	0.7583	1.80	0.0709	10000	3.75	
5.00	0.1969	19.50	0.7682	1.80	0.0709	10000	3.80	
5.00	0.1969	19.75	0.7780	1.80	0.0709	10000	3.85	
5.00	0.1969	20.00	0.7879	1.80	0.0709	10000	3.90	
5.00	0.1969	20.25	0.7977	1.80	0.0709	10000	3.95	
5.00	0.1969	20.50	0.8076	1.80	0.0709	10000	4.00	
5.00	0.1969	20.75	0.8174	1.80	0.0709	10000	4.05	
5.00	0.1969	21.00	0.8273	1.80	0.0709	10000	4.10	
5.00	0.1969	21.25	0.8371	1.80	0.0709	10000	4.15	
5.00	0.1969	21.50	0.8470	1.80	0.0709	10000	4.20	
5.00	0.1969	21.75	0.8568	1.80	0.0709	10000	4.25	
5.00	0.1969	22.00	0.8667	1.80	0.0709	10000	4.30	
5.00	0.1969	22.25	0.8765	1.80	0.0709	10000	4.35	
5.00	0.1969	22.50	0.8864	1.80	0.0709	10000	4.40	
5.00	0.1969	22.75	0.8962	1.80	0.0709	10000	4.45	
5.00	0.1969	23.00	0.9061	1.80	0.0709	10000	4.50	
5.00	0.1969	23.25	0.9159	1.80	0.0709	10000	4.55	
5.00	0.1969	23.50	0.9258	1.80	0.0709	10000	4.60	
5.00	0.1969	23.75	0.9356	1.80	0.0709	10000	4.65	
5.00	0.1969	24.00	0.9455	1.80	0.0709	10000	4.70	
5.00	0.1969	24.25	0.9553	1.80	0.0709	10000	4.75	
5.00	0.1969	24.50	0.9652	1.80	0.0709	10000	4.80	
5.00	0.1969	24.75	0.9750	1.80	0.0709	10000	4.85	
5.00	0.1969	25.00	0.9849	1.80	0.0709	10000	4.90	
5.00	0.1969	25.25	0.9947	1.80	0.0709	10000	4.95	
5.00	0.1969	25.50	1.0046	1.80	0.0709	10000	5.00	
5.00	0.1969	25.75	1.0144	1.80	0.0709	10000	5.05	
5.00	0.1969	26.00	1.0243	1.80	0.0709	10000	5.10	
5.00	0.1969	26.25	1.0341	1.80	0.0709	10000	5.15	
5.00	0.1969	26.50	1.0440	1.80	0.0709	10000	5.20	
5.00	0.1969	26.75	1.0538	1.80	0.0709	10000	5.25	
5.00	0.1969	27.00	1.0637	1.80	0.0709	10000	5.30	
5.00	0.1969	27.25	1.0735	1.80	0.0709	10000	5.35	
5.00	0.1969	27.50	1.0834	1.80	0.0709	10000	5.40	
5.00	0.1969	27.75	1.0932	1.80	0.0709	10000	5.45	
5.00	0.1969	28.00	1.1031	1.80	0.0709	10000	5.50	
5.00	0.1969	28.25	1.1129	1.80	0.0709	10000	5.55	
5.00	0.1969	28.50	1.1228	1.80	0.0709	10000	5.60	
5.00	0.1969	28.75	1.1326	1.80	0.0709	10000	5.65	
5.00	0.1969	29.00	1.1425	1.80	0.0709	10000	5.70	
5.00	0.1969	29.25	1.1523	1.80	0.0709	10000	5.75	
5.00	0.1969	29.50	1.1622	1.80	0.0709	10000	5.80	
5.00	0.1969	29.75	1.1720	1.80	0.0709	10000	5.85	
5.00	0.1969	30.00	1.1819	1.80	0.0709	10000	5.90	
5.00	0.1969	30.25	1.1917	1.80	0.0709	10000	5.95	
5.00	0.1969	30.50	1.2016	1.80	0.0709	10000	6.00	
5.00	0.1969	30.75	1.2114	1.80	0.0709	10000	6.05	
5.00	0.1969	31.00	1.2213	1.80	0.0709	10000	6.10	
5.00	0.1969	31.25	1.2311	1.80	0.0709	10000	6.15	
5.00	0.1969	31.50	1.2410	1.80	0.0709	10000	6.20	
5.00	0.1969	31.75	1.2508	1.80	0.0709	10000	6.25	
5.00	0.1969	32.00	1.2607	1.80	0.0709	10000	6.30	
5.00	0.1969	32.25	1.2705	1.80	0.0709	10000	6.35	
5.00	0.1969							

## MINIATURE HIGH PERFORMANCE DRILLS

Aluminum Alloys - Metric



Available for 3x, 5x, 8x,  
10x, & 12x Hole Depth

- Optimized for drilling aluminum and austenitic stainless steel without chatter, chatter marks, burrs, and broken edges.
- Special 3 flute design to maximize chip flow, hole accuracy, and finish.
- 130° cutting angle.
- Reshaped flute corners and 15% cooling channel built on edge and behind tool tip.
- All alloys optimized for high production tool makers.
- Notes on page 4 - DDC applies to this table.



Sumitomo Electric  
America, One Pine View  
Baltimore, MD 21286

DRILL DIAMETER			DRILL LENGTH			DRILL QUANTITY	DIN5480 LENGTH	PART NUMBER	
INCH	MM	INCH	MM	MM RANGE	DRILL			PKG	
		3/16" (1.57)		1.50	150	1000	1.00	400510100	40.00
		3/16" (1.57)		2.00	200	1000	1.00	400510120	44.00
		3/16" (1.57)		2.50	250	1000	1.00	400510140	50.00
		3/16" (1.57)		3.00	300	1000	1.00	400510160	56.00
		3/16" (1.57)		3.75	375	1000	1.00	400510180	62.00
		3/16" (1.57)		4.50	450	1000	1.00	400510200	68.00
		3/16" (1.57)		5.25	525	1000	1.00	400510220	74.00
		3/16" (1.57)		6.00	600	1000	1.00	400510240	80.00
		3/16" (1.57)		6.75	675	1000	1.00	400510260	86.00
		3/16" (1.57)		7.50	750	1000	1.00	400510280	92.00
		3/16" (1.57)		8.25	825	1000	1.00	400510300	98.00
		3/16" (1.57)		9.00	900	1000	1.00	400510320	104.00
		3/16" (1.57)		9.75	975	1000	1.00	400510340	110.00
		3/16" (1.57)		10.50	1050	1000	1.00	400510360	116.00
		3/16" (1.57)		11.25	1125	1000	1.00	400510380	122.00
		3/16" (1.57)		12.00	1200	1000	1.00	400510400	128.00
		3/16" (1.57)		12.75	1275	1000	1.00	400510420	134.00
		3/16" (1.57)		13.50	1350	1000	1.00	400510440	140.00
		3/16" (1.57)		14.25	1425	1000	1.00	400510460	146.00
		3/16" (1.57)		15.00	1500	1000	1.00	400510480	152.00
		3/16" (1.57)		15.75	1575	1000	1.00	400510500	158.00
		3/16" (1.57)		16.50	1650	1000	1.00	400510520	164.00
		3/16" (1.57)		17.25	1725	1000	1.00	400510540	170.00
		3/16" (1.57)		18.00	1800	1000	1.00	400510560	176.00
		3/16" (1.57)		18.75	1875	1000	1.00	400510580	182.00
		3/16" (1.57)		19.50	1950	1000	1.00	400510600	188.00
		3/16" (1.57)		20.25	2025	1000	1.00	400510620	194.00
		3/16" (1.57)		21.00	2100	1000	1.00	400510640	200.00
		3/16" (1.57)		21.75	2175	1000	1.00	400510660	206.00
		3/16" (1.57)		22.50	2250	1000	1.00	400510680	212.00
		3/16" (1.57)		23.25	2325	1000	1.00	400510700	218.00
		3/16" (1.57)		24.00	2400	1000	1.00	400510720	224.00
		3/16" (1.57)		24.75	2475	1000	1.00	400510740	230.00
		3/16" (1.57)		25.50	2550	1000	1.00	400510760	236.00
		3/16" (1.57)		26.25	2625	1000	1.00	400510780	242.00
		3/16" (1.57)		27.00	2700	1000	1.00	400510800	248.00
		3/16" (1.57)		27.75	2775	1000	1.00	400510820	254.00
		3/16" (1.57)		28.50	2850	1000	1.00	400510840	260.00
		3/16" (1.57)		29.25	2925	1000	1.00	400510860	266.00
		3/16" (1.57)		30.00	3000	1000	1.00	400510880	272.00
		3/16" (1.57)		30.75	3075	1000	1.00	400510900	278.00
		3/16" (1.57)		31.50	3150	1000	1.00	400510920	284.00
		3/16" (1.57)		32.25	3225	1000	1.00	400510940	290.00
		3/16" (1.57)		33.00	3300	1000	1.00	400510960	296.00
		3/16" (1.57)		33.75	3375	1000	1.00	400510980	302.00
		3/16" (1.57)		34.50	3450	1000	1.00	400511000	308.00
		3/16" (1.57)		35.25	3525	1000	1.00	400511020	314.00
		3/16" (1.57)		36.00	3600	1000	1.00	400511040	320.00
		3/16" (1.57)		36.75	3675	1000	1.00	400511060	326.00
		3/16" (1.57)		37.50	3750	1000	1.00	400511080	332.00
		3/16" (1.57)		38.25	3825	1000	1.00	400511100	338.00
		3/16" (1.57)		39.00	3900	1000	1.00	400511120	344.00
		3/16" (1.57)		39.75	3975	1000	1.00	400511140	350.00
		3/16" (1.57)		40.50	4050	1000	1.00	400511160	356.00
		3/16" (1.57)		41.25	4125	1000	1.00	400511180	362.00
		3/16" (1.57)		42.00	4200	1000	1.00	400511200	368.00
		3/16" (1.57)		42.75	4275	1000	1.00	400511220	374.00
		3/16" (1.57)		43.50	4350	1000	1.00	400511240	380.00
		3/16" (1.57)		44.25	4425	1000	1.00	400511260	386.00
		3/16" (1.57)		45.00	4500	1000	1.00	400511280	392.00
		3/16" (1.57)		45.75	4575	1000	1.00	400511300	398.00
		3/16" (1.57)		46.50	4650	1000	1.00	400511320	404.00
		3/16" (1.57)		47.25	4725	1000	1.00	400511340	410.00
		3/16" (1.57)		48.00	4800	1000	1.00	400511360	416.00
		3/16" (1.57)		48.75	4875	1000	1.00	400511380	422.00
		3/16" (1.57)		49.50	4950	1000	1.00	400511400	428.00
		3/16" (1.57)		50.25	5025	1000	1.00	400511420	434.00
		3/16" (1.57)		51.00	5100	1000	1.00	400511440	440.00
		3/16" (1.57)		51.75	5175	1000	1.00	400511460	446.00
		3/16" (1.57)		52.50	5250	1000	1.00	400511480	452.00
		3/16" (1.57)		53.25	5325	1000	1.00	400511500	458.00
		3/16" (1.57)		54.00	5400	1000	1.00	400511520	464.00
		3/16" (1.57)		54.75	5475	1000	1.00	400511540	470.00
		3/16" (1.57)		55.50	5550	1000	1.00	400511560	476.00
		3/16" (1.57)		56.25	5625	1000	1.00	400511580	482.00
		3/16" (1.57)		57.00	5700	1000	1.00	400511600	488.00
		3/16" (1.57)		57.75	5775	1000	1.00	400511620	494.00
		3/16" (1.57)		58.50	5850	1000	1.00	400511640	500.00
		3/16" (1.57)		59.25	5925	1000	1.00	400511660	506.00
		3/16" (1.57)		60.00	6000	1000	1.00	400511680	512.00
		3/16" (1.57)		60.75	6075	1000	1.00	400511700	518.00
		3/16" (1.57)		61.50	6150	1000	1.00	400511720	524.00
		3/16" (1.57)		62.25	6225	1000	1.00	400511740	530.00
		3/16" (1.57)		63.00	6300	1000	1.00	400511760	536.00
		3/16" (1.57)		63.75	6375	1000	1.00	400511780	542.00
		3/16" (1.57)		64.50	6450	1000	1.00	400511800	548.00
		3/16" (1.57)		65.25	6525	1000	1.00	400511820	554.00
		3/16" (1.57)		66.00	6600	1000	1.00	400511840	560.00
		3/16" (1.57)		66.75	6675	1000	1.00	400511860	566.00
		3/16" (1.57)		67.50	6750	1000	1.00	400511880	572.00
		3/16" (1.57)		68.25	6825	1000	1.00	400511900	578.00
		3/16" (1.57)		69.00	6900	1000	1.00	400511920	584.00
		3/16" (1.57)		69.75	6975	1000	1.00	400511940	590.00
		3/16" (1.57)		70.50	7050	1000	1.00	400511960	596.00
		3/16" (1.57)		71.25	7125	1000	1.00	400511980	602.00
		3/16" (1.57)		72.00	7200	1000	1.00	400512000	608.00
		3/16" (1.57)		72.75	7275	1000	1.00	400512020	614.00
		3/16" (1.57)		73.50	7350	1000	1.00	400512040	620.00
		3/16" (1.57)		74.25	7425	1000	1.00	400512060	626.00
		3/16" (1.57)		75.00	7500	1000	1.00	400512080	632.00
		3/16" (1.57)		75.75	7575	1000	1.00	400512100	638.00
		3/16" (1.57)		76.50	7650	1000	1.00	400512120	644.00
		3/16" (1.57)		77.25	7725	1000	1.00	400512140	650.00
		3/16" (1.57)		78.00	7800	1000	1.00	400512160	656.00
		3/16" (1.57)		78.75	7875	1000	1.00	400512180	662.00
		3/16" (1.57)		79.50	7950	1000	1.00	400512200	668.00
		3/16" (1.57)		80.25	8025	1000	1.00	400512220	674.00
		3/16" (1.57)		81.00	8100	1000	1.00	400512240	680.00
		3/16" (1.57)		81.75	8175	1000	1.00	400512260	686.00
		3/16" (1.57)		82.50	8250	1000	1.00	400512280	692.00
		3/16" (1.57)							



## MINIATURE HIGH PERFORMANCE DRILLS

Aluminum Alloys - Metric (cont.)

continued from previous page

DRILL NUMBER	DRILL SIZE	DRILL LENGTH	ROTT SPEED		FEED	DEPTH OF CUT	CHIPS	REMARKS	
			MIN	MAX				TYPE	REMARKS
1001	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1002	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1003	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1004	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1005	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1006	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1007	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1008	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1009	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1010	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1011	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1012	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1013	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1014	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1015	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1016	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1017	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1018	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1019	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1020	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1021	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1022	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1023	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1024	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1025	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1026	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1027	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1028	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1029	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1030	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1031	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1032	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1033	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1034	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1035	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1036	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1037	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1038	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1039	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1040	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1041	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1042	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1043	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1044	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1045	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1046	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1047	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1048	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1049	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00
1050	0.80	100 mm	200	3.000 mm	0.02	0.200	0.50 mm	STAINLESS	10.00

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DRILL NUMBER

## MINIATURE HIGH PERFORMANCE DRILLS

Aluminium Alloy - Metric (cont.)

(continued from previous page)

DRILL NUMBER		DRILL LENGTH	DRILL DIAMETER		DRILL FLUTE LENGTH	DRILL POINT ANGLE	DRILL POINT TYPE	DRILL POINT TYPE	DRILL POINT TYPE	
DRILL NUMBER	DRILL NUMBER		DRILL DIAMETER	DRILL DIAMETER					DRILL POINT TYPE	DRILL POINT TYPE
1000	1000	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1001	1001	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1002	1002	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1003	1003	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1004	1004	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1005	1005	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1006	1006	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1007	1007	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1008	1008	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1009	1009	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1010	1010	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1011	1011	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1012	1012	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1013	1013	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1014	1014	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1015	1015	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1016	1016	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1017	1017	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1018	1018	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1019	1019	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1020	1020	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1021	1021	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1022	1022	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1023	1023	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1024	1024	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1025	1025	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1026	1026	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1027	1027	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1028	1028	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1029	1029	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1030	1030	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1031	1031	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1032	1032	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1033	1033	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1034	1034	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1035	1035	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1036	1036	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1037	1037	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1038	1038	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1039	1039	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1040	1040	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1041	1041	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1042	1042	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1043	1043	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1044	1044	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1045	1045	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1046	1046	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1047	1047	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1048	1048	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1049	1049	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	
1050	1050	1.000 mm	1.000	1.000 mm	100	1.000	1.000	1.000	1.000	

(continued on next page)



# MINIATURE HIGH PERFORMANCE DRILLS

Aluminum Alloys - Metric (cont.)

Continued from previous page

DRILL HEAD SIZE			DRILL LENGTH			DRILL ANGLE	FLUTE LENGTH	FLUTE WIDTH	
MM	IN.	MM	MM	IN.	F <sub>1</sub>			F <sub>2</sub>	F <sub>3</sub>
<b>Series 10</b>									
100	4.0	137 mm	35	1.37 mm	120	1.25	2.75	0.75	0.75
101	4.0	127 mm	24	0.95 mm	120	1.25	2.75	0.75	0.75
102	4.0	117 mm	14	0.55 mm	120	1.25	2.75	0.75	0.75
103	4.0	107 mm	6	0.23 mm	120	1.25	2.75	0.75	0.75
104	4.0	97 mm	3	0.11 mm	120	1.25	2.75	0.75	0.75
105	4.0	87 mm	2	0.07 mm	120	1.25	2.75	0.75	0.75
106	4.0	77 mm	1	0.03 mm	120	1.25	2.75	0.75	0.75
107	4.0	67 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
108	4.0	57 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
109	4.0	47 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
110	4.0	37 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
111	4.0	27 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
112	4.0	17 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
113	4.0	7 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
114	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
115	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
116	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
117	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
118	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
119	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
120	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
121	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
122	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
123	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
124	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
125	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
126	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
127	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
128	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
129	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
130	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
131	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
132	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
133	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
134	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
135	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
136	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
137	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
138	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
139	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
140	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
141	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
142	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
143	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
144	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
145	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
146	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
147	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
148	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
149	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
150	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
151	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
152	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
153	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
154	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
155	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
156	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
157	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
158	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
159	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
160	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
161	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
162	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
163	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
164	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
165	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
166	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
167	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
168	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
169	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
170	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
171	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
172	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
173	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
174	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
175	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
176	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
177	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
178	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
179	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
180	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
181	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
182	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
183	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
184	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
185	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
186	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
187	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
188	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
189	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
190	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
191	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
192	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
193	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
194	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
195	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
196	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
197	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
198	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75
199	4.0	3 mm	0	0.00 mm	120	1.25	2.75	0.75	0.75

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Series 10

## MINIATURE HIGH PERFORMANCE DRILLS

Aluminum Alloys - Metric (cont.)

(continued from previous page)

DRILL LENGTH	DRILL DIAMETER	DRILL SIZE	ALUM. LENGTH		DRILL DIAMETER	DRILL LENGTH	MATERIAL	
			1-1/2"	2-1/2"			1-1/2"	2-1/2"
0.00	0.00	0.0000	0.00	0.00	0.00	0.00	0.00	0.00
0.05	0.05	0.0500	0.05	0.05	0.05	0.05	0.05	0.05
0.10	0.10	0.1000	0.10	0.10	0.10	0.10	0.10	0.10
0.15	0.15	0.1500	0.15	0.15	0.15	0.15	0.15	0.15
0.20	0.20	0.2000	0.20	0.20	0.20	0.20	0.20	0.20
0.25	0.25	0.2500	0.25	0.25	0.25	0.25	0.25	0.25
0.30	0.30	0.3000	0.30	0.30	0.30	0.30	0.30	0.30
0.35	0.35	0.3500	0.35	0.35	0.35	0.35	0.35	0.35
0.40	0.40	0.4000	0.40	0.40	0.40	0.40	0.40	0.40
0.45	0.45	0.4500	0.45	0.45	0.45	0.45	0.45	0.45
0.50	0.50	0.5000	0.50	0.50	0.50	0.50	0.50	0.50
0.55	0.55	0.5500	0.55	0.55	0.55	0.55	0.55	0.55
0.60	0.60	0.6000	0.60	0.60	0.60	0.60	0.60	0.60
0.65	0.65	0.6500	0.65	0.65	0.65	0.65	0.65	0.65
0.70	0.70	0.7000	0.70	0.70	0.70	0.70	0.70	0.70
0.75	0.75	0.7500	0.75	0.75	0.75	0.75	0.75	0.75
0.80	0.80	0.8000	0.80	0.80	0.80	0.80	0.80	0.80
0.85	0.85	0.8500	0.85	0.85	0.85	0.85	0.85	0.85
0.90	0.90	0.9000	0.90	0.90	0.90	0.90	0.90	0.90
0.95	0.95	0.9500	0.95	0.95	0.95	0.95	0.95	0.95
1.00	1.00	1.0000	1.00	1.00	1.00	1.00	1.00	1.00
1.05	1.05	1.0500	1.05	1.05	1.05	1.05	1.05	1.05
1.10	1.10	1.1000	1.10	1.10	1.10	1.10	1.10	1.10
1.15	1.15	1.1500	1.15	1.15	1.15	1.15	1.15	1.15
1.20	1.20	1.2000	1.20	1.20	1.20	1.20	1.20	1.20
1.25	1.25	1.2500	1.25	1.25	1.25	1.25	1.25	1.25
1.30	1.30	1.3000	1.30	1.30	1.30	1.30	1.30	1.30
1.35	1.35	1.3500	1.35	1.35	1.35	1.35	1.35	1.35
1.40	1.40	1.4000	1.40	1.40	1.40	1.40	1.40	1.40
1.45	1.45	1.4500	1.45	1.45	1.45	1.45	1.45	1.45
1.50	1.50	1.5000	1.50	1.50	1.50	1.50	1.50	1.50
1.55	1.55	1.5500	1.55	1.55	1.55	1.55	1.55	1.55
1.60	1.60	1.6000	1.60	1.60	1.60	1.60	1.60	1.60
1.65	1.65	1.6500	1.65	1.65	1.65	1.65	1.65	1.65
1.70	1.70	1.7000	1.70	1.70	1.70	1.70	1.70	1.70
1.75	1.75	1.7500	1.75	1.75	1.75	1.75	1.75	1.75
1.80	1.80	1.8000	1.80	1.80	1.80	1.80	1.80	1.80
1.85	1.85	1.8500	1.85	1.85	1.85	1.85	1.85	1.85
1.90	1.90	1.9000	1.90	1.90	1.90	1.90	1.90	1.90
1.95	1.95	1.9500	1.95	1.95	1.95	1.95	1.95	1.95
2.00	2.00	2.0000	2.00	2.00	2.00	2.00	2.00	2.00
2.05	2.05	2.0500	2.05	2.05	2.05	2.05	2.05	2.05
2.10	2.10	2.1000	2.10	2.10	2.10	2.10	2.10	2.10
2.15	2.15	2.1500	2.15	2.15	2.15	2.15	2.15	2.15
2.20	2.20	2.2000	2.20	2.20	2.20	2.20	2.20	2.20
2.25	2.25	2.2500	2.25	2.25	2.25	2.25	2.25	2.25
2.30	2.30	2.3000	2.30	2.30	2.30	2.30	2.30	2.30
2.35	2.35	2.3500	2.35	2.35	2.35	2.35	2.35	2.35
2.40	2.40	2.4000	2.40	2.40	2.40	2.40	2.40	2.40
2.45	2.45	2.4500	2.45	2.45	2.45	2.45	2.45	2.45
2.50	2.50	2.5000	2.50	2.50	2.50	2.50	2.50	2.50
2.55	2.55	2.5500	2.55	2.55	2.55	2.55	2.55	2.55
2.60	2.60	2.6000	2.60	2.60	2.60	2.60	2.60	2.60
2.65	2.65	2.6500	2.65	2.65	2.65	2.65	2.65	2.65
2.70	2.70	2.7000	2.70	2.70	2.70	2.70	2.70	2.70
2.75	2.75	2.7500	2.75	2.75	2.75	2.75	2.75	2.75
2.80	2.80	2.8000	2.80	2.80	2.80	2.80	2.80	2.80
2.85	2.85	2.8500	2.85	2.85	2.85	2.85	2.85	2.85
2.90	2.90	2.9000	2.90	2.90	2.90	2.90	2.90	2.90
2.95	2.95	2.9500	2.95	2.95	2.95	2.95	2.95	2.95
3.00	3.00	3.0000	3.00	3.00	3.00	3.00	3.00	3.00
3.05	3.05	3.0500	3.05	3.05	3.05	3.05	3.05	3.05
3.10	3.10	3.1000	3.10	3.10	3.10	3.10	3.10	3.10
3.15	3.15	3.1500	3.15	3.15	3.15	3.15	3.15	3.15
3.20	3.20	3.2000	3.20	3.20	3.20	3.20	3.20	3.20
3.25	3.25	3.2500	3.25	3.25	3.25	3.25	3.25	3.25
3.30	3.30	3.3000	3.30	3.30	3.30	3.30	3.30	3.30
3.35	3.35	3.3500	3.35	3.35	3.35	3.35	3.35	3.35
3.40	3.40	3.4000	3.40	3.40	3.40	3.40	3.40	3.40
3.45	3.45	3.4500	3.45	3.45	3.45	3.45	3.45	3.45
3.50	3.50	3.5000	3.50	3.50	3.50	3.50	3.50	3.50
3.55	3.55	3.5500	3.55	3.55	3.55	3.55	3.55	3.55
3.60	3.60	3.6000	3.60	3.60	3.60	3.60	3.60	3.60
3.65	3.65	3.6500	3.65	3.65	3.65	3.65	3.65	3.65
3.70	3.70	3.7000	3.70	3.70	3.70	3.70	3.70	3.70
3.75	3.75	3.7500	3.75	3.75	3.75	3.75	3.75	3.75
3.80	3.80	3.8000	3.80	3.80	3.80	3.80	3.80	3.80
3.85	3.85	3.8500	3.85	3.85	3.85	3.85	3.85	3.85
3.90	3.90	3.9000	3.90	3.90	3.90	3.90	3.90	3.90
3.95	3.95	3.9500	3.95	3.95	3.95	3.95	3.95	3.95
4.00	4.00	4.0000	4.00	4.00	4.00	4.00	4.00	4.00
4.05	4.05	4.0500	4.05	4.05	4.05	4.05	4.05	4.05
4.10	4.10	4.1000	4.10	4.10	4.10	4.10	4.10	4.10
4.15	4.15	4.1500	4.15	4.15	4.15	4.15	4.15	4.15
4.20	4.20	4.2000	4.20	4.20	4.20	4.20	4.20	4.20
4.25	4.25	4.2500	4.25	4.25	4.25	4.25	4.25	4.25
4.30	4.30	4.3000	4.30	4.30	4.30	4.30	4.30	4.30
4.35	4.35	4.3500	4.35	4.35	4.35	4.35	4.35	4.35
4.40	4.40	4.4000	4.40	4.40	4.40	4.40	4.40	4.40
4.45	4.45	4.4500	4.45	4.45	4.45	4.45	4.45	4.45
4.50	4.50	4.5000	4.50	4.50	4.50	4.50	4.50	4.50
4.55	4.55	4.5500	4.55	4.55	4.55	4.55	4.55	4.55
4.60	4.60	4.6000	4.60	4.60	4.60	4.60	4.60	4.60
4.65	4.65	4.6500	4.65	4.65	4.65	4.65	4.65	4.65
4.70	4.70	4.7000	4.70	4.70	4.70	4.70	4.70	4.70
4.75	4.75	4.7500	4.75	4.75	4.75	4.75	4.75	4.75
4.80	4.80	4.8000	4.80	4.80	4.80	4.80	4.80	4.80
4.85	4.85	4.8500	4.85	4.85	4.85	4.85	4.85	4.85
4.90	4.90	4.9000	4.90	4.90	4.90	4.90	4.90	4.90
4.95	4.95	4.9500	4.95	4.95	4.95	4.95	4.95	4.95
5.00	5.00	5.0000	5.00	5.00	5.00	5.00	5.00	5.00

(continued on next page)

# MINIATURE HIGH PERFORMANCE DRILLS

## Aluminum Alloys - Metric (cont.)

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TYPE 1 FLUTE			TYPE 2 FLUTE			TYPE 3 FLUTE		TYPE 4 FLUTE	
DRILL NO.	DRILL DIA.	DRILL LENGTH	DRILL NO.	DRILL DIA.	DRILL LENGTH	DRILL NO.	DRILL DIA.	DRILL NO.	DRILL DIA.
801	3.175 mm	1.000 mm	802	3.175 mm	1.000 mm	803	3.175 mm	804	3.175 mm
805	3.175 mm	1.000 mm	806	3.175 mm	1.000 mm	807	3.175 mm	808	3.175 mm
809	3.175 mm	1.000 mm	810	3.175 mm	1.000 mm	811	3.175 mm	812	3.175 mm
813	3.175 mm	1.000 mm	814	3.175 mm	1.000 mm	815	3.175 mm	816	3.175 mm
817	3.175 mm	1.000 mm	818	3.175 mm	1.000 mm	819	3.175 mm	820	3.175 mm
821	3.175 mm	1.000 mm	822	3.175 mm	1.000 mm	823	3.175 mm	824	3.175 mm
825	3.175 mm	1.000 mm	826	3.175 mm	1.000 mm	827	3.175 mm	828	3.175 mm
831	3.175 mm	1.000 mm	832	3.175 mm	1.000 mm	833	3.175 mm	834	3.175 mm
835	3.175 mm	1.000 mm	836	3.175 mm	1.000 mm	837	3.175 mm	838	3.175 mm
841	3.175 mm	1.000 mm	842	3.175 mm	1.000 mm	843	3.175 mm	844	3.175 mm
845	3.175 mm	1.000 mm	846	3.175 mm	1.000 mm	847	3.175 mm	848	3.175 mm
851	3.175 mm	1.000 mm	852	3.175 mm	1.000 mm	853	3.175 mm	854	3.175 mm
855	3.175 mm	1.000 mm	856	3.175 mm	1.000 mm	857	3.175 mm	858	3.175 mm
861	3.175 mm	1.000 mm	862	3.175 mm	1.000 mm	863	3.175 mm	864	3.175 mm
865	3.175 mm	1.000 mm	866	3.175 mm	1.000 mm	867	3.175 mm	868	3.175 mm
871	3.175 mm	1.000 mm	872	3.175 mm	1.000 mm	873	3.175 mm	874	3.175 mm
875	3.175 mm	1.000 mm	876	3.175 mm	1.000 mm	877	3.175 mm	878	3.175 mm
881	3.175 mm	1.000 mm	882	3.175 mm	1.000 mm	883	3.175 mm	884	3.175 mm
885	3.175 mm	1.000 mm	886	3.175 mm	1.000 mm	887	3.175 mm	888	3.175 mm
891	3.175 mm	1.000 mm	892	3.175 mm	1.000 mm	893	3.175 mm	894	3.175 mm
895	3.175 mm	1.000 mm	896	3.175 mm	1.000 mm	897	3.175 mm	898	3.175 mm
901	3.175 mm	1.000 mm	902	3.175 mm	1.000 mm	903	3.175 mm	904	3.175 mm
905	3.175 mm	1.000 mm	906	3.175 mm	1.000 mm	907	3.175 mm	908	3.175 mm
911	3.175 mm	1.000 mm	912	3.175 mm	1.000 mm	913	3.175 mm	914	3.175 mm
915	3.175 mm	1.000 mm	916	3.175 mm	1.000 mm	917	3.175 mm	918	3.175 mm
921	3.175 mm	1.000 mm	922	3.175 mm	1.000 mm	923	3.175 mm	924	3.175 mm
925	3.175 mm	1.000 mm	926	3.175 mm	1.000 mm	927	3.175 mm	928	3.175 mm
931	3.175 mm	1.000 mm	932	3.175 mm	1.000 mm	933	3.175 mm	934	3.175 mm
935	3.175 mm	1.000 mm	936	3.175 mm	1.000 mm	937	3.175 mm	938	3.175 mm
941	3.175 mm	1.000 mm	942	3.175 mm	1.000 mm	943	3.175 mm	944	3.175 mm
945	3.175 mm	1.000 mm	946	3.175 mm	1.000 mm	947	3.175 mm	948	3.175 mm
951	3.175 mm	1.000 mm	952	3.175 mm	1.000 mm	953	3.175 mm	954	3.175 mm
955	3.175 mm	1.000 mm	956	3.175 mm	1.000 mm	957	3.175 mm	958	3.175 mm
961	3.175 mm	1.000 mm	962	3.175 mm	1.000 mm	963	3.175 mm	964	3.175 mm
965	3.175 mm	1.000 mm	966	3.175 mm	1.000 mm	967	3.175 mm	968	3.175 mm
971	3.175 mm	1.000 mm	972	3.175 mm	1.000 mm	973	3.175 mm	974	3.175 mm
975	3.175 mm	1.000 mm	976	3.175 mm	1.000 mm	977	3.175 mm	978	3.175 mm
981	3.175 mm	1.000 mm	982	3.175 mm	1.000 mm	983	3.175 mm	984	3.175 mm
985	3.175 mm	1.000 mm	986	3.175 mm	1.000 mm	987	3.175 mm	988	3.175 mm
991	3.175 mm	1.000 mm	992	3.175 mm	1.000 mm	993	3.175 mm	994	3.175 mm
995	3.175 mm	1.000 mm	996	3.175 mm	1.000 mm	997	3.175 mm	998	3.175 mm

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# MINIATURE HIGH PERFORMANCE DRILLS

Aluminum Alloy - Metric (cont.)

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DRILL DIAMETER			FLUTE LENGTH			SHAPE NUMBER	STANDARD LENGTH	FINISH	
MM	INCH	MM	MM	INCH	PS			PKG	
Ø 1.000			L 1.000			PS-10	1.000	PS10	
1.00	.039	1.0000	1.00	1.0000	100	4.000	25.000	PS10-100-25	25.00
1.00	.039	1.0000	2.00	2.0000	50	4.000	25.000	PS10-100-50	49.00
1.00	.039	1.0000	3.00	3.0000	30	4.000	25.000	PS10-100-30	30.00
1.00	.039	1.0000	4.00	4.0000	20	4.000	25.000	PS10-100-20	20.00
1.00	.039	1.0000	5.00	5.0000	15	4.000	25.000	PS10-100-15	15.00
1.00	.039	1.0000	6.00	6.0000	10	4.000	25.000	PS10-100-10	10.00
1.00	.039	1.0000	7.00	7.0000	8	4.000	25.000	PS10-100-8	8.00
1.00	.039	1.0000	8.00	8.0000	6	4.000	25.000	PS10-100-6	6.00
1.00	.039	1.0000	9.00	9.0000	5	4.000	25.000	PS10-100-5	5.00
1.00	.039	1.0000	10.00	10.0000	4	4.000	25.000	PS10-100-4	4.00
1.00	.039	1.0000	12.00	12.0000	3	4.000	25.000	PS10-100-3	3.00
1.00	.039	1.0000	15.00	15.0000	2	4.000	25.000	PS10-100-2	2.00
1.00	.039	1.0000	18.00	18.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	20.00	20.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	25.00	25.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	30.00	30.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	35.00	35.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	40.00	40.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	45.00	45.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	50.00	50.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	60.00	60.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	70.00	70.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	80.00	80.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	90.00	90.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	100.00	100.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	120.00	120.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	150.00	150.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	180.00	180.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	200.00	200.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	250.00	250.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	300.00	300.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	350.00	350.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	400.00	400.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	450.00	450.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	500.00	500.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	600.00	600.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	700.00	700.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	800.00	800.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	900.00	900.0000	1	4.000	25.000	PS10-100-1	1.00
1.00	.039	1.0000	1000.00	1000.0000	1	4.000	25.000	PS10-100-1	1.00

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## MINIATURE HIGH PERFORMANCE DRILLS

### Aluminium Alloy – Mattel (cont.)

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DIN 6		DIN 6		DIN 6		DIN 6		DIN 6	
Part	Material	Part	Material	Part	Material	Part	Material	Part	Material
DIN 6		DIN 6		DIN 6		DIN 6		DIN 6	
Part	Material	Part	Material	Part	Material	Part	Material	Part	Material
200	Al 7075	201	Al 7075	202	Al 7075	203	Al 7075	204	Al 7075
205	Al 7075	206	Al 7075	207	Al 7075	208	Al 7075	209	Al 7075
210	Al 7075	211	Al 7075	212	Al 7075	213	Al 7075	214	Al 7075
215	Al 7075	216	Al 7075	217	Al 7075	218	Al 7075	219	Al 7075
220	Al 7075	221	Al 7075	222	Al 7075	223	Al 7075	224	Al 7075
225	Al 7075	226	Al 7075	227	Al 7075	228	Al 7075	229	Al 7075
230	Al 7075	231	Al 7075	232	Al 7075	233	Al 7075	234	Al 7075
235	Al 7075	236	Al 7075	237	Al 7075	238	Al 7075	239	Al 7075
240	Al 7075	241	Al 7075	242	Al 7075	243	Al 7075	244	Al 7075
245	Al 7075	246	Al 7075	247	Al 7075	248	Al 7075	249	Al 7075
250	Al 7075	251	Al 7075	252	Al 7075	253	Al 7075	254	Al 7075
255	Al 7075	256	Al 7075	257	Al 7075	258	Al 7075	259	Al 7075
260	Al 7075	261	Al 7075	262	Al 7075	263	Al 7075	264	Al 7075
265	Al 7075	266	Al 7075	267	Al 7075	268	Al 7075	269	Al 7075
270	Al 7075	271	Al 7075	272	Al 7075	273	Al 7075	274	Al 7075
275	Al 7075	276	Al 7075	277	Al 7075	278	Al 7075	279	Al 7075
280	Al 7075	281	Al 7075	282	Al 7075	283	Al 7075	284	Al 7075
285	Al 7075	286	Al 7075	287	Al 7075	288	Al 7075	289	Al 7075
290	Al 7075	291	Al 7075	292	Al 7075	293	Al 7075	294	Al 7075
295	Al 7075	296	Al 7075	297	Al 7075	298	Al 7075	299	Al 7075
300	Al 7075	301	Al 7075	302	Al 7075	303	Al 7075	304	Al 7075
305	Al 7075	306	Al 7075	307	Al 7075	308	Al 7075	309	Al 7075
310	Al 7075	311	Al 7075	312	Al 7075	313	Al 7075	314	Al 7075
315	Al 7075	316	Al 7075	317	Al 7075	318	Al 7075	319	Al 7075
320	Al 7075	321	Al 7075	322	Al 7075	323	Al 7075	324	Al 7075
325	Al 7075	326	Al 7075	327	Al 7075	328	Al 7075	329	Al 7075
330	Al 7075	331	Al 7075	332	Al 7075	333	Al 7075	334	Al 7075
335	Al 7075	336	Al 7075	337	Al 7075	338	Al 7075	339	Al 7075
340	Al 7075	341	Al 7075	342	Al 7075	343	Al 7075	344	Al 7075
345	Al 7075	346	Al 7075	347	Al 7075	348	Al 7075	349	Al 7075
350	Al 7075	351	Al 7075	352	Al 7075	353	Al 7075	354	Al 7075
355	Al 7075	356	Al 7075	357	Al 7075	358	Al 7075	359	Al 7075
360	Al 7075	361	Al 7075	362	Al 7075	363	Al 7075	364	Al 7075
365	Al 7075	366	Al 7075	367	Al 7075	368	Al 7075	369	Al 7075
370	Al 7075	371	Al 7075	372	Al 7075	373	Al 7075	374	Al 7075
375	Al 7075	376	Al 7075	377	Al 7075	378	Al 7075	379	Al 7075
380	Al 7075	381	Al 7075	382	Al 7075	383	Al 7075	384	Al 7075
385	Al 7075	386	Al 7075	387	Al 7075	388	Al 7075	389	Al 7075
390	Al 7075	391	Al 7075	392	Al 7075	393	Al 7075	394	Al 7075
395	Al 7075	396	Al 7075	397	Al 7075	398	Al 7075	399	Al 7075

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# MINIATURE HIGH PERFORMANCE DRILLS

## Aluminum Alloys – Metric (cont.)

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DRILL IS NUMBER			FLUTE LENGTH			DRILL SHARPER	DRILL LENGTH	DRILL LENGTH	
DRILL NO.	DRILL SIZE	DRILL TYPE	DRILL NO.	DRILL SIZE	DRILL TYPE			A.P.	MM
9473 1.75	1.75mm	1.75	32.00	32.00	32	3.00	75.00	94731215	32.00
9473 2.00	2.00mm	2.00	32.00	32.00	32	3.00	100.00	94731216	32.00
9473 2.25	2.25mm	2.25	32.00	32.00	32	3.00	100.00	94731217	32.00
9473 2.50	2.50mm	2.50	32.00	32.00	32	3.00	100.00	94731218	32.00
9473 2.75	2.75mm	2.75	32.00	32.00	32	3.00	100.00	94731219	32.00
9473 3.00	3.00mm	3.00	32.00	32.00	32	3.00	100.00	94731220	32.00
9473 3.25	3.25mm	3.25	32.00	32.00	32	3.00	100.00	94731221	32.00
9473 3.50	3.50mm	3.50	32.00	32.00	32	3.00	100.00	94731222	32.00
9473 3.75	3.75mm	3.75	32.00	32.00	32	3.00	100.00	94731223	32.00
9473 4.00	4.00mm	4.00	32.00	32.00	32	3.00	100.00	94731224	32.00
9473 4.25	4.25mm	4.25	32.00	32.00	32	3.00	100.00	94731225	32.00
9473 4.50	4.50mm	4.50	32.00	32.00	32	3.00	100.00	94731226	32.00
9473 4.75	4.75mm	4.75	32.00	32.00	32	3.00	100.00	94731227	32.00
9473 5.00	5.00mm	5.00	32.00	32.00	32	3.00	100.00	94731228	32.00
9473 5.25	5.25mm	5.25	32.00	32.00	32	3.00	100.00	94731229	32.00
9473 5.50	5.50mm	5.50	32.00	32.00	32	3.00	100.00	94731230	32.00
9473 5.75	5.75mm	5.75	32.00	32.00	32	3.00	100.00	94731231	32.00
9473 6.00	6.00mm	6.00	32.00	32.00	32	3.00	100.00	94731232	32.00
9473 6.25	6.25mm	6.25	32.00	32.00	32	3.00	100.00	94731233	32.00
9473 6.50	6.50mm	6.50	32.00	32.00	32	3.00	100.00	94731234	32.00
9473 6.75	6.75mm	6.75	32.00	32.00	32	3.00	100.00	94731235	32.00
9473 7.00	7.00mm	7.00	32.00	32.00	32	3.00	100.00	94731236	32.00
9473 7.25	7.25mm	7.25	32.00	32.00	32	3.00	100.00	94731237	32.00
9473 7.50	7.50mm	7.50	32.00	32.00	32	3.00	100.00	94731238	32.00
9473 7.75	7.75mm	7.75	32.00	32.00	32	3.00	100.00	94731239	32.00
9473 8.00	8.00mm	8.00	32.00	32.00	32	3.00	100.00	94731240	32.00
9473 8.25	8.25mm	8.25	32.00	32.00	32	3.00	100.00	94731241	32.00
9473 8.50	8.50mm	8.50	32.00	32.00	32	3.00	100.00	94731242	32.00
9473 8.75	8.75mm	8.75	32.00	32.00	32	3.00	100.00	94731243	32.00
9473 9.00	9.00mm	9.00	32.00	32.00	32	3.00	100.00	94731244	32.00
9473 9.25	9.25mm	9.25	32.00	32.00	32	3.00	100.00	94731245	32.00
9473 9.50	9.50mm	9.50	32.00	32.00	32	3.00	100.00	94731246	32.00
9473 9.75	9.75mm	9.75	32.00	32.00	32	3.00	100.00	94731247	32.00
9473 10.00	10.00mm	10.00	32.00	32.00	32	3.00	100.00	94731248	32.00
9473 10.25	10.25mm	10.25	32.00	32.00	32	3.00	100.00	94731249	32.00
9473 10.50	10.50mm	10.50	32.00	32.00	32	3.00	100.00	94731250	32.00
9473 10.75	10.75mm	10.75	32.00	32.00	32	3.00	100.00	94731251	32.00
9473 11.00	11.00mm	11.00	32.00	32.00	32	3.00	100.00	94731252	32.00
9473 11.25	11.25mm	11.25	32.00	32.00	32	3.00	100.00	94731253	32.00
9473 11.50	11.50mm	11.50	32.00	32.00	32	3.00	100.00	94731254	32.00
9473 11.75	11.75mm	11.75	32.00	32.00	32	3.00	100.00	94731255	32.00
9473 12.00	12.00mm	12.00	32.00	32.00	32	3.00	100.00	94731256	32.00
9473 12.25	12.25mm	12.25	32.00	32.00	32	3.00	100.00	94731257	32.00
9473 12.50	12.50mm	12.50	32.00	32.00	32	3.00	100.00	94731258	32.00
9473 12.75	12.75mm	12.75	32.00	32.00	32	3.00	100.00	94731259	32.00
9473 13.00	13.00mm	13.00	32.00	32.00	32	3.00	100.00	94731260	32.00
9473 13.25	13.25mm	13.25	32.00	32.00	32	3.00	100.00	94731261	32.00
9473 13.50	13.50mm	13.50	32.00	32.00	32	3.00	100.00	94731262	32.00
9473 13.75	13.75mm	13.75	32.00	32.00	32	3.00	100.00	94731263	32.00
9473 14.00	14.00mm	14.00	32.00	32.00	32	3.00	100.00	94731264	32.00
9473 14.25	14.25mm	14.25	32.00	32.00	32	3.00	100.00	94731265	32.00
9473 14.50	14.50mm	14.50	32.00	32.00	32	3.00	100.00	94731266	32.00
9473 14.75	14.75mm	14.75	32.00	32.00	32	3.00	100.00	94731267	32.00
9473 15.00	15.00mm	15.00	32.00	32.00	32	3.00	100.00	94731268	32.00
9473 15.25	15.25mm	15.25	32.00	32.00	32	3.00	100.00	94731269	32.00
9473 15.50	15.50mm	15.50	32.00	32.00	32	3.00	100.00	94731270	32.00
9473 15.75	15.75mm	15.75	32.00	32.00	32	3.00	100.00	94731271	32.00
9473 16.00	16.00mm	16.00	32.00	32.00	32	3.00	100.00	94731272	32.00
9473 16.25	16.25mm	16.25	32.00	32.00	32	3.00	100.00	94731273	32.00
9473 16.50	16.50mm	16.50	32.00	32.00	32	3.00	100.00	94731274	32.00
9473 16.75	16.75mm	16.75	32.00	32.00	32	3.00	100.00	94731275	32.00
9473 17.00	17.00mm	17.00	32.00	32.00	32	3.00	100.00	94731276	32.00
9473 17.25	17.25mm	17.25	32.00	32.00	32	3.00	100.00	94731277	32.00
9473 17.50	17.50mm	17.50	32.00	32.00	32	3.00	100.00	94731278	32.00
9473 17.75	17.75mm	17.75	32.00	32.00	32	3.00	100.00	94731279	32.00
9473 18.00	18.00mm	18.00	32.00	32.00	32	3.00	100.00	94731280	32.00
9473 18.25	18.25mm	18.25	32.00	32.00	32	3.00	100.00	94731281	32.00
9473 18.50	18.50mm	18.50	32.00	32.00	32	3.00	100.00	94731282	32.00
9473 18.75	18.75mm	18.75	32.00	32.00	32	3.00	100.00	94731283	32.00
9473 19.00	19.00mm	19.00	32.00	32.00	32	3.00	100.00	94731284	32.00
9473 19.25	19.25mm	19.25	32.00	32.00	32	3.00	100.00	94731285	32.00
9473 19.50	19.50mm	19.50	32.00	32.00	32	3.00	100.00	94731286	32.00
9473 19.75	19.75mm	19.75	32.00	32.00	32	3.00	100.00	94731287	32.00
9473 20.00	20.00mm	20.00	32.00	32.00	32	3.00	100.00	94731288	32.00

**PLEASE SEE STEPS & TIPS ON PAGE 408**

## MINIATURE HIGH PERFORMANCE DRILLS

Aluminum Alloys – Metric (mm)

**SPS25 & SPS15 Miniature High Performance Drills – Aluminum Alloys – Metric**

Material (Aluminum Alloys)		DIN	High Speed Steel For Maximum Speed & Life											
			SPS25	SPS15	SPS25	SPS15	SPS25	SPS15	SPS25	SPS15	SPS25	SPS15	SPS25	SPS15
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		1.5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		2.0	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		2.5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		3.0	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		3.5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		4.0	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		4.5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		5.0	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		5.5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		6.0	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		6.5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		7.0	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		7.5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		8.0	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		8.5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		9.0	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		9.5	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Aluminum Alloys: 6061-T6, 6063-T5, 7075-T6		10.0	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	



### Check Out Our New CNC Show!

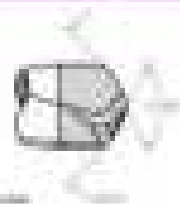
Join us on the Performance Company National Applications Engineer Day event as we show you specific cutting tool topics, answering the questions manufacturers have, to help you increase production at the spindle.

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



## MINIATURE HIGH PERFORMANCE DRILLS

PCD Diamond - Double Angle - Metric



- PCD diamond coated for better and stiffer cutting edge (only when an increased tool life is required)
- Flat PCD to allow for positive cutting geometry
- Double angle point geometry for superior performance in penetrating ductile and brittle materials in general
- Flank磨面 and zero degree aluminum, copper, brass, bronze, cast iron, graphite, carbon, carbon fiber materials, green cast iron, cast steel, magnesium, zinc, green cast steel
- 60 degree clearance for high pressure tool forces

DRILL LENGTH		FLUTE LENGTH		SHANK DIAMETER	OVERALL LENGTH	TOOL WEIGHT	
mm	inch	mm	inch			g	oz
<b>DRILL LENGTH</b>		<b>FLUTE LENGTH</b>		<b>Diameter</b>	<b>L</b>	<b>g</b>	<b>oz</b>
100 (3.937)	3.937 inch	100 (3.937)	100 (3.937)	1.0 mm	33 mm	0.025000	0.8820
150 (5.906)	5.906 inch	150 (5.906)	150 (5.906)	1.5 mm	42 mm	0.071250	2.5180
<b>DRILL LENGTH</b>		<b>FLUTE LENGTH</b>		<b>Diameter</b>	<b>L</b>	<b>g</b>	<b>oz</b>
125 (4.921)	4.921 inch	125 (4.921)	125 (4.921)	1.2 mm	35 mm	0.037500	1.3200
150 (5.906)	5.906 inch	150 (5.906)	150 (5.906)	1.5 mm	42 mm	0.071250	2.5180
175 (6.889)	6.889 inch	175 (6.889)	175 (6.889)	1.7 mm	45 mm	0.097500	3.4500
200 (7.874)	7.874 inch	200 (7.874)	200 (7.874)	2.0 mm	48 mm	0.135000	4.7700
225 (8.858)	8.858 inch	225 (8.858)	225 (8.858)	2.2 mm	51 mm	0.172500	6.0900
250 (9.843)	9.843 inch	250 (9.843)	250 (9.843)	2.5 mm	54 mm	0.210000	7.4100
275 (10.827)	10.827 inch	275 (10.827)	275 (10.827)	2.7 mm	57 mm	0.247500	8.7300
300 (11.811)	11.811 inch	300 (11.811)	300 (11.811)	3.0 mm	60 mm	0.285000	10.0500
325 (12.796)	12.796 inch	325 (12.796)	325 (12.796)	3.2 mm	63 mm	0.322500	11.3700

For PCD End Mills, see pages 210 and 216.

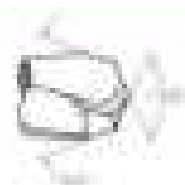
### COOLING & LUBRICATION: Miniature High Performance Drills - PCD Diamond - Metric

**Important Note:** Selection of fluids are a critical and essential part of tool selection. Select the cooling and lubrication fluids based on the drill. The general OEM recommendation is to use a synthetic fluid. For additional information on fluids, visit our website at [www.harsco.com](http://www.harsco.com). Always use the correct concentration of coolant and use the correct type of coolant. The correct type of coolant is for Harsco's drill tools. Additional parts of COOLING & LUBRICATION: Miniature High Performance Drills - PCD Diamond - Metric are available. Visit our website at [www.harsco.com](http://www.harsco.com) for more information. The correct fluid and concentration are critical to the tool's performance and life. Visit our website at [www.harsco.com](http://www.harsco.com) for more information.

Model	Type	Material	DIA	Tool Length (mm)				
				100	150	200	250	300
100 (3.937)	PCD Diamond	Aluminum, Copper, Brass, Bronze, Cast Iron, Graphite, Carbon, Carbon Fiber, Magnesium, Zinc, Green Cast Steel	1.0	33	33	33	33	33
150 (5.906)	PCD Diamond	Aluminum, Copper, Brass, Bronze, Cast Iron, Graphite, Carbon, Carbon Fiber, Magnesium, Zinc, Green Cast Steel	1.5	42	42	42	42	42
125 (4.921)	PCD Diamond	Aluminum, Copper, Brass, Bronze, Cast Iron, Graphite, Carbon, Carbon Fiber, Magnesium, Zinc, Green Cast Steel	1.2	35	35	35	35	35
150 (5.906)	PCD Diamond	Aluminum, Copper, Brass, Bronze, Cast Iron, Graphite, Carbon, Carbon Fiber, Magnesium, Zinc, Green Cast Steel	1.5	42	42	42	42	42
175 (6.889)	PCD Diamond	Aluminum, Copper, Brass, Bronze, Cast Iron, Graphite, Carbon, Carbon Fiber, Magnesium, Zinc, Green Cast Steel	1.7	45	45	45	45	45
200 (7.874)	PCD Diamond	Aluminum, Copper, Brass, Bronze, Cast Iron, Graphite, Carbon, Carbon Fiber, Magnesium, Zinc, Green Cast Steel	2.0	48	48	48	48	48
225 (8.858)	PCD Diamond	Aluminum, Copper, Brass, Bronze, Cast Iron, Graphite, Carbon, Carbon Fiber, Magnesium, Zinc, Green Cast Steel	2.2	51	51	51	51	51
250 (9.843)	PCD Diamond	Aluminum, Copper, Brass, Bronze, Cast Iron, Graphite, Carbon, Carbon Fiber, Magnesium, Zinc, Green Cast Steel	2.5	54	54	54	54	54
275 (10.827)	PCD Diamond	Aluminum, Copper, Brass, Bronze, Cast Iron, Graphite, Carbon, Carbon Fiber, Magnesium, Zinc, Green Cast Steel	2.7	57	57	57	57	57
300 (11.811)	PCD Diamond	Aluminum, Copper, Brass, Bronze, Cast Iron, Graphite, Carbon, Carbon Fiber, Magnesium, Zinc, Green Cast Steel	3.0	60	60	60	60	60
325 (12.796)	PCD Diamond	Aluminum, Copper, Brass, Bronze, Cast Iron, Graphite, Carbon, Carbon Fiber, Magnesium, Zinc, Green Cast Steel	3.2	63	63	63	63	63

## MINIATURE HIGH PERFORMANCE DRILLS

Composites - Double Flute - Metric



- Optimized for drilling typical composites with excellent performance in edge drilling and other composite materials
- Double edge zero geometry for superior performance in precision post-drill and deburring of layered composites
- An advanced demand coating for increased lifespan resistance
- All shank diameters for full precision tool delivery
- Solid coolant
- CNC ground in the USA



Double Edge Zero  
Geometry Precision  
Tooling

DRILL DIAMETER		DRILL LENGTH	FLUTE LENGTH		SHANK DIAMETER	TOTAL LENGTH	MATERIALS OF USE	
mm	inch		mm	inch			FR-1	FR-2
0.25 (0.010)		75 mm	0.1	0.004 inch	0.25	85 mm	FR-1/FR-2	FR-1
0.30		80 mm	0.1	0.004 inch	0.30	90 mm	FR-1/FR-2	FR-1
0.35	0.014	85 mm	0.1	0.004 inch	0.35	95 mm	FR-1/FR-2	FR-1
0.40	0.016	90 mm	0.1	0.004 inch	0.40	100 mm	FR-1/FR-2	FR-1
0.45	0.018	95 mm	0.1	0.004 inch	0.45	105 mm	FR-1/FR-2	FR-1
0.50	0.020	100 mm	0.1	0.004 inch	0.50	110 mm	FR-1/FR-2	FR-1
0.55	0.022	105 mm	0.1	0.004 inch	0.55	115 mm	FR-1/FR-2	FR-1
0.60	0.024	110 mm	0.1	0.004 inch	0.60	120 mm	FR-1/FR-2	FR-1
0.65	0.026	115 mm	0.1	0.004 inch	0.65	125 mm	FR-1/FR-2	FR-1
0.70	0.028	120 mm	0.1	0.004 inch	0.70	130 mm	FR-1/FR-2	FR-1
0.75	0.030	125 mm	0.1	0.004 inch	0.75	135 mm	FR-1/FR-2	FR-1
0.80	0.032	130 mm	0.1	0.004 inch	0.80	140 mm	FR-1/FR-2	FR-1
0.85	0.034	135 mm	0.1	0.004 inch	0.85	145 mm	FR-1/FR-2	FR-1
0.90	0.036	140 mm	0.1	0.004 inch	0.90	150 mm	FR-1/FR-2	FR-1
0.95	0.038	145 mm	0.1	0.004 inch	0.95	155 mm	FR-1/FR-2	FR-1
1.00	0.040	150 mm	0.1	0.004 inch	1.00	160 mm	FR-1/FR-2	FR-1
1.10	0.044	160 mm	0.1	0.004 inch	1.10	170 mm	FR-1/FR-2	FR-1
1.20	0.048	170 mm	0.1	0.004 inch	1.20	180 mm	FR-1/FR-2	FR-1
1.30	0.052	180 mm	0.1	0.004 inch	1.30	190 mm	FR-1/FR-2	FR-1
1.40	0.056	190 mm	0.1	0.004 inch	1.40	200 mm	FR-1/FR-2	FR-1
1.50	0.060	200 mm	0.1	0.004 inch	1.50	210 mm	FR-1/FR-2	FR-1
1.60	0.064	210 mm	0.1	0.004 inch	1.60	220 mm	FR-1/FR-2	FR-1
1.70	0.068	220 mm	0.1	0.004 inch	1.70	230 mm	FR-1/FR-2	FR-1
1.80	0.072	230 mm	0.1	0.004 inch	1.80	240 mm	FR-1/FR-2	FR-1
1.90	0.076	240 mm	0.1	0.004 inch	1.90	250 mm	FR-1/FR-2	FR-1
2.00	0.080	250 mm	0.1	0.004 inch	2.00	260 mm	FR-1/FR-2	FR-1
2.20	0.088	270 mm	0.1	0.004 inch	2.20	280 mm	FR-1/FR-2	FR-1
2.40	0.096	290 mm	0.1	0.004 inch	2.40	300 mm	FR-1/FR-2	FR-1
2.60	0.104	310 mm	0.1	0.004 inch	2.60	320 mm	FR-1/FR-2	FR-1
2.80	0.112	330 mm	0.1	0.004 inch	2.80	340 mm	FR-1/FR-2	FR-1
3.00	0.120	350 mm	0.1	0.004 inch	3.00	360 mm	FR-1/FR-2	FR-1

continued on next page

## MINIATURE HIGH PERFORMANCE DRILLS

Composites - Double Flute - Metric (cont.)

continued from previous page

DRILL SHANKS			DRILL LENGTH			DRILL DIAMETER		DRILL LENGTH		RECOMMENDED SPEED	
mm	inch	mm	mm	inch	mm	mm	inch	mm	inch	rpm	m/min
<b>D-11002</b>			<b>L-11002</b>			<b>D-11002</b>		<b>L-11002</b>		<b>rpm</b> <b>m/min</b>	
10	3/8"	110	10	3/8"	110	10	3/8"	110	3/8"	11000	110
12	1/2"	120	12	1/2"	120	12	1/2"	120	1/2"	12000	120
14	9/16"	140	14	9/16"	140	14	9/16"	140	9/16"	14000	140
16	5/8"	160	16	5/8"	160	16	5/8"	160	5/8"	16000	160
18	3/4"	180	18	3/4"	180	18	3/4"	180	3/4"	18000	180
20	7/8"	200	20	7/8"	200	20	7/8"	200	7/8"	20000	200
22	1"	220	22	1"	220	22	1"	220	1"	22000	220
24	1 1/8"	240	24	1 1/8"	240	24	1 1/8"	240	1 1/8"	24000	240
26	1 1/4"	260	26	1 1/4"	260	26	1 1/4"	260	1 1/4"	26000	260
28	1 1/2"	280	28	1 1/2"	280	28	1 1/2"	280	1 1/2"	28000	280
30	1 1/4"	300	30	1 1/4"	300	30	1 1/4"	300	1 1/4"	30000	300
32	1 1/2"	320	32	1 1/2"	320	32	1 1/2"	320	1 1/2"	32000	320
35	1 3/8"	350	35	1 3/8"	350	35	1 3/8"	350	1 3/8"	35000	350
38	1 5/8"	380	38	1 5/8"	380	38	1 5/8"	380	1 5/8"	38000	380
40	1 5/8"	400	40	1 5/8"	400	40	1 5/8"	400	1 5/8"	40000	400
42	1 7/8"	420	42	1 7/8"	420	42	1 7/8"	420	1 7/8"	42000	420
45	1 7/8"	450	45	1 7/8"	450	45	1 7/8"	450	1 7/8"	45000	450
48	1 9/16"	480	48	1 9/16"	480	48	1 9/16"	480	1 9/16"	48000	480
50	1 7/8"	500	50	1 7/8"	500	50	1 7/8"	500	1 7/8"	50000	500
55	2 1/8"	550	55	2 1/8"	550	55	2 1/8"	550	2 1/8"	55000	550
60	2 3/8"	600	60	2 3/8"	600	60	2 3/8"	600	2 3/8"	60000	600
65	2 5/8"	650	65	2 5/8"	650	65	2 5/8"	650	2 5/8"	65000	650
70	2 7/8"	700	70	2 7/8"	700	70	2 7/8"	700	2 7/8"	70000	700
75	3"	750	75	3"	750	75	3"	750	3"	75000	750
80	3 1/4"	800	80	3 1/4"	800	80	3 1/4"	800	3 1/4"	80000	800
85	3 3/8"	850	85	3 3/8"	850	85	3 3/8"	850	3 3/8"	85000	850
90	3 1/2"	900	90	3 1/2"	900	90	3 1/2"	900	3 1/2"	90000	900
95	3 7/8"	950	95	3 7/8"	950	95	3 7/8"	950	3 7/8"	95000	950
100	4"	1000	100	4"	1000	100	4"	1000	4"	100000	1000

continued on next page

## MINIATURE HIGH PERFORMANCE DRILLS

Composites - Double Angle - Metric (cont.)

continued from previous page

ITEM NUMBER	DRILL DIAMETER		DRILL LENGTH			DRILL NUMBER	ITEM CODE	APPROXIMATE QUANTITY PER BOX	
	mm	inch	mm	inch	mm depth			#1	#2
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000
250000000	3.00000	0.1181	1.00	0.0394	00	1.000	7000	100000000	4000

## SIZES & SPEEDS: Miniature High Performance Drills - Composites - Metric

Standard Note: For additional information regarding our products visit our website [www.nsk.com](http://www.nsk.com) or contact us at 800-527-0030. These specifications conform to the standards of ISO 5350 and industry standards. All dimensions shown in this catalog are for reference only. For more detailed information, please refer to the relevant standards and specifications. The data and dimensions shown are for reference only. We reserve the right to change the specifications and dimensions without notice. All dimensions are in millimeters unless otherwise specified.

ITEM NUMBER	DRILL DIAMETER (mm)	DRILL LENGTH (mm)	DRILL NUMBER	RECOMMENDED SPEEDS (RPM)											
				#1	#2	#3	#4	#5	#6	#7	#8	#9	#10		
250000000	3.00000	1.00000	1.000	1500	1000	750	600	500	450	400	350	300	250	200	
250000000	3.00000	1.00000	1.000	1500	1000	750	600	500	450	400	350	300	250	200	
250000000	3.00000	1.00000	1.000	1500	1000	750	600	500	450	400	350	300	250	200	
250000000	3.00000	1.00000	1.000	1500	1000	750	600	500	450	400	350	300	250	200	
250000000	3.00000	1.00000	1.000	1500	1000	750	600	500	450	400	350	300	250	200	
250000000	3.00000	1.00000	1.000	1500	1000	750	600	500	450	400	350	300	250	200	
250000000	3.00000	1.00000	1.000	1500	1000	750	600	500	450	400	350	300	250	200	
250000000	3.00000	1.00000	1.000	1500	1000	750	600	500	450	400	350	300	250	200	
250000000	3.00000	1.00000	1.000	1500	1000	750	600	500	450	400	350	300	250	200	
250000000	3.00000	1.00000	1.000	1500	1000	750	600	500	450	400	350	300	250	200	

## MINIATURE HIGH PERFORMANCE DRILLS

Composite - Brad Point - Metric



- Optimized for drilling glass or carbon fiber that are reinforced composites with excellent performance in other steel, titanium, and exotic composite materials.
- Features the ISO drill point geometry for accurate drilling without excessive fluting, axial force, and run-out.
- Through-hole drilling using for increased vibration resistance.
- All sizes conform to high precision tool standards.
- Solid carbide - CBN ground to the point.



Drill Point Protects Flutes & The Bit

DRILL DIAMETER			FLUTE LENGTH			SHANK DIAMETER		TOTAL LENGTH		MATERIALS LISTED	
mm	inch	mm	mm	inch	mm	mm	mm	inch	Al	Steel	
0.5 (0.0197)			75 mm	3.0	0.1181	0.5	75.0	2.95	0.1161	Aluminum 6061	1018
0.75 (0.0295)			100 mm	3.0	0.1181	0.75	100.0	2.95	0.1161	Aluminum 6061	1018
1.0 (0.0394)			125 mm	3.0	0.1181	1.0	125.0	2.95	0.1161	Aluminum 6061	1018
1.25 (0.0492)			150 mm	3.0	0.1181	1.25	150.0	2.95	0.1161	Aluminum 6061	1018
1.5 (0.0591)			175 mm	3.0	0.1181	1.5	175.0	2.95	0.1161	Aluminum 6061	1018
1.75 (0.0689)			200 mm	3.0	0.1181	1.75	200.0	2.95	0.1161	Aluminum 6061	1018
2.0 (0.0787)			225 mm	3.0	0.1181	2.0	225.0	2.95	0.1161	Aluminum 6061	1018
2.25 (0.0885)			250 mm	3.0	0.1181	2.25	250.0	2.95	0.1161	Aluminum 6061	1018
2.5 (0.0984)			275 mm	3.0	0.1181	2.5	275.0	2.95	0.1161	Aluminum 6061	1018
2.75 (0.1082)			300 mm	3.0	0.1181	2.75	300.0	2.95	0.1161	Aluminum 6061	1018
3.0 (0.1181)			325 mm	3.0	0.1181	3.0	325.0	2.95	0.1161	Aluminum 6061	1018
3.25 (0.1279)			350 mm	3.0	0.1181	3.25	350.0	2.95	0.1161	Aluminum 6061	1018
3.5 (0.1378)			375 mm	3.0	0.1181	3.5	375.0	2.95	0.1161	Aluminum 6061	1018
3.75 (0.1476)			400 mm	3.0	0.1181	3.75	400.0	2.95	0.1161	Aluminum 6061	1018
4.0 (0.1575)			425 mm	3.0	0.1181	4.0	425.0	2.95	0.1161	Aluminum 6061	1018
4.25 (0.1673)			450 mm	3.0	0.1181	4.25	450.0	2.95	0.1161	Aluminum 6061	1018
4.5 (0.1772)			475 mm	3.0	0.1181	4.5	475.0	2.95	0.1161	Aluminum 6061	1018
4.75 (0.1870)			500 mm	3.0	0.1181	4.75	500.0	2.95	0.1161	Aluminum 6061	1018
5.0 (0.1969)			525 mm	3.0	0.1181	5.0	525.0	2.95	0.1161	Aluminum 6061	1018
5.25 (0.2067)			550 mm	3.0	0.1181	5.25	550.0	2.95	0.1161	Aluminum 6061	1018
5.5 (0.2166)			575 mm	3.0	0.1181	5.5	575.0	2.95	0.1161	Aluminum 6061	1018
5.75 (0.2264)			600 mm	3.0	0.1181	5.75	600.0	2.95	0.1161	Aluminum 6061	1018
6.0 (0.2362)			625 mm	3.0	0.1181	6.0	625.0	2.95	0.1161	Aluminum 6061	1018
6.25 (0.2461)			650 mm	3.0	0.1181	6.25	650.0	2.95	0.1161	Aluminum 6061	1018
6.5 (0.2559)			675 mm	3.0	0.1181	6.5	675.0	2.95	0.1161	Aluminum 6061	1018
6.75 (0.2658)			700 mm	3.0	0.1181	6.75	700.0	2.95	0.1161	Aluminum 6061	1018
7.0 (0.2756)			725 mm	3.0	0.1181	7.0	725.0	2.95	0.1161	Aluminum 6061	1018
7.25 (0.2854)			750 mm	3.0	0.1181	7.25	750.0	2.95	0.1161	Aluminum 6061	1018
7.5 (0.2953)			775 mm	3.0	0.1181	7.5	775.0	2.95	0.1161	Aluminum 6061	1018
7.75 (0.3051)			800 mm	3.0	0.1181	7.75	800.0	2.95	0.1161	Aluminum 6061	1018
8.0 (0.3150)			825 mm	3.0	0.1181	8.0	825.0	2.95	0.1161	Aluminum 6061	1018
8.25 (0.3248)			850 mm	3.0	0.1181	8.25	850.0	2.95	0.1161	Aluminum 6061	1018
8.5 (0.3347)			875 mm	3.0	0.1181	8.5	875.0	2.95	0.1161	Aluminum 6061	1018
8.75 (0.3445)			900 mm	3.0	0.1181	8.75	900.0	2.95	0.1161	Aluminum 6061	1018
9.0 (0.3544)			925 mm	3.0	0.1181	9.0	925.0	2.95	0.1161	Aluminum 6061	1018
9.25 (0.3642)			950 mm	3.0	0.1181	9.25	950.0	2.95	0.1161	Aluminum 6061	1018
9.5 (0.3741)			975 mm	3.0	0.1181	9.5	975.0	2.95	0.1161	Aluminum 6061	1018
9.75 (0.3839)			1000 mm	3.0	0.1181	9.75	1000.0	2.95	0.1161	Aluminum 6061	1018

Continued on next page

## MINIATURE HIGH PERFORMANCE DRILLS

Composites – Brad Point – Metric (cont.)

continued from previous page

JOB	DRILL DIAMETER		DRILL LENGTH		DRILL NUMBER	TOTAL LENGTH	AVERAGE VELOCITY	
	MM	INCH	MM	INCH			FPM	M/S
	<b>0.1250</b>		<b>1.0000</b>		<b>25-100</b>	<b>1.0000</b>		
001	0.125	1.0000	0.1	1.0000	100	0.1000	0.0000	10000
002	0.125	1.0000	0.2	1.0000	100	0.2000	0.0000	10000
003	0.125	1.0000	0.3	1.0000	100	0.3000	0.0000	10000
004	0.125	1.0000	0.4	1.0000	100	0.4000	0.0000	10000
005	0.125	1.0000	0.5	1.0000	100	0.5000	0.0000	10000
006	0.125	1.0000	0.6	1.0000	100	0.6000	0.0000	10000
007	0.125	1.0000	0.7	1.0000	100	0.7000	0.0000	10000
008	0.125	1.0000	0.8	1.0000	100	0.8000	0.0000	10000
009	0.125	1.0000	0.9	1.0000	100	0.9000	0.0000	10000
010	0.125	1.0000	1.0	1.0000	100	1.0000	0.0000	10000
011	0.125	1.0000	0.1	1.0000	200	0.1000	0.0000	10000
012	0.125	1.0000	0.2	1.0000	200	0.2000	0.0000	10000
013	0.125	1.0000	0.3	1.0000	200	0.3000	0.0000	10000
014	0.125	1.0000	0.4	1.0000	200	0.4000	0.0000	10000
015	0.125	1.0000	0.5	1.0000	200	0.5000	0.0000	10000
016	0.125	1.0000	0.6	1.0000	200	0.6000	0.0000	10000
017	0.125	1.0000	0.7	1.0000	200	0.7000	0.0000	10000
018	0.125	1.0000	0.8	1.0000	200	0.8000	0.0000	10000
019	0.125	1.0000	0.9	1.0000	200	0.9000	0.0000	10000
020	0.125	1.0000	1.0	1.0000	200	1.0000	0.0000	10000
021	0.125	1.0000	0.1	1.0000	300	0.1000	0.0000	10000
022	0.125	1.0000	0.2	1.0000	300	0.2000	0.0000	10000
023	0.125	1.0000	0.3	1.0000	300	0.3000	0.0000	10000
024	0.125	1.0000	0.4	1.0000	300	0.4000	0.0000	10000
025	0.125	1.0000	0.5	1.0000	300	0.5000	0.0000	10000
026	0.125	1.0000	0.6	1.0000	300	0.6000	0.0000	10000
027	0.125	1.0000	0.7	1.0000	300	0.7000	0.0000	10000
028	0.125	1.0000	0.8	1.0000	300	0.8000	0.0000	10000
029	0.125	1.0000	0.9	1.0000	300	0.9000	0.0000	10000
030	0.125	1.0000	1.0	1.0000	300	1.0000	0.0000	10000
031	0.125	1.0000	0.1	1.0000	400	0.1000	0.0000	10000
032	0.125	1.0000	0.2	1.0000	400	0.2000	0.0000	10000
033	0.125	1.0000	0.3	1.0000	400	0.3000	0.0000	10000
034	0.125	1.0000	0.4	1.0000	400	0.4000	0.0000	10000
035	0.125	1.0000	0.5	1.0000	400	0.5000	0.0000	10000
036	0.125	1.0000	0.6	1.0000	400	0.6000	0.0000	10000
037	0.125	1.0000	0.7	1.0000	400	0.7000	0.0000	10000
038	0.125	1.0000	0.8	1.0000	400	0.8000	0.0000	10000
039	0.125	1.0000	0.9	1.0000	400	0.9000	0.0000	10000
040	0.125	1.0000	1.0	1.0000	400	1.0000	0.0000	10000

PLEASE SEE SPEEDS &amp; FEEDS IN PAGE 400

# MINIATURE HIGH PERFORMANCE DRILLS

## Flat Bottom - Matrix



Ideal for Flatness & Rounded Surfaces

- Flat bottom design (no point angle and no chisel) allows for drilling on irregular surfaces and reduced burrs for great strength
- Ideal for drilling on flat and rounded surfaces, creating flat bottom holes. Ideal drilling for angled holes, and drilling aluminium alloys, cast alloys, stainless, or heat alloys
- Flat bottom design for high accurate hole location
- Solid carbide
- DMC proven to the left



Flat Bottom Design & No Chisel allows for drilling on irregular surfaces

DRILL SIZE (mm)			DRILL LENGTH (mm)			DRILL WEIGHT (g)		DRILL LENGTH (mm)		DRILL WEIGHT (g)	
DIN	ISO	DRILL	DIN	ISO	DRILL	DIN	ISO	DIN	ISO	DIN	ISO
<b>DRILL LENGTH 100mm</b>											
0.6	0.6	100	1.2	1.2	100	0.4	0.4	0.6	0.6	100	0.4
0.8	0.8	100	1.5	1.5	100	0.5	0.5	0.8	0.8	100	0.5
1.0	1.0	100	1.8	1.8	100	0.6	0.6	1.0	1.0	100	0.6
1.2	1.2	100	2.1	2.1	100	0.7	0.7	1.2	1.2	100	0.7
1.5	1.5	100	2.5	2.5	100	0.8	0.8	1.5	1.5	100	0.8
2.0	2.0	100	3.1	3.1	100	1.0	1.0	2.0	2.0	100	1.0
2.5	2.5	100	3.7	3.7	100	1.2	1.2	2.5	2.5	100	1.2
3.0	3.0	100	4.2	4.2	100	1.4	1.4	3.0	3.0	100	1.4
3.5	3.5	100	4.7	4.7	100	1.6	1.6	3.5	3.5	100	1.6
4.0	4.0	100	5.2	5.2	100	1.8	1.8	4.0	4.0	100	1.8
5.0	5.0	100	6.3	6.3	100	2.2	2.2	5.0	5.0	100	2.2
6.0	6.0	100	7.4	7.4	100	2.6	2.6	6.0	6.0	100	2.6
7.0	7.0	100	8.4	8.4	100	3.0	3.0	7.0	7.0	100	3.0
8.0	8.0	100	9.4	9.4	100	3.4	3.4	8.0	8.0	100	3.4
10.0	10.0	100	11.4	11.4	100	4.1	4.1	10.0	10.0	100	4.1
12.0	12.0	100	13.4	13.4	100	4.8	4.8	12.0	12.0	100	4.8
15.0	15.0	100	16.4	16.4	100	5.9	5.9	15.0	15.0	100	5.9
20.0	20.0	100	21.4	21.4	100	7.6	7.6	20.0	20.0	100	7.6
25.0	25.0	100	26.4	26.4	100	9.2	9.2	25.0	25.0	100	9.2
30.0	30.0	100	31.4	31.4	100	10.8	10.8	30.0	30.0	100	10.8
35.0	35.0	100	36.4	36.4	100	12.4	12.4	35.0	35.0	100	12.4
40.0	40.0	100	41.4	41.4	100	14.0	14.0	40.0	40.0	100	14.0
<b>DRILL LENGTH 150mm</b>											
0.6	0.6	150	1.5	1.5	150	0.6	0.6	0.6	0.6	150	0.6
0.8	0.8	150	1.8	1.8	150	0.7	0.7	0.8	0.8	150	0.7
1.0	1.0	150	2.1	2.1	150	0.8	0.8	1.0	1.0	150	0.8
1.2	1.2	150	2.4	2.4	150	0.9	0.9	1.2	1.2	150	0.9
1.5	1.5	150	2.8	2.8	150	1.1	1.1	1.5	1.5	150	1.1
2.0	2.0	150	3.4	3.4	150	1.3	1.3	2.0	2.0	150	1.3
2.5	2.5	150	4.0	4.0	150	1.5	1.5	2.5	2.5	150	1.5
3.0	3.0	150	4.6	4.6	150	1.7	1.7	3.0	3.0	150	1.7
3.5	3.5	150	5.2	5.2	150	1.9	1.9	3.5	3.5	150	1.9
4.0	4.0	150	5.8	5.8	150	2.1	2.1	4.0	4.0	150	2.1
5.0	5.0	150	6.9	6.9	150	2.5	2.5	5.0	5.0	150	2.5
6.0	6.0	150	8.0	8.0	150	2.9	2.9	6.0	6.0	150	2.9
7.0	7.0	150	9.1	9.1	150	3.3	3.3	7.0	7.0	150	3.3
8.0	8.0	150	10.2	10.2	150	3.7	3.7	8.0	8.0	150	3.7
10.0	10.0	150	12.2	12.2	150	4.4	4.4	10.0	10.0	150	4.4
12.0	12.0	150	14.2	14.2	150	5.1	5.1	12.0	12.0	150	5.1
15.0	15.0	150	17.2	17.2	150	6.2	6.2	15.0	15.0	150	6.2
20.0	20.0	150	22.2	22.2	150	7.8	7.8	20.0	20.0	150	7.8
25.0	25.0	150	27.2	27.2	150	9.4	9.4	25.0	25.0	150	9.4
30.0	30.0	150	32.2	32.2	150	11.0	11.0	30.0	30.0	150	11.0
35.0	35.0	150	37.2	37.2	150	12.6	12.6	35.0	35.0	150	12.6
40.0	40.0	150	42.2	42.2	150	14.2	14.2	40.0	40.0	150	14.2

continued on next page







## MINIATURE HIGH PERFORMANCE DRILLS

Deep Hole - Constant-Through - Metric



Available in  
10 & 15x Flute  
Lengths

- 20° point angle
- Double-flute design for improved chip removal and tool reduction at the drill tip
- 110° point angle
- Specialized flute design for improved chip evacuation and maximum rigidity
- 14 Magn operable for high pressure tool holders
- 40° chamfer for improved stability and tool life
- DMC grade in Germany
- 5000 cycles



Double-flute design for maximum rigidity

DRILL DIAMETER			DRILL LENGTH			GRADE IN JACOBS	DRILL LENGTH	DRILL WEIGHT	
mm	inch	mm	mm	inch	g			oz	
Ø1.0 - Ø1.5			L100 - L150			D100	100	0.0000	0.0000
1.00	0.0394	100	100	3.94	0.0000			0.0000	
1.25	0.0492	125	125	4.92	0.0000	0.0000			
1.50	0.0591	150	150	5.91	0.0000	0.0000			
Ø2.0 - Ø2.5			L100 - L150			D100	100	0.0000	0.0000
2.00	0.0787	100	100	7.87	0.0000			0.0000	
2.50	0.0984	125	125	9.84	0.0000	0.0000			
Ø3.0 - Ø3.5			L100 - L150			D100	100	0.0000	0.0000
3.00	0.1181	100	100	11.81	0.0000			0.0000	
3.50	0.1378	125	125	13.78	0.0000	0.0000			
Ø4.0 - Ø4.5			L100 - L150			D100	100	0.0000	0.0000
4.00	0.1575	100	100	15.75	0.0000			0.0000	
4.50	0.1772	125	125	17.72	0.0000	0.0000			
Ø5.0 - Ø5.5			L100 - L150			D100	100	0.0000	0.0000
5.00	0.1969	100	100	19.69	0.0000			0.0000	
5.50	0.2166	125	125	21.66	0.0000	0.0000			
Ø6.0 - Ø6.5			L100 - L150			D100	100	0.0000	0.0000
6.00	0.2363	100	100	23.63	0.0000			0.0000	
6.50	0.2560	125	125	25.60	0.0000	0.0000			
Ø7.0 - Ø7.5			L100 - L150			D100	100	0.0000	0.0000
7.00	0.2757	100	100	27.57	0.0000			0.0000	
7.50	0.2954	125	125	29.54	0.0000	0.0000			
Ø8.0 - Ø8.5			L100 - L150			D100	100	0.0000	0.0000
8.00	0.3151	100	100	31.51	0.0000			0.0000	
8.50	0.3348	125	125	33.48	0.0000	0.0000			
Ø9.0 - Ø9.5			L100 - L150			D100	100	0.0000	0.0000
9.00	0.3545	100	100	35.45	0.0000			0.0000	
9.50	0.3742	125	125	37.42	0.0000	0.0000			
Ø10.0 - Ø10.5			L100 - L150			D100	100	0.0000	0.0000
10.00	0.3939	100	100	39.39	0.0000			0.0000	
10.50	0.4136	125	125	41.36	0.0000	0.0000			

PLEASE SEE SPEEDS & FEEDS ON PAGE 407

## MINIATURE HIGH PERFORMANCE DRILLS

### Deep Hole - Coherent-Through - Metric

#### SPEEDS & FEEDS | Miniature High Performance Drills - Deep Hole - Metric

**Important Note:** Always apply dress codes and no load run 1-2 lengths and use maximum cutting speed (100%) for 10 seconds and then decrease cutting speed until you find the maximum life, minimum THL. To determine a drill bit's actual THL or SHL, the following table will help you to determine your maximum life.

Material (Material: 100%)	DPR	Cuts per Inch (CPI) Surface Feeds by Material by Drill Diameter								
		.25	.315	.398	.500	.635	.800	1.000	1.250	1.600
<b>Carbon Steels</b> AISI 1008 to 1045 (all grades) - 800 - 1000 ft/min SAE 1008 to 1045 (all grades) - 800 ft/min SAE 1008 to 1045 (all grades) - 800 ft/min	10	3000	3000	3000	3000	3000	3000	3000	3000	3000
<b>Low Alloy Steels</b> SAE 5140 to 52100 (all grades) - 900 ft/min SAE 5140 to 52100 (all grades) - 900 ft/min SAE 5140 to 52100 (all grades) - 900 ft/min	10	3000	3000	3000	3000	3000	3000	3000	3000	3000
<b>Stainless Steels</b> AISI 300 Series (all grades) - 700 ft/min AISI 300 Series (all grades) - 700 ft/min AISI 300 Series (all grades) - 700 ft/min AISI 300 Series (all grades) - 700 ft/min AISI 300 Series (all grades) - 700 ft/min AISI 300 Series (all grades) - 700 ft/min	10	2000	2000	2000	2000	2000	2000	2000	2000	2000
<b>Aluminum</b> 7075-T6 (all grades) - 1000 ft/min 7075-T6 (all grades) - 1000 ft/min 7075-T6 (all grades) - 1000 ft/min 7075-T6 (all grades) - 1000 ft/min	10	3000	3000	3000	3000	3000	3000	3000	3000	3000
<b>Cast Irons</b> G-10, F-10 Series G-10, F-10 Series	10	3000	3000	3000	3000	3000	3000	3000	3000	3000
<b>Cast Irons</b> G-10, F-10 Series G-10, F-10 Series	10	3000	3000	3000	3000	3000	3000	3000	3000	3000
<b>High Speed Steels</b> M2, M42, M43, M43T, M43T2, M43T3, M43T4, M43T5, M43T6, M43T7, M43T8, M43T9, M43T10, M43T11, M43T12, M43T13, M43T14, M43T15, M43T16, M43T17, M43T18, M43T19, M43T20, M43T21, M43T22, M43T23, M43T24, M43T25, M43T26, M43T27, M43T28, M43T29, M43T30, M43T31, M43T32, M43T33, M43T34, M43T35, M43T36, M43T37, M43T38, M43T39, M43T40, M43T41, M43T42, M43T43, M43T44, M43T45, M43T46, M43T47, M43T48, M43T49, M43T50, M43T51, M43T52, M43T53, M43T54, M43T55, M43T56, M43T57, M43T58, M43T59, M43T60, M43T61, M43T62, M43T63, M43T64, M43T65, M43T66, M43T67, M43T68, M43T69, M43T70, M43T71, M43T72, M43T73, M43T74, M43T75, M43T76, M43T77, M43T78, M43T79, M43T80, M43T81, M43T82, M43T83, M43T84, M43T85, M43T86, M43T87, M43T88, M43T89, M43T90, M43T91, M43T92, M43T93, M43T94, M43T95, M43T96, M43T97, M43T98, M43T99, M43T100	10	3000	3000	3000	3000	3000	3000	3000	3000	3000

#### Deep Hole Drilling Guidelines

For best results, the following guidelines are recommended:

1. Use high speeds of up to 10000 ft/min (3000 m/min) and a good tool set (HVT) to drill through a drill with the SHL or THL.
2. Use a primary drill at the speed of 1000 ft/min and then increase feed.
3. Use a secondary drill at the speed of 1000 ft/min and then increase feed.
4. Use a tertiary drill at the speed of 1000 ft/min and then increase feed.
5. Use a quaternary drill at the speed of 1000 ft/min and then increase feed.
6. Use a quaternary drill at the speed of 1000 ft/min and then increase feed.
7. Use a quaternary drill at the speed of 1000 ft/min and then increase feed.
8. Use a quaternary drill at the speed of 1000 ft/min and then increase feed.
9. Use a quaternary drill at the speed of 1000 ft/min and then increase feed.
10. Use a quaternary drill at the speed of 1000 ft/min and then increase feed.



### 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 one for your specific job. Learn how to choose the right one for your application in our latest blog post, [Selecting the Right Miniature Drill](#).

[Read more on Harvey performance tools for the shop.](#)

## MINIATURE DRILLS



Miniature Drills  
Down to .005"

- For sizes .005" and smaller, there is an intermediate hole diameter as shown above.
- 118° cutting angle
- Double
- GAO ground to tolerance

DRILL DIAMETER INCH	DRILL DIAMETER MILLIMETER	FLUTE LENGTH INCH	FLUTE LENGTH MILLIMETER	OVERALL LENGTH INCH	MATERIAL		SPECS		MATERIAL TOLERANCE	
					TYPE	FINISH	TYPE	FINISH	TYPE	FINISH
.005	.127mm	.118	3.0	0.112	SAE52100	SAE52100				
.006	.152mm	.118	3.0	0.112	SAE52100	SAE52100				
.008	.203mm	.118	3.0	0.112	SAE52100	SAE52100				
.010	.254mm	.118	3.0	0.112	SAE52100	SAE52100				
.012	.305mm	.118	3.0	0.112	SAE52100	SAE52100				
.015	.381mm	.118	3.0	0.112	SAE52100	SAE52100				
.020	.508mm	.118	3.0	0.112	SAE52100	SAE52100				
.025	.635mm	.118	3.0	0.112	SAE52100	SAE52100				
.030	.762mm	.118	3.0	0.112	SAE52100	SAE52100				
.035	.889mm	.118	3.0	0.112	SAE52100	SAE52100				
.040	1.016mm	.118	3.0	0.112	SAE52100	SAE52100				
.050	1.27mm	.118	3.0	0.112	SAE52100	SAE52100				
.060	1.52mm	.118	3.0	0.112	SAE52100	SAE52100				
.075	1.90mm	.118	3.0	0.112	SAE52100	SAE52100				
.090	2.28mm	.118	3.0	0.112	SAE52100	SAE52100				
.100	2.54mm	.118	3.0	0.112	SAE52100	SAE52100				
.125	3.17mm	.118	3.0	0.112	SAE52100	SAE52100				
.150	3.81mm	.118	3.0	0.112	SAE52100	SAE52100				
.175	4.44mm	.118	3.0	0.112	SAE52100	SAE52100				
.200	5.08mm	.118	3.0	0.112	SAE52100	SAE52100				
.250	6.35mm	.118	3.0	0.112	SAE52100	SAE52100				
.300	7.62mm	.118	3.0	0.112	SAE52100	SAE52100				
.350	8.89mm	.118	3.0	0.112	SAE52100	SAE52100				
.400	10.16mm	.118	3.0	0.112	SAE52100	SAE52100				
.450	11.43mm	.118	3.0	0.112	SAE52100	SAE52100				
.500	12.7mm	.118	3.0	0.112	SAE52100	SAE52100				
.550	13.97mm	.118	3.0	0.112	SAE52100	SAE52100				
.600	15.24mm	.118	3.0	0.112	SAE52100	SAE52100				
.650	16.51mm	.118	3.0	0.112	SAE52100	SAE52100				
.700	17.78mm	.118	3.0	0.112	SAE52100	SAE52100				
.750	19.05mm	.118	3.0	0.112	SAE52100	SAE52100				
.800	20.32mm	.118	3.0	0.112	SAE52100	SAE52100				
.850	21.59mm	.118	3.0	0.112	SAE52100	SAE52100				
.900	22.86mm	.118	3.0	0.112	SAE52100	SAE52100				
.950	24.13mm	.118	3.0	0.112	SAE52100	SAE52100				
1.00	25.4mm	.118	3.0	0.112	SAE52100	SAE52100				

1. Reference to metric catalog is 2000. 2000. 2. Lead working tolerance tolerance 200

## MINIATURE DRILLS

Sheet 1



continued from previous page

Drill Diameter mm	DRILL DIAMETER		SHANK DIAMETER	SHANK LENGTH	CUTTING LENGTH	DRILL LENGTH		DRILL WEIGHT		MATERIAL	
	mm	inch				mm	inch	g	oz	AISI	HSS-CO
1.00	1.00		10.00	1.00	1.00	11.00	0.14	10.00	0.14		
1.25	1.25		10.00	1.25	1.25	11.25	0.22	10.00	0.22	10.00	0.35
1.50	1.50		10.00	1.50	1.50	11.50	0.34	10.00	0.34		
1.75	1.75		10.00	1.75	1.75	11.75	0.50	10.00	0.50	10.00	0.35
2.00	2.00		10.00	2.00	2.00	12.00	0.69	10.00	0.70		
2.25	2.25	800 mm	10.00	2.25	2.25	12.25	1.00	10.00	0.70		
2.50	2.50		10.00	2.50	2.50	12.50	1.36	10.00	0.70		
2.75	2.75	400 mm	10.00	2.75	2.75	12.75	1.80	10.00	0.70	10.00	0.35
3.00	3.00		10.00	3.00	3.00	13.00	2.34	10.00	0.70		
3.25	3.25	400 mm	10.00	3.25	3.25	13.25	2.96	10.00	0.70	10.00	0.35
3.50	3.50		10.00	3.50	3.50	13.50	3.68	10.00	0.70		
3.75	3.75	200 mm	10.00	3.75	3.75	13.75	4.52	10.00	0.70		
4.00	4.00		10.00	4.00	4.00	14.00	5.50	10.00	0.70		
4.25	4.25	800 mm	10.00	4.25	4.25	14.25	6.63	10.00	0.70	10.00	0.35
4.50	4.50		10.00	4.50	4.50	14.50	7.94	10.00	0.70		
4.75	4.75	400 mm	10.00	4.75	4.75	14.75	9.45	10.00	0.70	10.00	0.35
5.00	5.00		10.00	5.00	5.00	15.00	11.15	10.00	0.70		
5.25	5.25	200 mm	10.00	5.25	5.25	15.25	13.05	10.00	0.70		
5.50	5.50		10.00	5.50	5.50	15.50	15.17	10.00	0.70		
5.75	5.75	100 mm	10.00	5.75	5.75	15.75	17.50	10.00	0.70	10.00	0.35
6.00	6.00		10.00	6.00	6.00	16.00	20.07	10.00	0.70		
6.25	6.25	200 mm	10.00	6.25	6.25	16.25	22.90	10.00	0.70		
6.50	6.50		10.00	6.50	6.50	16.50	26.00	10.00	0.70		
6.75	6.75	100 mm	10.00	6.75	6.75	16.75	29.40	10.00	0.70	10.00	0.35
7.00	7.00		10.00	7.00	7.00	17.00	34.10	10.00	0.70		
7.25	7.25	200 mm	10.00	7.25	7.25	17.25	39.20	10.00	0.70		
7.50	7.50		10.00	7.50	7.50	17.50	44.75	10.00	0.70		
7.75	7.75	100 mm	10.00	7.75	7.75	17.75	50.80	10.00	0.70	10.00	0.35
8.00	8.00		10.00	8.00	8.00	18.00	57.40	10.00	0.70		
8.25	8.25	200 mm	10.00	8.25	8.25	18.25	64.60	10.00	0.70		
8.50	8.50		10.00	8.50	8.50	18.50	72.45	10.00	0.70		
8.75	8.75	100 mm	10.00	8.75	8.75	18.75	80.90	10.00	0.70	10.00	0.35
9.00	9.00		10.00	9.00	9.00	19.00	90.00	10.00	0.70		
9.25	9.25	200 mm	10.00	9.25	9.25	19.25	99.70	10.00	0.70		
9.50	9.50		10.00	9.50	9.50	19.50	110.10	10.00	0.70		
9.75	9.75	100 mm	10.00	9.75	9.75	19.75	121.25	10.00	0.70	10.00	0.35
10.00	10.00		10.00	10.00	10.00	20.00	133.20	10.00	0.70		
10.25	10.25	200 mm	10.00	10.25	10.25	20.25	145.95	10.00	0.70		
10.50	10.50		10.00	10.50	10.50	20.50	159.55	10.00	0.70		
10.75	10.75	100 mm	10.00	10.75	10.75	20.75	173.95	10.00	0.70	10.00	0.35
11.00	11.00		10.00	11.00	11.00	21.00	189.20	10.00	0.70		
11.25	11.25	200 mm	10.00	11.25	11.25	21.25	205.35	10.00	0.70		
11.50	11.50		10.00	11.50	11.50	21.50	222.45	10.00	0.70		
11.75	11.75	100 mm	10.00	11.75	11.75	21.75	240.55	10.00	0.70	10.00	0.35
12.00	12.00		10.00	12.00	12.00	22.00	259.70	10.00	0.70		
12.25	12.25	200 mm	10.00	12.25	12.25	22.25	280.00	10.00	0.70		
12.50	12.50		10.00	12.50	12.50	22.50	301.50	10.00	0.70		
12.75	12.75	100 mm	10.00	12.75	12.75	22.75	324.25	10.00	0.70	10.00	0.35
13.00	13.00		10.00	13.00	13.00	23.00	348.40	10.00	0.70		
13.25	13.25	200 mm	10.00	13.25	13.25	23.25	374.00	10.00	0.70		
13.50	13.50		10.00	13.50	13.50	23.50	401.10	10.00	0.70		
13.75	13.75	100 mm	10.00	13.75	13.75	23.75	429.75	10.00	0.70	10.00	0.35
14.00	14.00		10.00	14.00	14.00	24.00	460.00	10.00	0.70		
14.25	14.25	200 mm	10.00	14.25	14.25	24.25	492.00	10.00	0.70		
14.50	14.50		10.00	14.50	14.50	24.50	525.75	10.00	0.70		
14.75	14.75	100 mm	10.00	14.75	14.75	24.75	561.30	10.00	0.70	10.00	0.35
15.00	15.00		10.00	15.00	15.00	25.00	608.70	10.00	0.70		
15.25	15.25	200 mm	10.00	15.25	15.25	25.25	658.00	10.00	0.70		
15.50	15.50		10.00	15.50	15.50	25.50	709.30	10.00	0.70		
15.75	15.75	100 mm	10.00	15.75	15.75	25.75	762.65	10.00	0.70	10.00	0.35
16.00	16.00		10.00	16.00	16.00	26.00	818.10	10.00	0.70		
16.25	16.25	200 mm	10.00	16.25	16.25	26.25	875.70	10.00	0.70		
16.50	16.50		10.00	16.50	16.50	26.50	935.50	10.00	0.70		
16.75	16.75	100 mm	10.00	16.75	16.75	26.75	997.60	10.00	0.70	10.00	0.35
17.00	17.00		10.00	17.00	17.00	27.00	1062.00	10.00	0.70		
17.25	17.25	200 mm	10.00	17.25	17.25	27.25	1128.75	10.00	0.70		
17.50	17.50		10.00	17.50	17.50	27.50	1197.90	10.00	0.70		
17.75	17.75	100 mm	10.00	17.75	17.75	27.75	1269.50	10.00	0.70	10.00	0.35
18.00	18.00		10.00	18.00	18.00	28.00	1343.65	10.00	0.70		
18.25	18.25	200 mm	10.00	18.25	18.25	28.25	1420.40	10.00	0.70		
18.50	18.50		10.00	18.50	18.50	28.50	1500.00	10.00	0.70		
18.75	18.75	100 mm	10.00	18.75	18.75	28.75	1582.50	10.00	0.70	10.00	0.35
19.00	19.00		10.00	19.00	19.00	29.00	1668.00	10.00	0.70		
19.25	19.25	200 mm	10.00	19.25	19.25	29.25	1756.50	10.00	0.70		
19.50	19.50		10.00	19.50	19.50	29.50	1849.10	10.00	0.70		
19.75	19.75	100 mm	10.00	19.75	19.75	29.75	1944.90	10.00	0.70	10.00	0.35
20.00	20.00		10.00	20.00	20.00	30.00	2045.00	10.00	0.70		

\* Standard length cutting 1.0000 (39.37) inch; \*\* length cutting 0.6250 (24.81) inch

continued on next page



## MINIATURE DRILLS

(cont.)

Continued from previous page

DRILL NUMBER	FLUTE LENGTH (IN.)	SHANK DIAMETER (IN.)	TOTAL LENGTH (IN.)	OPERATOR		SPIN SPEED (RPM)		RECOMMENDED FEED (IPM)	
				F1	F10	F1	F10	F1	F10
1242	0.18	0.125	1.12	2000	15.0	6000	11.0		
1243	0.18	0.125	1.12	2000	15.0	6000	11.0		
1244	0.18	0.125	1.12	2000	15.0	6000	11.0		
1245	0.18	0.125	1.12	2000	15.0	6000	11.0		
1246	0.18	0.125	1.12	2000	15.0	6000	11.0		
1247	0.18	0.125	1.12	2000	15.0	6000	11.0		
1248	0.18	0.125	1.12	2000	15.0	6000	11.0		
1249	0.18	0.125	1.12	2000	15.0	6000	11.0		
1250	0.18	0.125	1.12	2000	15.0	6000	11.0		
1251	0.18	0.125	1.12	2000	15.0	6000	11.0		
1252	0.18	0.125	1.12	2000	15.0	6000	11.0		
1253	0.18	0.125	1.12	2000	15.0	6000	11.0		
1254	0.18	0.125	1.12	2000	15.0	6000	11.0		
1255	0.18	0.125	1.12	2000	15.0	6000	11.0		
1256	0.18	0.125	1.12	2000	15.0	6000	11.0		
1257	0.18	0.125	1.12	2000	15.0	6000	11.0		
1258	0.18	0.125	1.12	2000	15.0	6000	11.0		
1259	0.18	0.125	1.12	2000	15.0	6000	11.0		
1260	0.18	0.125	1.12	2000	15.0	6000	11.0		
1261	0.18	0.125	1.12	2000	15.0	6000	11.0		
1262	0.18	0.125	1.12	2000	15.0	6000	11.0		
1263	0.18	0.125	1.12	2000	15.0	6000	11.0		
1264	0.18	0.125	1.12	2000	15.0	6000	11.0		
1265	0.18	0.125	1.12	2000	15.0	6000	11.0		
1266	0.18	0.125	1.12	2000	15.0	6000	11.0		
1267	0.18	0.125	1.12	2000	15.0	6000	11.0		
1268	0.18	0.125	1.12	2000	15.0	6000	11.0		
1269	0.18	0.125	1.12	2000	15.0	6000	11.0		
1270	0.18	0.125	1.12	2000	15.0	6000	11.0		
1271	0.18	0.125	1.12	2000	15.0	6000	11.0		
1272	0.18	0.125	1.12	2000	15.0	6000	11.0		
1273	0.18	0.125	1.12	2000	15.0	6000	11.0		
1274	0.18	0.125	1.12	2000	15.0	6000	11.0		
1275	0.18	0.125	1.12	2000	15.0	6000	11.0		
1276	0.18	0.125	1.12	2000	15.0	6000	11.0		
1277	0.18	0.125	1.12	2000	15.0	6000	11.0		
1278	0.18	0.125	1.12	2000	15.0	6000	11.0		
1279	0.18	0.125	1.12	2000	15.0	6000	11.0		
1280	0.18	0.125	1.12	2000	15.0	6000	11.0		
1281	0.18	0.125	1.12	2000	15.0	6000	11.0		
1282	0.18	0.125	1.12	2000	15.0	6000	11.0		
1283	0.18	0.125	1.12	2000	15.0	6000	11.0		
1284	0.18	0.125	1.12	2000	15.0	6000	11.0		
1285	0.18	0.125	1.12	2000	15.0	6000	11.0		
1286	0.18	0.125	1.12	2000	15.0	6000	11.0		
1287	0.18	0.125	1.12	2000	15.0	6000	11.0		
1288	0.18	0.125	1.12	2000	15.0	6000	11.0		
1289	0.18	0.125	1.12	2000	15.0	6000	11.0		
1290	0.18	0.125	1.12	2000	15.0	6000	11.0		
1291	0.18	0.125	1.12	2000	15.0	6000	11.0		
1292	0.18	0.125	1.12	2000	15.0	6000	11.0		
1293	0.18	0.125	1.12	2000	15.0	6000	11.0		
1294	0.18	0.125	1.12	2000	15.0	6000	11.0		
1295	0.18	0.125	1.12	2000	15.0	6000	11.0		
1296	0.18	0.125	1.12	2000	15.0	6000	11.0		
1297	0.18	0.125	1.12	2000	15.0	6000	11.0		
1298	0.18	0.125	1.12	2000	15.0	6000	11.0		
1299	0.18	0.125	1.12	2000	15.0	6000	11.0		

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# MINIATURE DRILLS

## Splitting Drills




Stacked in 18  
Included Angles


- Threaded end for easier cutting • Self-centering point geometry
- 2 Flutes • Heat-treated • OQC ground to the USA

INCLUDES DRILL	DRILL DIAMETER	FLUTE LENGTH		MAX RECOMMEND. RPM	MAXIMUM FEED RATE		RECOMMEND.		MSRP (each)	
		IN	MM		IPM	MM/REV	IN/REV	IN/REV	IN/REV	
1/8"	1/8"	1/4"	3/8"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/8"	1/4"	3/8"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/8" (1.5mm)	1/4"	3/8"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/8"	1/4"	3/8"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/8"	1/4"	3/8"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/8" (2mm)	1/4"	3/8"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/8"	1/4"	3/8"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/8" (2.5mm)	1/4"	3/8"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/8"	1/4"	3/8"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/8" (3mm)	1/4"	3/8"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/8"	1/4"	3/8"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/8" (4mm)	1/4"	3/8"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
1/4"	1/4"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/4"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/4"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/4"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/4"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/4" (6mm)	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/4"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/4" (8mm)	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/4"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/4" (10mm)	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/4"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	1/4" (12mm)	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
3/8"	3/8"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	3/8"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	3/8"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	3/8"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	3/8"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	3/8" (15mm)	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	3/8"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	3/8" (18mm)	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	3/8"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	3/8" (20mm)	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	3/8"	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20
	3/8" (25mm)	1/2"	3/4"	1000	0.005	0.005	1000	1000	\$1.20	\$1.20

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**TYPE I**  
Drill bit with longer cutting edge and stronger tip is suitable for most applications. Drill bit with double-flute design.



**TYPE II**  
Based on longer double-flute design, longer cutting edge and larger diameter of the cutting edge.



# MINIATURE DRILLS

Spitting Drills (cont.)

continued from previous page

Product Series	Series Description	Flute Length		HSS	HSS	HSS	HSS	Material		Reference		
		mm	in.					mm	in.	mm	in.	mm
HSS	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-01	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-02	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-03	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-04	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-05	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-06	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-07	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-08	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-09	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-10	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-11	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-12	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-13	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-14	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-15	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-16	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-17	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-18	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-19	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-20	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-21	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-22	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-23	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-24	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-25	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-26	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-27	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-28	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-29	0.00	
	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-30	0.00	
	HSS	SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-31	0.00
		SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-32	0.00
		SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-33	0.00
		SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-34	0.00
		SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-35	0.00
		SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-36	0.00
		SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-37	0.00
		SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-38	0.00
		SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-39	0.00
		SD	60	2.36	0.00	0.00	0.00	0.00	1.40	0.05	1344-40	0.00

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# MINIATURE DRILLS

## Splitting Drills (cont.)

(continued from previous page)

DIN/ISO DRILL NO.	DIN DRILL NO.	FLUTE LENGTH	DIN FLUTE LENGTH	DIN DRILL TYPE	DIN DRILL DIA.	DIN DRILL LENGTH	STRENGTH		USE (DRILL)		
							YIELD STRENGTH	TENSILE STRENGTH	TYPE	DRILL	
130°	117	100	100	117	1	110	1 1/2	1170	80.00	1170-12	26.00
	117-110mm	100	100	117	1	110	1 1/2	1170	80.00	1170-12	26.00
	121	100	100	121	1	120	1 1/2	1170	80.00	1210-12	26.00
	121-110mm	100	100	121	1	120	1 1/2	1170	80.00	1210-12	26.00
	125	100	100	125	1	120	1 1/2	1170	80.00	1250-12	26.00
	125-110mm	100	100	125	1	120	1 1/2	1170	80.00	1250-12	26.00
	129	100	100	129	1	120	1 1/2	1170	80.00	1290-12	26.00
	129-110mm	100	100	129	1	120	1 1/2	1170	80.00	1290-12	26.00
	133	100	100	133	1	120	1 1/2	1170	80.00	1330-12	26.00
	133-110mm	100	100	133	1	120	1 1/2	1170	80.00	1330-12	26.00
	137	100	100	137	1	120	1 1/2	1170	80.00	1370-12	26.00
	137-110mm	100	100	137	1	120	1 1/2	1170	80.00	1370-12	26.00
	141	100	100	141	1	120	1 1/2	1170	80.00	1410-12	26.00
	141-110mm	100	100	141	1	120	1 1/2	1170	80.00	1410-12	26.00
	145	100	100	145	1	120	1 1/2	1170	80.00	1450-12	26.00
	145-110mm	100	100	145	1	120	1 1/2	1170	80.00	1450-12	26.00
	149	100	100	149	1	120	1 1/2	1170	80.00	1490-12	26.00
	149-110mm	100	100	149	1	120	1 1/2	1170	80.00	1490-12	26.00
	153	100	100	153	1	120	1 1/2	1170	80.00	1530-12	26.00
	153-110mm	100	100	153	1	120	1 1/2	1170	80.00	1530-12	26.00
	157	100	100	157	1	120	1 1/2	1170	80.00	1570-12	26.00
	157-110mm	100	100	157	1	120	1 1/2	1170	80.00	1570-12	26.00
	161	100	100	161	1	120	1 1/2	1170	80.00	1610-12	26.00
	161-110mm	100	100	161	1	120	1 1/2	1170	80.00	1610-12	26.00
	165	100	100	165	1	120	1 1/2	1170	80.00	1650-12	26.00
	165-110mm	100	100	165	1	120	1 1/2	1170	80.00	1650-12	26.00
169	100	100	169	1	120	1 1/2	1170	80.00	1690-12	26.00	
169-110mm	100	100	169	1	120	1 1/2	1170	80.00	1690-12	26.00	
173	100	100	173	1	120	1 1/2	1170	80.00	1730-12	26.00	
173-110mm	100	100	173	1	120	1 1/2	1170	80.00	1730-12	26.00	
177	100	100	177	1	120	1 1/2	1170	80.00	1770-12	26.00	
177-110mm	100	100	177	1	120	1 1/2	1170	80.00	1770-12	26.00	
181	100	100	181	1	120	1 1/2	1170	80.00	1810-12	26.00	
181-110mm	100	100	181	1	120	1 1/2	1170	80.00	1810-12	26.00	
185	100	100	185	1	120	1 1/2	1170	80.00	1850-12	26.00	
185-110mm	100	100	185	1	120	1 1/2	1170	80.00	1850-12	26.00	
189	100	100	189	1	120	1 1/2	1170	80.00	1890-12	26.00	
189-110mm	100	100	189	1	120	1 1/2	1170	80.00	1890-12	26.00	
193	100	100	193	1	120	1 1/2	1170	80.00	1930-12	26.00	
193-110mm	100	100	193	1	120	1 1/2	1170	80.00	1930-12	26.00	
197	100	100	197	1	120	1 1/2	1170	80.00	1970-12	26.00	
197-110mm	100	100	197	1	120	1 1/2	1170	80.00	1970-12	26.00	

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## MINIATURE DRILLS

Spitting Drills (cont.)

Continued from previous page

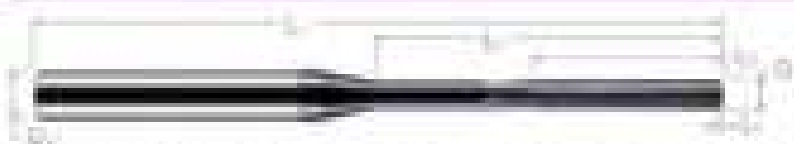
HARVEY ANAL	HARVEY ANALYSIS	TYPE LENGTH	TYPE REVISION	TYPE REVISION	TYPE REVISION	TYPE REVISION	REVISION		DATE	
							REV	DATE	REV	DATE
100°	001	00 00	000	0	00	000	0000	0000	0000 00	0000
	002	00 00	000	1	00	000	0000	0000	0000 00	0000
	003	00 00	000	1	00	000	0000	0000	0000 00	0000
	004	00 00	000	1	00	000	0000	0000	0000 00	0000
	005	00 00	000	1	00	000	0000	0000	0000 00	0000
	006	00 00	000	1	00	000	0000	0000	0000 00	0000
	007	00 00	000	1	00	000	0000	0000	0000 00	0000
	008	00 00	000	1	00	000	0000	0000	0000 00	0000
	009	00 00	000	1	00	000	0000	0000	0000 00	0000
	010	00 00	000	1	00	000	0000	0000	0000 00	0000
	011	00 00	000	1	00	000	0000	0000	0000 00	0000
	012	00 00	000	1	00	000	0000	0000	0000 00	0000
	013	00 00	000	1	00	000	0000	0000	0000 00	0000
	014	00 00	000	1	00	000	0000	0000	0000 00	0000
	015	00 00	000	1	00	000	0000	0000	0000 00	0000
140°	001	00 00	000	0	00	000	0000	0000	0000 00	0000
	002	00 00	000	1	00	000	0000	0000	0000 00	0000
	003	00 00	000	1	00	000	0000	0000	0000 00	0000
	004	00 00	000	1	00	000	0000	0000	0000 00	0000
	005	00 00	000	1	00	000	0000	0000	0000 00	0000
150°	001	00 00	000	0	00	000	0000	0000	0000 00	0000
	002	00 00	000	1	00	000	0000	0000	0000 00	0000
	003	00 00	000	1	00	000	0000	0000	0000 00	0000
	004	00 00	000	1	00	000	0000	0000	0000 00	0000
	005	00 00	000	1	00	000	0000	0000	0000 00	0000
	006	00 00	000	1	00	000	0000	0000	0000 00	0000
	007	00 00	000	1	00	000	0000	0000	0000 00	0000
	008	00 00	000	1	00	000	0000	0000	0000 00	0000
	009	00 00	000	1	00	000	0000	0000	0000 00	0000
	010	00 00	000	1	00	000	0000	0000	0000 00	0000
	011	00 00	000	1	00	000	0000	0000	0000 00	0000
	012	00 00	000	1	00	000	0000	0000	0000 00	0000
	013	00 00	000	1	00	000	0000	0000	0000 00	0000
170°	001	00 00	000	0	00	000	0000	0000	0000 00	0000
	002	00 00	000	1	00	000	0000	0000	0000 00	0000
	003	00 00	000	1	00	000	0000	0000	0000 00	0000



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## MINIATURE REAMERS



REAMER		REAMER	
ITEM NO.	ITEM NO.	ITEM NO.	ITEM NO.

- Available plated or with MIP coating for improved life life and feed resistance
- Design allows for through and through applications
- Standard, standard ground to maintain strength, stiffness, and accuracy
- All sizes tolerant for high-pressure fluid cutting
- Best quality
- ISO grade of the tool

REAMER DIAMETER	ITEM	SHANK LENGTH	OVERALL LENGTH	COATED LENGTH	FLUTES	SHANK DIAMETER	OVERALL LENGTH	UNPLATED		MIP COATED	
								ITEM #	PRICE	ITEM #	PRICE
0.05		0.05	0.05	0.05	4	0.05	0.05				
0.06		0.06	0.06	0.06	4	0.06	0.06				
0.07		0.07	0.07	0.07	4	0.07	0.07				
0.08		0.08	0.08	0.08	4	0.08	0.08				
0.09		0.09	0.09	0.09	4	0.09	0.09				
0.10		0.10	0.10	0.10	4	0.10	0.10				
0.11		0.11	0.11	0.11	4	0.11	0.11				
0.12		0.12	0.12	0.12	4	0.12	0.12				
0.13		0.13	0.13	0.13	4	0.13	0.13				
0.14		0.14	0.14	0.14	4	0.14	0.14				
0.15		0.15	0.15	0.15	4	0.15	0.15				
0.16		0.16	0.16	0.16	4	0.16	0.16				
0.17		0.17	0.17	0.17	4	0.17	0.17				
0.18		0.18	0.18	0.18	4	0.18	0.18				
0.19		0.19	0.19	0.19	4	0.19	0.19				
0.20		0.20	0.20	0.20	4	0.20	0.20				
0.21		0.21	0.21	0.21	4	0.21	0.21				
0.22		0.22	0.22	0.22	4	0.22	0.22				
0.23		0.23	0.23	0.23	4	0.23	0.23				
0.24		0.24	0.24	0.24	4	0.24	0.24				
0.25		0.25	0.25	0.25	4	0.25	0.25				
0.26		0.26	0.26	0.26	4	0.26	0.26				
0.27		0.27	0.27	0.27	4	0.27	0.27				
0.28		0.28	0.28	0.28	4	0.28	0.28				
0.29		0.29	0.29	0.29	4	0.29	0.29				
0.30		0.30	0.30	0.30	4	0.30	0.30				
0.31		0.31	0.31	0.31	4	0.31	0.31				
0.32		0.32	0.32	0.32	4	0.32	0.32				
0.33		0.33	0.33	0.33	4	0.33	0.33				
0.34		0.34	0.34	0.34	4	0.34	0.34				
0.35		0.35	0.35	0.35	4	0.35	0.35				
0.36		0.36	0.36	0.36	4	0.36	0.36				
0.37		0.37	0.37	0.37	4	0.37	0.37				
0.38		0.38	0.38	0.38	4	0.38	0.38				
0.39		0.39	0.39	0.39	4	0.39	0.39				
0.40		0.40	0.40	0.40	4	0.40	0.40				
0.41		0.41	0.41	0.41	4	0.41	0.41				
0.42		0.42	0.42	0.42	4	0.42	0.42				
0.43		0.43	0.43	0.43	4	0.43	0.43				
0.44		0.44	0.44	0.44	4	0.44	0.44				
0.45		0.45	0.45	0.45	4	0.45	0.45				
0.46		0.46	0.46	0.46	4	0.46	0.46				
0.47		0.47	0.47	0.47	4	0.47	0.47				
0.48		0.48	0.48	0.48	4	0.48	0.48				
0.49		0.49	0.49	0.49	4	0.49	0.49				
0.50		0.50	0.50	0.50	4	0.50	0.50				

\* Based on ISO standards & ANSI - 1987. \* Based on MIP coating & ANSI - 1987.

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# MINIATURE REAMERS

Sheet 1

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ITEM NUMBER	ITEM NAME	QTY	UNIT PRICE	TOTAL PRICE	QTY	UNIT PRICE	TOTAL PRICE	REMARKS		REMARKS	
								DESCRIPTION	REMARKS	DESCRIPTION	REMARKS
0001		10	1.00	10.00	1	1.00	1.00				
0002	...	10	1.00	10.00	1	1.00	1.00				
0003	...	10	1.00	10.00	1	1.00	1.00				
0004	...	10	1.00	10.00	1	1.00	1.00				
0005	...	10	1.00	10.00	1	1.00	1.00				
0006	...	10	1.00	10.00	1	1.00	1.00				
0007	...	10	1.00	10.00	1	1.00	1.00				
0008	...	10	1.00	10.00	1	1.00	1.00				
0009	...	10	1.00	10.00	1	1.00	1.00				
0010	...	10	1.00	10.00	1	1.00	1.00				
0011	...	10	1.00	10.00	1	1.00	1.00				
0012	...	10	1.00	10.00	1	1.00	1.00				
0013	...	10	1.00	10.00	1	1.00	1.00				
0014	...	10	1.00	10.00	1	1.00	1.00				
0015	...	10	1.00	10.00	1	1.00	1.00				
0016	...	10	1.00	10.00	1	1.00	1.00				
0017	...	10	1.00	10.00	1	1.00	1.00				
0018	...	10	1.00	10.00	1	1.00	1.00				
0019	...	10	1.00	10.00	1	1.00	1.00				
0020	...	10	1.00	10.00	1	1.00	1.00				
0021	...	10	1.00	10.00	1	1.00	1.00				
0022	...	10	1.00	10.00	1	1.00	1.00				
0023	...	10	1.00	10.00	1	1.00	1.00				
0024	...	10	1.00	10.00	1	1.00	1.00				
0025	...	10	1.00	10.00	1	1.00	1.00				
0026	...	10	1.00	10.00	1	1.00	1.00				
0027	...	10	1.00	10.00	1	1.00	1.00				
0028	...	10	1.00	10.00	1	1.00	1.00				
0029	...	10	1.00	10.00	1	1.00	1.00				
0030	...	10	1.00	10.00	1	1.00	1.00				
0031	...	10	1.00	10.00	1	1.00	1.00				
0032	...	10	1.00	10.00	1	1.00	1.00				
0033	...	10	1.00	10.00	1	1.00	1.00				
0034	...	10	1.00	10.00	1	1.00	1.00				
0035	...	10	1.00	10.00	1	1.00	1.00				
0036	...	10	1.00	10.00	1	1.00	1.00				
0037	...	10	1.00	10.00	1	1.00	1.00				
0038	...	10	1.00	10.00	1	1.00	1.00				
0039	...	10	1.00	10.00	1	1.00	1.00				
0040	...	10	1.00	10.00	1	1.00	1.00				
0041	...	10	1.00	10.00	1	1.00	1.00				
0042	...	10	1.00	10.00	1	1.00	1.00				
0043	...	10	1.00	10.00	1	1.00	1.00				
0044	...	10	1.00	10.00	1	1.00	1.00				
0045	...	10	1.00	10.00	1	1.00	1.00				
0046	...	10	1.00	10.00	1	1.00	1.00				
0047	...	10	1.00	10.00	1	1.00	1.00				
0048	...	10	1.00	10.00	1	1.00	1.00				
0049	...	10	1.00	10.00	1	1.00	1.00				
0050	...	10	1.00	10.00	1	1.00	1.00				
0051	...	10	1.00	10.00	1	1.00	1.00				
0052	...	10	1.00	10.00	1	1.00	1.00				
0053	...	10	1.00	10.00	1	1.00	1.00				
0054	...	10	1.00	10.00	1	1.00	1.00				
0055	...	10	1.00	10.00	1	1.00	1.00				
0056	...	10	1.00	10.00	1	1.00	1.00				
0057	...	10	1.00	10.00	1	1.00	1.00				
0058	...	10	1.00	10.00	1	1.00	1.00				
0059	...	10	1.00	10.00	1	1.00	1.00				
0060	...	10	1.00	10.00	1	1.00	1.00				
0061	...	10	1.00	10.00	1	1.00	1.00				
0062	...	10	1.00	10.00	1	1.00	1.00				
0063	...	10	1.00	10.00	1	1.00	1.00				
0064	...	10	1.00	10.00	1	1.00	1.00				
0065	...	10	1.00	10.00	1	1.00	1.00				
0066	...	10	1.00	10.00	1	1.00	1.00				
0067	...	10	1.00	10.00	1	1.00	1.00				
0068	...	10	1.00	10.00	1	1.00	1.00				
0069	...	10	1.00	10.00	1	1.00	1.00				
0070	...	10	1.00	10.00	1	1.00	1.00				
0071	...	10	1.00	10.00	1	1.00	1.00				
0072	...	10	1.00	10.00	1	1.00	1.00				
0073	...	10	1.00	10.00	1	1.00	1.00				
0074	...	10	1.00	10.00	1	1.00	1.00				
0075	...	10	1.00	10.00	1	1.00	1.00				
0076	...	10	1.00	10.00	1	1.00	1.00				
0077	...	10	1.00	10.00	1	1.00	1.00				
0078	...	10	1.00	10.00	1	1.00	1.00				
0079	...	10	1.00	10.00	1	1.00	1.00				
0080	...	10	1.00	10.00	1	1.00	1.00				
0081	...	10	1.00	10.00	1	1.00	1.00				
0082	...	10	1.00	10.00	1	1.00	1.00				
0083	...	10	1.00	10.00	1	1.00	1.00				
0084	...	10	1.00	10.00	1	1.00	1.00				
0085	...	10	1.00	10.00	1	1.00	1.00				
0086	...	10	1.00	10.00	1	1.00	1.00				
0087	...	10	1.00	10.00	1	1.00	1.00				
0088	...	10	1.00	10.00	1	1.00	1.00				
0089	...	10	1.00	10.00	1	1.00	1.00				
0090	...	10	1.00	10.00	1	1.00	1.00				
0091	...	10	1.00	10.00	1	1.00	1.00				
0092	...	10	1.00	10.00	1	1.00	1.00				
0093	...	10	1.00	10.00	1	1.00	1.00				
0094	...	10	1.00	10.00	1	1.00	1.00				
0095	...	10	1.00	10.00	1	1.00	1.00				
0096	...	10	1.00	10.00	1	1.00	1.00				
0097	...	10	1.00	10.00	1	1.00	1.00				
0098	...	10	1.00	10.00	1	1.00	1.00				
0099	...	10	1.00	10.00	1	1.00	1.00				
0100	...	10	1.00	10.00	1	1.00	1.00				

\* Prices are subject to change without notice. © 2023 - 2024

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## MINIATURE REAMERS

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ITEM NUMBER	SIZE	MATERIAL LENGTH	TOTAL LENGTH	CHANGE LENGTH	PISTON	ITEM NUMBER	TOTAL LENGTH	WEIGHT		MATERIAL	
								IN. (mm)	LB.	TYPE 1	TYPE 2
100		1.0	1.0	0.0	1	100	1	0.0000	0.00	STAINLESS	304
101		1.1	1.1	0.0	1	101	1	0.0000	0.00	STAINLESS	304
102		1.2	1.2	0.0	1	102	1	0.0000	0.00	STAINLESS	304
103		1.3	1.3	0.0	1	103	1	0.0000	0.00	STAINLESS	304
104		1.4	1.4	0.0	1	104	1	0.0000	0.00	STAINLESS	304
105		1.5	1.5	0.0	1	105	1	0.0000	0.00	STAINLESS	304
106		1.6	1.6	0.0	1	106	1	0.0000	0.00	STAINLESS	304
107		1.7	1.7	0.0	1	107	1	0.0000	0.00	STAINLESS	304
108		1.8	1.8	0.0	1	108	1	0.0000	0.00	STAINLESS	304
109		1.9	1.9	0.0	1	109	1	0.0000	0.00	STAINLESS	304
110	0.01	2.0	2.0	0.0	1	110	1	0.0000	0.00	STAINLESS	304
111		2.1	2.1	0.0	1	111	1	0.0000	0.00	STAINLESS	304
112		2.2	2.2	0.0	1	112	1	0.0000	0.00	STAINLESS	304
113		2.3	2.3	0.0	1	113	1	0.0000	0.00	STAINLESS	304
114		2.4	2.4	0.0	1	114	1	0.0000	0.00	STAINLESS	304
115		2.5	2.5	0.0	1	115	1	0.0000	0.00	STAINLESS	304
116	0.01	2.6	2.6	0.0	1	116	1	0.0000	0.00	STAINLESS	304
117		2.7	2.7	0.0	1	117	1	0.0000	0.00	STAINLESS	304
118		2.8	2.8	0.0	1	118	1	0.0000	0.00	STAINLESS	304
119		2.9	2.9	0.0	1	119	1	0.0000	0.00	STAINLESS	304
120		3.0	3.0	0.0	1	120	1	0.0000	0.00	STAINLESS	304
121		3.1	3.1	0.0	1	121	1	0.0000	0.00	STAINLESS	304
122		3.2	3.2	0.0	1	122	1	0.0000	0.00	STAINLESS	304
123		3.3	3.3	0.0	1	123	1	0.0000	0.00	STAINLESS	304
124		3.4	3.4	0.0	1	124	1	0.0000	0.00	STAINLESS	304
125		3.5	3.5	0.0	1	125	1	0.0000	0.00	STAINLESS	304
126	0.01	3.6	3.6	0.0	1	126	1	0.0000	0.00	STAINLESS	304
127		3.7	3.7	0.0	1	127	1	0.0000	0.00	STAINLESS	304
128		3.8	3.8	0.0	1	128	1	0.0000	0.00	STAINLESS	304
129		3.9	3.9	0.0	1	129	1	0.0000	0.00	STAINLESS	304
130		4.0	4.0	0.0	1	130	1	0.0000	0.00	STAINLESS	304
131		4.1	4.1	0.0	1	131	1	0.0000	0.00	STAINLESS	304
132		4.2	4.2	0.0	1	132	1	0.0000	0.00	STAINLESS	304
133		4.3	4.3	0.0	1	133	1	0.0000	0.00	STAINLESS	304
134		4.4	4.4	0.0	1	134	1	0.0000	0.00	STAINLESS	304
135		4.5	4.5	0.0	1	135	1	0.0000	0.00	STAINLESS	304
136	0.01	4.6	4.6	0.0	1	136	1	0.0000	0.00	STAINLESS	304
137		4.7	4.7	0.0	1	137	1	0.0000	0.00	STAINLESS	304
138		4.8	4.8	0.0	1	138	1	0.0000	0.00	STAINLESS	304
139		4.9	4.9	0.0	1	139	1	0.0000	0.00	STAINLESS	304
140		5.0	5.0	0.0	1	140	1	0.0000	0.00	STAINLESS	304
141		5.1	5.1	0.0	1	141	1	0.0000	0.00	STAINLESS	304
142		5.2	5.2	0.0	1	142	1	0.0000	0.00	STAINLESS	304
143		5.3	5.3	0.0	1	143	1	0.0000	0.00	STAINLESS	304
144		5.4	5.4	0.0	1	144	1	0.0000	0.00	STAINLESS	304
145		5.5	5.5	0.0	1	145	1	0.0000	0.00	STAINLESS	304
146	0.01	5.6	5.6	0.0	1	146	1	0.0000	0.00	STAINLESS	304
147		5.7	5.7	0.0	1	147	1	0.0000	0.00	STAINLESS	304
148		5.8	5.8	0.0	1	148	1	0.0000	0.00	STAINLESS	304
149		5.9	5.9	0.0	1	149	1	0.0000	0.00	STAINLESS	304
150		6.0	6.0	0.0	1	150	1	0.0000	0.00	STAINLESS	304

\* Weights are approximate. © 2007, 2008, 2009. Revised for 2014. Catalog # 2007-2009

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## MINIATURE BEAMERS

(cont.)

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BEAMER NUMBER	YEAR	RANGE & CAPACITY	TOTAL POWER	LASER TYPES	LASER CLASS	RANGE CAPACITY	TOTAL FUEL CONSUMPTION	OPERATING COST		UTILIZATION	
								\$/hr	\$/hr	hrs/yr	hrs/yr
0777		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0778		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0779		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0780 (beam)		100	1000	CO2	A	10	2	20000	100	2000/yr	0.70
0780	FM	100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0780 (beam)		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0781		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0782		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0783		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0784		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0785		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0786	FM	100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0787		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0788		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0789		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0790	FM	100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0791		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0792		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0793		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0794		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0795		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0796 (beam)		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0796	FM	100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0797		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0798		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0799	FM	100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0800		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0801		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0802		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0803	FM	100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0804		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0805		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0806	FM	100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0807		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0808		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0809	FM	100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0810		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0811		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0812	FM	100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0813		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0814		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0815	FM	100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0816		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0817		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0818	FM	100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0819		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0820		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0821	FM	100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0822		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0823		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0824	FM	100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0825		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70
0826 (beam)		100	1000	CO2	A	10	0	20000	100	2000/yr	0.70

\* Beam power measured in 100% operation. Beam time at 100% average is 100% of beam power.

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## MINIATURE REAMERS

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STANDARD DIMENSIONS	DRILL SIZE	DIAMETER LENGTH	TOTAL LENGTH	DRILLING LENGTH	FLUTE LENGTH	SHAFT DIAMETER	DRILL CORNER	PRICE		STOCKING	
								TYPE 1	TYPE 2	TYPE 1	TYPE 2
	1/32"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-01	10000
	1/32"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-02	10000
	1/16" (fine)	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-03	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-04	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-05	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-06	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-07	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-08	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-09	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-10	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-11	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-12	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-13	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-14	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-15	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-16	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-17	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-18	10000
	1/16" (fine)	1/8"	1 1/8"	5/8"	4	1/8"	2°/32"	1000000	1000	1000000-19	10000

STANDARD DIMENSIONS	DRILL SIZE	DIAMETER LENGTH	TOTAL LENGTH	DRILLING LENGTH	FLUTE LENGTH	SHAFT DIAMETER	DRILL CORNER	PRICE		STOCKING	
								TYPE 1	TYPE 2	TYPE 1	TYPE 2
	1/32"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-20	10000
	1/32"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-21	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-22	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-23	10000
	1/16" (fine)	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-24	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-25	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-26	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-27	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-28	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-29	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-30	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-31	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-32	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-33	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-34	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-35	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-36	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-37	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-38	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-39	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-40	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-41	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-42	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-43	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-44	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-45	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-46	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-47	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-48	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-49	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-50	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-51	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-52	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-53	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-54	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-55	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-56	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-57	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-58	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-59	10000
	1/16"	1/8"	1 1/8"	5/8"	4	1/8"	3°/32"	1000000	1000	1000000-60	10000

\*Standard dimensions are in inches. All dimensions are in inches unless otherwise indicated.

continued on next page



## MINIATURE REAMERS

Sheet 1

Continued from previous page

REAMER DESCRIPTION	WHL	ROCK LENGTH	OVERALL LENGTH	QUANTUM LENGTH	FLUTES	ROCK DIAMETER	OVERALL LENGTH	MATERIAL		APPROXIMATE	
								TYP. 1	TYP. 2	TYP. 1	TYP. 2
100		85	130	75	2	0.10	1	PM-100	10.0	PM-100-01	1000
100 (SST)		85	130	75	2	0.10	1	PM-100	10.0	PM-100-02	1000
100		85	130	75	2	0.10	1	PM-100	10.0	PM-100-03	1000
100	60	85	130	75	2	0.10	1	PM-100	10.0	PM-100-04	1000
100 (SST) 60		85	130	75	2	0.10	1	PM-100	10.0	PM-100-05	1000
100		85	130	75	2	0.10	1	PM-100	10.0	PM-100-06	1000
100		85	130	75	2	0.10	1	PM-100	10.0	PM-100-07	1000
100	45	85	130	75	2	0.10	1	PM-100	10.0	PM-100-08	1000
100	60	85	130	75	2	0.10	1	PM-100	10.0	PM-100-09	1000
100	75	85	130	75	2	0.10	1	PM-100	10.0	PM-100-10	1000
100	90	85	130	75	2	0.10	1	PM-100	10.0	PM-100-11	1000
110		100	150	100	2	0.10	1	PM-110	11.0	PM-110-01	1000
110		100	150	100	2	0.10	1	PM-110	11.0	PM-110-02	1000
110		100	150	100	2	0.10	1	PM-110	11.0	PM-110-03	1000
110 (SST)		100	150	100	2	0.10	1	PM-110	11.0	PM-110-04	1000
110		100	150	100	2	0.10	1	PM-110	11.0	PM-110-05	1000
110	60	100	150	100	2	0.10	1	PM-110	11.0	PM-110-06	1000
110	75	100	150	100	2	0.10	1	PM-110	11.0	PM-110-07	1000
110	90	100	150	100	2	0.10	1	PM-110	11.0	PM-110-08	1000
110	45	100	150	100	2	0.10	1	PM-110	11.0	PM-110-09	1000
110 (SST) 45		100	150	100	2	0.10	1	PM-110	11.0	PM-110-10	1000
110		100	150	100	2	0.10	1	PM-110	11.0	PM-110-11	1000
110	60	100	150	100	2	0.10	1	PM-110	11.0	PM-110-12	1000
110	75	100	150	100	2	0.10	1	PM-110	11.0	PM-110-13	1000
110	90	100	150	100	2	0.10	1	PM-110	11.0	PM-110-14	1000
120		120	180	120	2	0.10	1	PM-120	12.0	PM-120-01	1000
120		120	180	120	2	0.10	1	PM-120	12.0	PM-120-02	1000
120		120	180	120	2	0.10	1	PM-120	12.0	PM-120-03	1000
120 (SST)		120	180	120	2	0.10	1	PM-120	12.0	PM-120-04	1000
120		120	180	120	2	0.10	1	PM-120	12.0	PM-120-05	1000
120	60	120	180	120	2	0.10	1	PM-120	12.0	PM-120-06	1000
120	75	120	180	120	2	0.10	1	PM-120	12.0	PM-120-07	1000
120	90	120	180	120	2	0.10	1	PM-120	12.0	PM-120-08	1000
120	45	120	180	120	2	0.10	1	PM-120	12.0	PM-120-09	1000
120 (SST) 45		120	180	120	2	0.10	1	PM-120	12.0	PM-120-10	1000
120		120	180	120	2	0.10	1	PM-120	12.0	PM-120-11	1000
120	60	120	180	120	2	0.10	1	PM-120	12.0	PM-120-12	1000
120	75	120	180	120	2	0.10	1	PM-120	12.0	PM-120-13	1000
120	90	120	180	120	2	0.10	1	PM-120	12.0	PM-120-14	1000
130		140	200	140	2	0.10	1	PM-130	13.0	PM-130-01	1000

\* Diameters including coolant. \*\* SST - Stainless Steel. \*\*\* Length is 0.005 inches (0.127 mm).

Continued on next page

# MINIATURE REAMERS

ITEMS 1

continued from previous page

REAMER NUMBER	HSS	HSS H SERVICE	OVERALL LENGTH	SHANK LENGTH	FLUTES	HSS H DIAMETER	OVERALL LENGTH	TYPICAL		MATERIALS	
								TRAQ 2	PR10	TRAQ 2	PR10
6130		1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00
6140		1.00	2.00	0.00	3	1.4	3	0.0020	0.00	0.0020	0.00
6150		1.00	2.00	0.00	4	1.4	4	0.0020	0.00	0.0020	0.00
6170 STAINL		1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00
6180		1.00	2.00	0.00	4	1.0	4	0.0020	0.00	0.0020	0.00
6190		1.00	2.00	0.00	3	1.4	3	0.0020	0.00	0.0020	0.00
6200		1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00
6220 H-REAMER		1.00	2.00	0.00	3	1.4	3	0.0020	0.00	0.0020	0.00
6250	0.5	1.00	2.00	0.00	4	1.4	4	0.0020	0.00	0.0020	0.00
6260	0.1	1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00
6270		1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00
6280		1.00	2.00	0.00	3	1.4	3	0.0020	0.00	0.0020	0.00
6290		1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00
6300	0.8	1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00
6310 H-REAMER		1.00	2.00	0.00	3	1.4	3	0.0020	0.00	0.0020	0.00
6320		1.00	2.00	0.00	3	1.4	4	0.0020	0.00	0.0020	0.00
6330		1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00
6340		1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00
6350 H-REAMER		1.00	2.00	0.00	3	1.4	3	0.0020	0.00	0.0020	0.00
6360	0.8	1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00
6370	0	1.00	2.00	0.00	3	1.4	3	0.0020	0.00	0.0020	0.00
6380	0	1.00	2.00	0.00	3	1.4	4	0.0020	0.00	0.0020	0.00
6390		1.00	2.00	0.00	3	1.4	3	0.0020	0.00	0.0020	0.00
6400		1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00
6410 H-REAMER		1.00	2.00	0.00	3	1.4	3	0.0020	0.00	0.0020	0.00
6420	0.8	1.00	2.00	0.00	3	1.4	4	0.0020	0.00	0.0020	0.00
6430		1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00
6440 H-REAMER		1.00	2.00	0.00	3	1.4	3	0.0020	0.00	0.0020	0.00
6450		1.00	2.00	0.00	3	1.4	3	0.0020	0.00	0.0020	0.00
6460		1.00	2.00	0.00	3	1.4	4	0.0020	0.00	0.0020	0.00
6470 H-REAMER		1.00	2.00	0.00	3	1.4	3	0.0020	0.00	0.0020	0.00
6480		1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00
6490		1.00	2.00	0.00	3	1.0	3	0.0020	0.00	0.0020	0.00

\*Standard tolerances: (1) 2.000" - 0.0020" (2) 0.0020" - 0.0025" (3) 0.0025" - 0.0050" (4) 0.0050" - 0.0100"

**PLEASE SEE SPECIALS & FEEDS ON PAGE 64**



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## MINIATURE BEAMERS

Right Hand Spiral



D (mm)	
Flute	1.25
Overall	2.00

- Thread holes drilled during initial production for superior finish
- Right hand spiral flute for increased chip evacuation in thin wall applications
- Features coolant slots with 35° bevel for maximum coolant and chip evacuation
- Chamfer, corner chamfers to increase strength, stiffness, and accuracy
- 317 stainless steel - 1st choice material for high precision tool holders
- Stock surface finish (Ra) ground to the 4th

TOOL NUMBER	D <sub>1</sub>	FLUTE LENGTH	TOTAL LENGTH	FLUTE LENGTH	FLUTE FLUTE	FLUTE FLUTE	TOTAL LENGTH	RECOMMEND		RECOMMEND	
								RPM	FEED	RPM	FEED
1000	.0075	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1001		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1002	.0100	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1003	.0125	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1004		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1005	.0150	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1006		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1007	.0175	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1008		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1009	.0200	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1010		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1011	.0225	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1012		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1013	.0250	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1014		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1015	.0275	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1016		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1017	.0300	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1018		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1019	.0325	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1020		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1021	.0350	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1022		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1023	.0375	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1024		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1025	.0400	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1026		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1027	.0425	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1028		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1029	.0450	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1030		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1031	.0475	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1032		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1033	.0500	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1034		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1035	.0525	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1036		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1037	.0550	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1038		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1039	.0575	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1040		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1041	.0600	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1042		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1043	.0625	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1044		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1045	.0650	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1046		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1047	.0675	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1048		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1049	.0700	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1050		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1051	.0725	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1052		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1053	.0750	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1054		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1055	.0775	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1056		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1057	.0800	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1058		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1059	.0825	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1060		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1061	.0850	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1062		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1063	.0875	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1064		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1065	.0900	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1066		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1067	.0925	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1068		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1069	.0950	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1070		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1071	.0975	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1072		.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001
1073	.1000	.10	.10	.075	0	10	110	2000	0.05	0.00100000	0.001

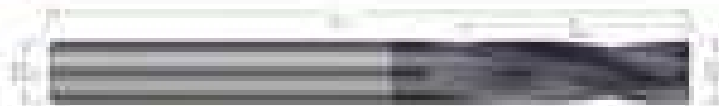
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PLEASE SEE SPREADSHEET ON PAGE 466



# COUNTERBORES

## Flat Bottom



For Best Fixing in Counterboring in Irregular Surfaces

- Flat Bottom (see 040) - Ideal choice for fixing or counterboring in irregular surfaces
- Ideal for cutting threaded parts, grooves or drilled surfaces - Chamfered
- Can be used for the better reaming or straightening of drilled holes - 10° hole - 4° chamfer - Flat bottom
- Ground with 10° symmetrical chamfer (flat side cutting) - ATTC coating for increased performance in terms of abrasion
- ATTC Nano coating for superior performance in terms of difficult to machine materials
- 100% coating penetration during a continuous operation - 100% ground on the side

ITEM NUMBER	FLUTE LENGTH	INNER DIAMETER	SMALL LENGTH	MATERIAL		ATTC COATING		ATTC NANO COATING		TOTAL WEIGHT	
				L1	MM	L1	MM	L1	MM	L1	MM
040	60	10	110	040	0.40	040-02	0.40				
040	70	10	110	040	0.40	040-02	0.40				
040 110	70	10	110	040	0.40	040-02	0.40				
040 120	80	10	110	040	0.40	040-02	0.40			040-02 0.40	
040	80	10	110	040	0.40	040-02	0.40				
040 100	70	10	110	040	0.40	040-02	0.40				
040	70	10	110	040	0.40	040-02	0.40				
040	70	10	110	040	0.40	040-02	0.40				
040 110	70	10	110	040	0.40	040-02	0.40	040-02 0.40		040-02 0.40	
040	80	10	110	040	0.40	040-02	0.40				
040 100	70	10	110	040	0.40	040-02	0.40				
040 120	80	10	110	040	0.40	040-02	0.40	040-02 0.40			
040 140	90	10	110	040	0.40	040-02	0.40				
040 160	70	10	110	040	0.40	040-02	0.40	040-02 0.40	0.40	040-02 0.40	
040 170	70	10	110	040	0.40	040-02	0.40	040-02 0.40	0.40	040-02 0.40	
040 180	70	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 190	80	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 200	80	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 210	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 220	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 230	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 240	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 250	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 260	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 270	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 280	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 290	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 300	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 310	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 320	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 330	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 340	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 350	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 360	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 370	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 380	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 390	90	10	0	040	0.40	040-02	0.40	040-02 0.40			
040 400	90	10	0	040	0.40	040-02	0.40	040-02 0.40			

\*Specify flat end when in product description. \*Specify ATTC or ATTC Nano coating in table. © 2017

continued on next page

## COUNTERBORES

### Flat Bottom (cont.)

Continued from previous page

ITEM NUMBER	FLAT BOTTOM		ITEM NUMBER	FLAT BOTTOM		ITEM PRICE		ITEM WEIGHT		ITEM LENGTH	
	L	D		L	D	EA	PK	EA	PK	EA	PK
900-0000	1.00	0.125	900-0000	1.00	0.125	0.000	0.00	0.000	0.00	0.000	0.000
900-0001	1.00	0.150	900-0001	1.00	0.150	0.000	0.00	0.000	0.00	0.000	0.000
900-0002	1.00	0.175	900-0002	1.00	0.175	0.000	0.00	0.000	0.00	0.000	0.000
900-0003	1.00	0.200	900-0003	1.00	0.200	0.000	0.00	0.000	0.00	0.000	0.000
900-0004	1.00	0.225	900-0004	1.00	0.225	0.000	0.00	0.000	0.00	0.000	0.000
900-0005	1.00	0.250	900-0005	1.00	0.250	0.000	0.00	0.000	0.00	0.000	0.000
900-0006	1.00	0.275	900-0006	1.00	0.275	0.000	0.00	0.000	0.00	0.000	0.000
900-0007	1.00	0.300	900-0007	1.00	0.300	0.000	0.00	0.000	0.00	0.000	0.000
900-0008	1.00	0.325	900-0008	1.00	0.325	0.000	0.00	0.000	0.00	0.000	0.000
900-0009	1.00	0.350	900-0009	1.00	0.350	0.000	0.00	0.000	0.00	0.000	0.000
900-0010	1.00	0.375	900-0010	1.00	0.375	0.000	0.00	0.000	0.00	0.000	0.000
900-0011	1.00	0.400	900-0011	1.00	0.400	0.000	0.00	0.000	0.00	0.000	0.000
900-0012	1.00	0.425	900-0012	1.00	0.425	0.000	0.00	0.000	0.00	0.000	0.000
900-0013	1.00	0.450	900-0013	1.00	0.450	0.000	0.00	0.000	0.00	0.000	0.000
900-0014	1.00	0.475	900-0014	1.00	0.475	0.000	0.00	0.000	0.00	0.000	0.000
900-0015	1.00	0.500	900-0015	1.00	0.500	0.000	0.00	0.000	0.00	0.000	0.000
900-0016	1.00	0.525	900-0016	1.00	0.525	0.000	0.00	0.000	0.00	0.000	0.000
900-0017	1.00	0.550	900-0017	1.00	0.550	0.000	0.00	0.000	0.00	0.000	0.000
900-0018	1.00	0.575	900-0018	1.00	0.575	0.000	0.00	0.000	0.00	0.000	0.000
900-0019	1.00	0.600	900-0019	1.00	0.600	0.000	0.00	0.000	0.00	0.000	0.000
900-0020	1.00	0.625	900-0020	1.00	0.625	0.000	0.00	0.000	0.00	0.000	0.000
900-0021	1.00	0.650	900-0021	1.00	0.650	0.000	0.00	0.000	0.00	0.000	0.000
900-0022	1.00	0.675	900-0022	1.00	0.675	0.000	0.00	0.000	0.00	0.000	0.000
900-0023	1.00	0.700	900-0023	1.00	0.700	0.000	0.00	0.000	0.00	0.000	0.000
900-0024	1.00	0.725	900-0024	1.00	0.725	0.000	0.00	0.000	0.00	0.000	0.000
900-0025	1.00	0.750	900-0025	1.00	0.750	0.000	0.00	0.000	0.00	0.000	0.000
900-0026	1.00	0.775	900-0026	1.00	0.775	0.000	0.00	0.000	0.00	0.000	0.000
900-0027	1.00	0.800	900-0027	1.00	0.800	0.000	0.00	0.000	0.00	0.000	0.000
900-0028	1.00	0.825	900-0028	1.00	0.825	0.000	0.00	0.000	0.00	0.000	0.000
900-0029	1.00	0.850	900-0029	1.00	0.850	0.000	0.00	0.000	0.00	0.000	0.000
900-0030	1.00	0.875	900-0030	1.00	0.875	0.000	0.00	0.000	0.00	0.000	0.000
900-0031	1.00	0.900	900-0031	1.00	0.900	0.000	0.00	0.000	0.00	0.000	0.000
900-0032	1.00	0.925	900-0032	1.00	0.925	0.000	0.00	0.000	0.00	0.000	0.000
900-0033	1.00	0.950	900-0033	1.00	0.950	0.000	0.00	0.000	0.00	0.000	0.000
900-0034	1.00	0.975	900-0034	1.00	0.975	0.000	0.00	0.000	0.00	0.000	0.000
900-0035	1.00	1.000	900-0035	1.00	1.000	0.000	0.00	0.000	0.00	0.000	0.000

Standard flat bottom counterbores are available in diameters ranging from 0.125 to 1.000 inch. Lengths range from 0.125 to 1.000 inch.



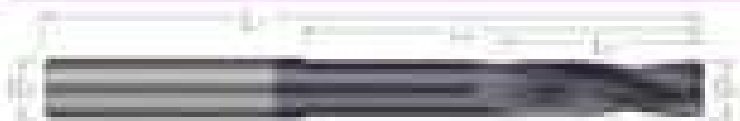
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## COUNTERBORES

### Flat Bottom - Long Reach



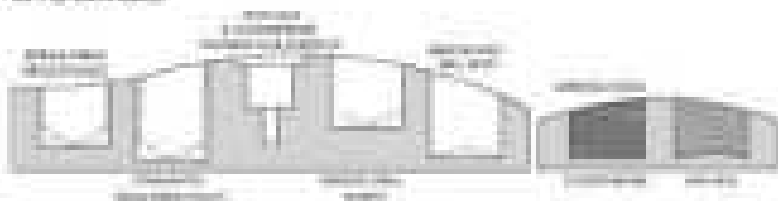
Undersized Flank to Avoid Flaring

- Flat bottom (see Note) design allows easy filing or sandblasting for regular surfaces
- Ideal for castings, rounded parts, aluminum, or plated surfaces
- Can be used for flat bottom reaming or straightening of drilled holes
- Center spring
- Ground with helical flutes for chip evacuation
- 11° Flute
- 3 Flutes
- Solid Carbide
- DDC ground in the USA

ITEM NUMBER	FLUTE LENGTH	OVERALL LENGTH	INNER DIAMETER	OUTER DIAMETER	LENGTHS		WEIGHTS	
					L1	L2	WT.	WT. G
46001000	18	18	1/8	1/8	1.10	1.40	4.4	4.0
46001005	18	18	5/32	5/32	1.10	1.40	4.4	4.0
46001010	18	18	3/16	3/16	1.10	1.40	4.4	4.0
46001015	18	18	1/4	1/4	1.10	1.40	4.4	4.0
46001020	18	18	5/16	5/16	1.10	1.40	4.4	4.0
46001025	18	18	3/8	3/8	1.10	1.40	4.4	4.0
46001030	18	18	7/16	7/16	1.10	1.40	4.4	4.0
46001035	18	18	1/2	1/2	1.10	1.40	4.4	4.0
46001040	18	18	9/16	9/16	1.10	1.40	4.4	4.0
46001045	18	18	5/8	5/8	1.10	1.40	4.4	4.0
46001050	18	18	11/16	11/16	1.10	1.40	4.4	4.0
46001055	18	18	3/4	3/4	1.10	1.40	4.4	4.0
46001060	18	18	13/16	13/16	1.10	1.40	4.4	4.0
46001065	18	18	7/8	7/8	1.10	1.40	4.4	4.0
46001070	18	18	15/16	15/16	1.10	1.40	4.4	4.0
46001075	18	18	1	1	1.10	1.40	4.4	4.0
46001080	18	18	1 1/16	1 1/16	1.10	1.40	4.4	4.0
46001085	18	18	1 1/8	1 1/8	1.10	1.40	4.4	4.0
46001090	18	18	1 1/4	1 1/4	1.10	1.40	4.4	4.0
46001095	18	18	1 3/8	1 3/8	1.10	1.40	4.4	4.0
46001100	18	18	1 1/2	1 1/2	1.10	1.40	4.4	4.0
46001105	18	18	1 5/8	1 5/8	1.10	1.40	4.4	4.0
46001110	18	18	1 3/4	1 3/4	1.10	1.40	4.4	4.0
46001115	18	18	1 7/8	1 7/8	1.10	1.40	4.4	4.0
46001120	18	18	2	2	1.10	1.40	4.4	4.0
46001125	18	18	2 1/16	2 1/16	1.10	1.40	4.4	4.0
46001130	18	18	2 1/8	2 1/8	1.10	1.40	4.4	4.0
46001135	18	18	2 1/4	2 1/4	1.10	1.40	4.4	4.0
46001140	18	18	2 3/8	2 3/8	1.10	1.40	4.4	4.0
46001145	18	18	2 1/2	2 1/2	1.10	1.40	4.4	4.0
46001150	18	18	2 5/8	2 5/8	1.10	1.40	4.4	4.0
46001155	18	18	2 3/4	2 3/4	1.10	1.40	4.4	4.0
46001160	18	18	2 7/8	2 7/8	1.10	1.40	4.4	4.0
46001165	18	18	3	3	1.10	1.40	4.4	4.0
46001170	18	18	3 1/16	3 1/16	1.10	1.40	4.4	4.0
46001175	18	18	3 1/8	3 1/8	1.10	1.40	4.4	4.0
46001180	18	18	3 1/4	3 1/4	1.10	1.40	4.4	4.0
46001185	18	18	3 3/8	3 3/8	1.10	1.40	4.4	4.0
46001190	18	18	3 1/2	3 1/2	1.10	1.40	4.4	4.0
46001195	18	18	3 5/8	3 5/8	1.10	1.40	4.4	4.0
46001200	18	18	3 3/4	3 3/4	1.10	1.40	4.4	4.0
46001205	18	18	3 7/8	3 7/8	1.10	1.40	4.4	4.0
46001210	18	18	4	4	1.10	1.40	4.4	4.0
46001215	18	18	4 1/16	4 1/16	1.10	1.40	4.4	4.0
46001220	18	18	4 1/8	4 1/8	1.10	1.40	4.4	4.0
46001225	18	18	4 1/4	4 1/4	1.10	1.40	4.4	4.0
46001230	18	18	4 3/8	4 3/8	1.10	1.40	4.4	4.0
46001235	18	18	4 1/2	4 1/2	1.10	1.40	4.4	4.0
46001240	18	18	4 5/8	4 5/8	1.10	1.40	4.4	4.0
46001245	18	18	4 3/4	4 3/4	1.10	1.40	4.4	4.0
46001250	18	18	4 7/8	4 7/8	1.10	1.40	4.4	4.0
46001255	18	18	5	5	1.10	1.40	4.4	4.0
46001260	18	18	5 1/16	5 1/16	1.10	1.40	4.4	4.0
46001265	18	18	5 1/8	5 1/8	1.10	1.40	4.4	4.0
46001270	18	18	5 1/4	5 1/4	1.10	1.40	4.4	4.0
46001275	18	18	5 3/8	5 3/8	1.10	1.40	4.4	4.0
46001280	18	18	5 1/2	5 1/2	1.10	1.40	4.4	4.0
46001285	18	18	5 5/8	5 5/8	1.10	1.40	4.4	4.0
46001290	18	18	5 3/4	5 3/4	1.10	1.40	4.4	4.0
46001295	18	18	5 7/8	5 7/8	1.10	1.40	4.4	4.0
46001300	18	18	6	6	1.10	1.40	4.4	4.0

\* Flutes are ground with helical flutes for chip evacuation. Flutes are 11° flutes with 3 flutes.

**APP. 14 (1) (00)**

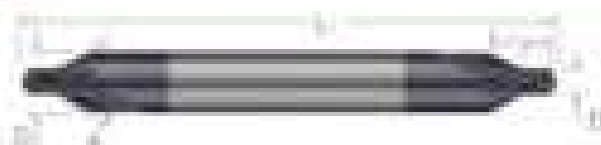


**NOTE: PRECISION:** For all grades, counterbores are made to tight tolerances allowing fitting on regular surfaces.

**NOTE: FILE TO FIT:** The tool is precision ground and held to close tolerances. We recommend you file to finish.

**NOTE: FILE TO FIT:** The tool is precision ground and held to close tolerances. We recommend you file to finish.

## COMBINED DRILL & COUNTERSINKS



- 60°, 82°, 90°, 100° and 120° included angles, plus type
- 2 Flutes
- 130° included top angle
- Double-fluted
- Solid carbide
- CNC ground to the USA

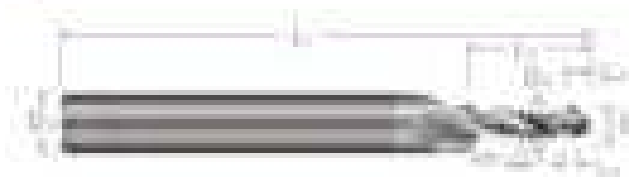


Shank to Flute Angles

INCLUDED ANGLE	D (mm)	DRILL DIAMETER (mm)	DRILL LENGTH (mm)	SHANK DIAMETER (mm)	OVERALL LENGTH (mm)	DRILL FLUTE		DRILL SHANK	
						FLUTE	SHANK	FLUTE	SHANK
60°	1000	100	100	10	110	1100	100	1000.00	1000
	900	80	80	10	90	900	80	900.00	900
	800	60	60	10	70	700	60	700.00	700
	700	50	50	10	60	600	50	600.00	600
	600	40	40	10	50	500	40	500.00	500
	500	30	30	10	40	400	30	400.00	400
	400	25	25	10	35	350	25	350.00	350
	300	20	20	10	30	300	20	300.00	300
	200	15	15	10	25	250	15	250.00	250
	100	10	10	10	20	200	10	200.00	200
82°	1000	100	100	10	110	1000	100	1000.00	1000
	900	80	80	10	90	900	80	900.00	900
	800	60	60	10	70	800	60	800.00	800
	700	50	50	10	60	700	50	700.00	700
	600	40	40	10	50	600	40	600.00	600
	500	30	30	10	40	500	30	500.00	500
	400	25	25	10	35	400	25	400.00	400
90°	1000	100	100	10	110	1100	100	1100.00	1100
	900	80	80	10	90	900	80	900.00	900
	800	60	60	10	70	800	60	800.00	800
	700	50	50	10	60	700	50	700.00	700
	600	40	40	10	50	600	40	600.00	600
	500	30	30	10	40	500	30	500.00	500
	400	25	25	10	35	400	25	400.00	400
	300	20	20	10	30	300	20	300.00	300
	200	15	15	10	25	250	15	250.00	250
100°	1000	100	100	10	110	1000	100	1000.00	1000
	900	80	80	10	90	900	80	900.00	900
	800	60	60	10	70	800	60	800.00	800
	700	50	50	10	60	700	50	700.00	700
	600	40	40	10	50	600	40	600.00	600
120°	1000	100	100	10	110	1000	100	1000.00	1000
	900	80	80	10	90	900	80	900.00	900
	800	60	60	10	70	800	60	800.00	800



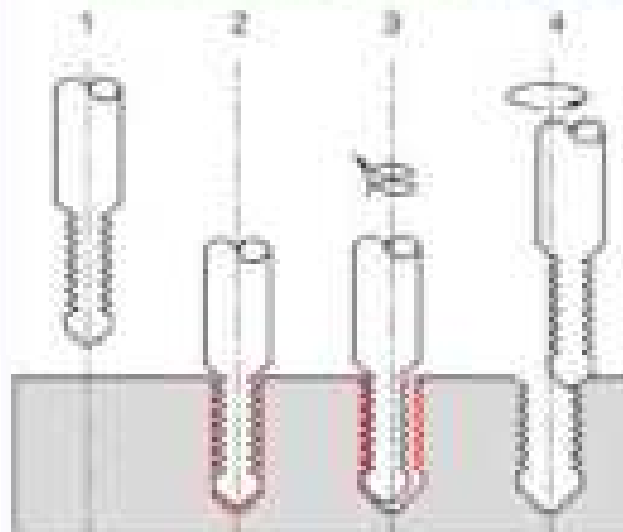
## COMBINATION DRILL / THREAD MILLS



- Designed for combined drilling, broaching, thread chasing, and chamfering
- One cutter for a reduced assembly sequence on lathe, shaper and turret lathes (see to the tool holder)
- Length of cut increases clearance angle, allowing for reduced RPM, chipover pass.
- Optimized for cutting ferrous materials such as aluminum, cuttler steels, casted steels and bronze alloys
- Recommended for cutting, broaching and chamfering through hole.
- 3 Flute to center - 1 Flute tapered 80° LH for web - 1 80° tapered web chamfer
- Hole surface - 120° ground in the USA.

DRILL SIZE	DRILL DIAMETER	LENGTH OF CUT	DRILL DIAMETER	TAPERED WEB DIAMETER	LENGTH OF CUT	LENGTH OF TAPERED WEB	TAPERED LENGTH	DRILL SIZE	FLUTE ANGLE	DIMENSIONS		MATERIALS	
										Ø <sub>1</sub>	Ø <sub>2</sub>	Ø <sub>1</sub>	Ø <sub>2</sub>
1/4"	6.35	25.4	6.35	5.08	25.4	12.7	12.7	1/4"	0	Ø10.0	10.00	Ø10.0	10.00
5/16"	7.94	31.75	7.94	6.35	31.75	15.88	15.88	5/16"	0	Ø12.5	12.50	Ø12.5	12.50
3/8"	9.53	38.10	9.53	7.62	38.10	19.05	19.05	3/8"	0	Ø15.0	15.00	Ø15.0	15.00
1/2"	12.70	50.80	12.70	10.00	50.80	25.40	25.40	1/2"	0	Ø17.5	17.50	Ø17.5	17.50
5/8"	15.88	63.50	15.88	12.70	63.50	31.75	31.75	5/8"	0	Ø20.0	20.00	Ø20.0	20.00
3/4"	19.05	76.20	19.05	15.24	76.20	38.10	38.10	3/4"	0	Ø22.5	22.50	Ø22.5	22.50
7/8"	21.88	86.10	21.88	17.78	86.10	43.05	43.05	7/8"	0	Ø25.0	25.00	Ø25.0	25.00
1"	25.40	101.60	25.40	20.32	101.60	50.80	50.80	1"	0	Ø27.5	27.50	Ø27.5	27.50
1 1/8"	31.75	127.00	31.75	25.40	127.00	63.50	63.50	1 1/8"	0	Ø30.0	30.00	Ø30.0	30.00

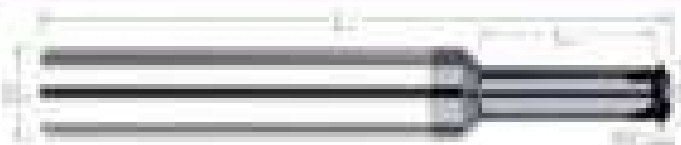
### Combination Drill/Thread Mills Order of Operations



1. Approach the workpiece by rotating the tool along the axis of the unthreaded hole.
2. Drill down to the desired depth for simultaneous chamfering; use the full length of cut to engage the chamfer of the hole.
3. Change thread; lift drill up by the 1/2 cut, horizontally translate by 1/2 cut, then cut to other end of the hole to reverse.
4. Withdraw for full rotation of the hole to finish, proceed to finish the chamfer if desired.

# THREAD MILLING CUTTERS

## Single Form - UN Threads

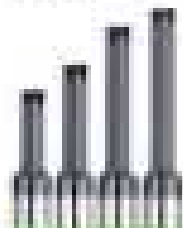


- Single form tool - 1 end used to plane groove
- Both internal and external UN threads
- Both right hand and left hand threads
- Tap all included angles ground to a point

Horizontal thread applications  
or end face applications



Standard Machine  
Thread Length



METRIC DISE	DISE D1	DISE D2	DISE COPY OF THREAD	FLUTES	DISE D3	DISE L1	UNFRAZED		WITH COATING		APPLICATION BY LENGTH	
							PRCL 1	PRCL 2	PRCL 1	PRCL 2	PRCL 1	PRCL 2
10	100	100	1.15	2	10	1.12	T1001	1008	T1001C2	1008		
12	120	120	1.15	2	12	1.12	T1201	1208	T1201C2	1208		
16	160	160	1.15	2	16	1.12	T1601	1608	T1601C2	1608		
20	200	200	1.15	2	20	1.12	T2001	2008	T2001C2	2008	T2001C1	1600
25	250	250	1.15	2	25	1.12	T2501	2508	T2501C2	2508	T2501C1	1600
30	300	300	1.15	2	30	1.12	T3001	3008	T3001C2	3008	T3001C1	1600
40	400	400	1.15	2	40	1.12	T4001	4008	T4001C2	4008	T4001C1	1600
50	500	500	1.15	2	50	1.12	T5001	5008	T5001C2	5008	T5001C1	1600
60	600	600	1.15	2	60	1.12	T6001	6008	T6001C2	6008	T6001C1	1600
80	800	800	1.15	2	80	1.12	T8001	8008	T8001C2	8008	T8001C1	1600
100	1000	1000	1.15	2	100	1.12	T1001	1008	T1001C2	1008	T1001C1	1600
120	1200	1200	1.15	2	120	1.12	T1201	1208	T1201C2	1208	T1201C1	1600
150	1500	1500	1.15	2	150	1.12	T1501	1508	T1501C2	1508	T1501C1	1600
200	2000	2000	1.15	2	200	1.12	T2001	2008	T2001C2	2008	T2001C1	1600
250	2500	2500	1.15	2	250	1.12	T2501	2508	T2501C2	2508	T2501C1	1600
300	3000	3000	1.15	2	300	1.12	T3001	3008	T3001C2	3008	T3001C1	1600
400	4000	4000	1.15	2	400	1.12	T4001	4008	T4001C2	4008	T4001C1	1600
500	5000	5000	1.15	2	500	1.12	T5001	5008	T5001C2	5008	T5001C1	1600
600	6000	6000	1.15	2	600	1.12	T6001	6008	T6001C2	6008	T6001C1	1600
800	8000	8000	1.15	2	800	1.12	T8001	8008	T8001C2	8008	T8001C1	1600
1000	10000	10000	1.15	2	1000	1.12	T1001	1008	T1001C2	1008	T1001C1	1600
1200	12000	12000	1.15	2	1200	1.12	T1201	1208	T1201C2	1208	T1201C1	1600
1500	15000	15000	1.15	2	1500	1.12	T1501	1508	T1501C2	1508	T1501C1	1600
2000	20000	20000	1.15	2	2000	1.12	T2001	2008	T2001C2	2008	T2001C1	1600
2500	25000	25000	1.15	2	2500	1.12	T2501	2508	T2501C2	2508	T2501C1	1600
3000	30000	30000	1.15	2	3000	1.12	T3001	3008	T3001C2	3008	T3001C1	1600
4000	40000	40000	1.15	2	4000	1.12	T4001	4008	T4001C2	4008	T4001C1	1600
5000	50000	50000	1.15	2	5000	1.12	T5001	5008	T5001C2	5008	T5001C1	1600
6000	60000	60000	1.15	2	6000	1.12	T6001	6008	T6001C2	6008	T6001C1	1600

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**THREAD MILLING CUTTERS**

Single Form - UN Threads (cont.)

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THREAD SIZE	SETTER DIA.	HEAT DIA.	MAX DEPTH OF THREAD	FLUTES	SHANK DIA.	TOTAL LENGTH	HSS-E70		HSS-E20		SPECIALTY MATERIALS	
							TOOL #	PRICE	TOOL #	PRICE	TOOL #	PRICE
1/2	1.00	1.00	0.06	2	0.75	3	60000	11.00	60000022	60.00		
3/8	0.75	0.75	0.06	2	0.75	3	7000	11.00	7000022	60.00	7000024	91.00
1/4	0.50	0.50	0.06	2	0.75	3	80000	10.00	8000022	60.00		
3/16	0.375	0.375	0.06	2	0.75	3	13000	10.00	1300022	60.00	1300024	80.00
1/8	0.25	0.25	0.06	2	0.75	3	16000	9.00	1600022	60.00		
5/16	0.3125	0.3125	0.06	2	0.75	3	14000	10.00	1400022	60.00	1400024	80.00
7/16	0.4375	0.4375	0.06	2	0.75	3	18000	10.00	1800022	60.00		
9/16	0.5625	0.5625	0.06	2	0.75	3	21000	11.00	2100022	60.00		
1 1/16	0.6875	0.6875	0.06	2	0.75	3	25000	11.00	2500022	60.00		
1 1/8	0.875	0.875	0.06	2	1.00	3.14	30000	11.00	3000022	60.00	3000024	80.00
1 1/4	1.00	1.00	0.06	2	1.00	3.14	35000	11.00	3500022	60.00		
1 3/8	1.125	1.125	0.06	2	1.00	3.14	40000	12.00	4000022	60.00		
1 1/2	1.25	1.25	0.06	2	1.00	3.14	45000	12.00	4500022	60.00	4500024	100.00
1 5/8	1.375	1.375	0.06	2	1.00	3.14	50000	12.00	5000022	60.00		
1 3/4	1.50	1.50	0.06	2	1.00	3.14	55000	13.00	5500022	60.00	5500024	100.00
1 7/8	1.625	1.625	0.06	2	1.00	3.14	60000	13.00	6000022	60.00		
2	1.75	1.75	0.06	2	1.00	3.14	65000	14.00	6500022	60.00	6500024	100.00
2 1/8	1.875	1.875	0.06	2	1.00	3.14	70000	14.00	7000022	60.00		
2 1/4	2.00	2.00	0.06	2	1.00	3.14	75000	15.00	7500022	60.00		
2 3/8	2.125	2.125	0.06	2	1.00	3.14	80000	15.00	8000022	60.00		
2 1/2	2.25	2.25	0.06	2	1.00	3.14	85000	16.00	8500022	60.00	8500024	100.00
2 5/8	2.375	2.375	0.06	2	1.00	3.14	90000	16.00	9000022	60.00		
2 3/4	2.50	2.50	0.06	2	1.00	3.14	95000	17.00	9500022	60.00	9500024	100.00
2 7/8	2.625	2.625	0.06	2	1.00	3.14	100000	17.00	10000022	60.00		
3	2.75	2.75	0.06	2	1.00	3.14	105000	18.00	10500022	60.00		
3 1/8	2.875	2.875	0.06	2	1.00	3.14	110000	18.00	11000022	60.00		
3 1/4	3.00	3.00	0.06	2	1.00	3.14	115000	19.00	11500022	60.00	1150024	100.00
3 3/8	3.125	3.125	0.06	2	1.00	3.14	120000	19.00	12000022	60.00		
3 1/2	3.25	3.25	0.06	2	1.00	3.14	125000	20.00	12500022	60.00		

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**THREAD MILLING CUTTERS**
**Single Form - UN Threads**

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Thread Size	CUTTER Dia.	Hole Dia.	Max. Depth of Thread	Flutes	Spindle Dia.	Overall Length	HSS-30		SPIN COAT		Sintered Carbide	
							T02-3	P02	T02-3	P02	T02-3	P02
.05	.05	.05	0.10	4	.02	2.12	1.00	10.00	1.0000	12.00	1.0000	12.00
.08	.08	.08	0.16	4	.02	2.12	1.075	10.00	1.0750	12.00	1.0750	12.00
.10	.10	.10	0.20	4	.02	2.12	1.125	10.00	1.1250	12.00	1.1250	12.00
.125	.125	.125	0.25	4	.02	2.12	1.200	10.00	1.2000	12.00	1.2000	12.00
.15	.15	.15	0.30	4	.02	2.12	1.275	10.00	1.2750	12.00	1.2750	12.00
.20	.20	.20	0.40	4	.02	2.12	1.425	10.00	1.4250	12.00	1.4250	12.00
.25	.25	.25	0.50	4	.02	2.12	1.625	10.00	1.6250	12.00	1.6250	12.00
.30	.30	.30	0.60	4	.02	2.12	1.825	10.00	1.8250	12.00	1.8250	12.00
.375	.375	.375	0.75	4	.02	2.12	2.075	10.00	2.0750	12.00	2.0750	12.00
.45	.45	.45	0.90	4	.02	2.12	2.375	10.00	2.3750	12.00	2.3750	12.00
.50	.50	.50	1.00	4	.02	2.12	2.625	10.00	2.6250	12.00	2.6250	12.00
.625	.625	.625	1.25	4	.02	2.12	3.175	10.00	3.1750	12.00	3.1750	12.00
.75	.75	.75	1.50	4	.02	2.12	3.575	10.00	3.5750	12.00	3.5750	12.00
.875	.875	.875	1.75	4	.02	2.12	4.075	10.00	4.0750	12.00	4.0750	12.00
1.00	1.00	1.00	2.00	4	.02	2.12	4.625	10.00	4.6250	12.00	4.6250	12.00
1.125	1.125	1.125	2.25	4	.02	2.12	5.075	10.00	5.0750	12.00	5.0750	12.00
1.25	1.25	1.25	2.50	4	.02	2.12	5.625	10.00	5.6250	12.00	5.6250	12.00
1.375	1.375	1.375	2.75	4	.02	2.12	6.075	10.00	6.0750	12.00	6.0750	12.00
1.50	1.50	1.50	3.00	4	.02	2.12	6.625	10.00	6.6250	12.00	6.6250	12.00
1.75	1.75	1.75	3.50	4	.02	2.12	7.625	10.00	7.6250	12.00	7.6250	12.00
2.00	2.00	2.00	4.00	4	.02	2.12	8.625	10.00	8.6250	12.00	8.6250	12.00
2.25	2.25	2.25	4.50	4	.02	2.12	9.175	10.00	9.1750	12.00	9.1750	12.00
2.50	2.50	2.50	5.00	4	.02	2.12	10.175	10.00	10.1750	12.00	10.1750	12.00
2.75	2.75	2.75	5.50	4	.02	2.12	10.675	10.00	10.6750	12.00	10.6750	12.00
3.00	3.00	3.00	6.00	4	.02	2.12	11.675	10.00	11.6750	12.00	11.6750	12.00
3.25	3.25	3.25	6.50	4	.02	2.12	12.175	10.00	12.1750	12.00	12.1750	12.00
3.50	3.50	3.50	7.00	4	.02	2.12	12.675	10.00	12.6750	12.00	12.6750	12.00
3.75	3.75	3.75	7.50	4	.02	2.12	13.175	10.00	13.1750	12.00	13.1750	12.00
4.00	4.00	4.00	8.00	4	.02	2.12	14.175	10.00	14.1750	12.00	14.1750	12.00
4.25	4.25	4.25	8.50	4	.02	2.12	14.675	10.00	14.6750	12.00	14.6750	12.00
4.50	4.50	4.50	9.00	4	.02	2.12	15.175	10.00	15.1750	12.00	15.1750	12.00
4.75	4.75	4.75	9.50	4	.02	2.12	15.675	10.00	15.6750	12.00	15.6750	12.00
5.00	5.00	5.00	10.00	4	.02	2.12	16.675	10.00	16.6750	12.00	16.6750	12.00
5.25	5.25	5.25	10.50	4	.02	2.12	17.175	10.00	17.1750	12.00	17.1750	12.00
5.50	5.50	5.50	11.00	4	.02	2.12	17.675	10.00	17.6750	12.00	17.6750	12.00
5.75	5.75	5.75	11.50	4	.02	2.12	18.175	10.00	18.1750	12.00	18.1750	12.00
6.00	6.00	6.00	12.00	4	.02	2.12	19.175	10.00	19.1750	12.00	19.1750	12.00
6.25	6.25	6.25	12.50	4	.02	2.12	19.675	10.00	19.6750	12.00	19.6750	12.00
6.50	6.50	6.50	13.00	4	.02	2.12	20.175	10.00	20.1750	12.00	20.1750	12.00
6.75	6.75	6.75	13.50	4	.02	2.12	20.675	10.00	20.6750	12.00	20.6750	12.00
7.00	7.00	7.00	14.00	4	.02	2.12	21.675	10.00	21.6750	12.00	21.6750	12.00
7.25	7.25	7.25	14.50	4	.02	2.12	22.175	10.00	22.1750	12.00	22.1750	12.00
7.50	7.50	7.50	15.00	4	.02	2.12	23.175	10.00	23.1750	12.00	23.1750	12.00
7.75	7.75	7.75	15.50	4	.02	2.12	23.675	10.00	23.6750	12.00	23.6750	12.00
8.00	8.00	8.00	16.00	4	.02	2.12	24.675	10.00	24.6750	12.00	24.6750	12.00
8.25	8.25	8.25	16.50	4	.02	2.12	25.175	10.00	25.1750	12.00	25.1750	12.00
8.50	8.50	8.50	17.00	4	.02	2.12	25.675	10.00	25.6750	12.00	25.6750	12.00
8.75	8.75	8.75	17.50	4	.02	2.12	26.175	10.00	26.1750	12.00	26.1750	12.00
9.00	9.00	9.00	18.00	4	.02	2.12	27.175	10.00	27.1750	12.00	27.1750	12.00
9.25	9.25	9.25	18.50	4	.02	2.12	27.675	10.00	27.6750	12.00	27.6750	12.00
9.50	9.50	9.50	19.00	4	.02	2.12	28.175	10.00	28.1750	12.00	28.1750	12.00
9.75	9.75	9.75	19.50	4	.02	2.12	28.675	10.00	28.6750	12.00	28.6750	12.00
10.00	10.00	10.00	20.00	4	.02	2.12	29.675	10.00	29.6750	12.00	29.6750	12.00
10.25	10.25	10.25	20.50	4	.02	2.12	30.175	10.00	30.1750	12.00	30.1750	12.00
10.50	10.50	10.50	21.00	4	.02	2.12	30.675	10.00	30.6750	12.00	30.6750	12.00
10.75	10.75	10.75	21.50	4	.02	2.12	31.175	10.00	31.1750	12.00	31.1750	12.00
11.00	11.00	11.00	22.00	4	.02	2.12	32.175	10.00	32.1750	12.00	32.1750	12.00
11.25	11.25	11.25	22.50	4	.02	2.12	32.675	10.00	32.6750	12.00	32.6750	12.00
11.50	11.50	11.50	23.00	4	.02	2.12	33.175	10.00	33.1750	12.00	33.1750	12.00
11.75	11.75	11.75	23.50	4	.02	2.12	33.675	10.00	33.6750	12.00	33.6750	12.00
12.00	12.00	12.00	24.00	4	.02	2.12	34.675	10.00	34.6750	12.00	34.6750	12.00
12.25	12.25	12.25	24.50	4	.02	2.12	35.175	10.00	35.1750	12.00	35.1750	12.00
12.50	12.50	12.50	25.00	4	.02	2.12	35.675	10.00	35.6750	12.00	35.6750	12.00
12.75	12.75	12.75	25.50	4	.02	2.12	36.175	10.00	36.1750	12.00	36.1750	12.00
13.00	13.00	13.00	26.00	4	.02	2.12	37.175	10.00	37.1750	12.00	37.1750	12.00
13.25	13.25	13.25	26.50	4	.02	2.12	37.675	10.00	37.6750	12.00	37.6750	12.00
13.50	13.50	13.50	27.00	4	.02	2.12	38.175	10.00	38.1750	12.00	38.1750	12.00
13.75	13.75	13.75	27.50	4	.02	2.12	38.675	10.00	38.6750	12.00	38.6750	12.00
14.00	14.00	14.00	28.00	4	.02	2.12	39.675	10.00	39.6750	12.00	39.6750	12.00
14.25	14.25	14.25	28.50	4	.02	2.12	40.175	10.00	40.1750	12.00	40.1750	12.00
14.50	14.50	14.50	29.00	4	.02	2.12	40.675	10.00	40.6750	12.00	40.6750	12.00
14.75	14.75	14.75	29.50	4	.02	2.12	41.175	10.00	41.1750	12.00	41.1750	12.00
15.00	15.00	15.00	30.00	4	.02	2.12	42.175	10.00	42.1750	12.00	42.1750	12.00
15.25	15.25	15.25	30.50	4	.02	2.12	42.675	10.00	42.6750	12.00	42.6750	12.00
15.50	15.50	15.50	31.00	4	.02	2.12	43.175	10.00	43.1750	12.00	43.1750	12.00
15.75	15.75	15.75	31.50	4	.02	2.12	43.675	10.00	43.6750	12.00	43.6750	12.00
16.00	16.00	16.00	32.00	4	.02	2.12	44.675	10.00	44.6750	12.00	44.6750	12.00
16.25	16.25	16.25	32.50	4	.02	2.12	45.175	10.00	45.1750	12.00	45.1750	12.00
16.50	16.50	16.50	33.00	4	.02	2.12	45.675	10.00	45.6750	12.00	45.6750	12.00
16.75	16.75	16.75	33.50	4	.02	2.12	46.175	10.00	46.1750	12.00	46.1750	12.00
17.00	17.00	17.00	34.00	4	.02	2.12	47.175	10.00	47.1750	12.00	47.1750	12.00
17.25	17.25	17.25	34.50	4	.02	2.12	47.675	10.00	47.6750	12.00	47.6750	12.00
17.50	17.50	17.50	35.00	4	.02	2.12	48.175	10.00	48.1750	12.00	48.1750	12.00
17.75	17.75	17.75	35.50	4	.02	2.12	48.675	10.00	48.6750	12.00	48.6750	12.00
18.00	18.00	18.00	36.00	4	.02	2.12	49.675	10.00	49.6750	12.00	49.6750	12.00
18.25	18.25	18.25	36.50	4	.02	2.12	50.175	10.00	50.1750	12.00	50.1750	12.00
18.50	18.50	18.50	37.00	4	.02	2.12	50.675	10.00	50.6750	12.00	50.6750	12.00
18.75	18.75	18.75	37.50	4	.02	2.12	51.175	10.00	51.1750	12.00	51.1750	12.00
19.00	19.00	19.00	38.00	4	.02	2.12	52.175	10.00	52.1750	12.00	52.1750	12.00
19.25	19.25	19.25	38.50	4	.02	2.12	52.675	10.00	52.6750	12.00	52.6750	12.00
19.50	19.50	19.50	39.00	4	.02	2.12	53.175	10.00	53.1750	12.00	53.1750	12.00
19.75	19.75	19.75	39.50	4	.02	2.12	53.675	10.00	53.6750	12.00	53.6750	12.00
20.00	20.00	20.00	40.00	4	.02	2.12	54.675	10.00	54.6750	12.00	54.6750	12.00

# THREAD MILLING CUTTERS

Single Flute - Metric



- Single thread form - left and right-hand threads
- Double-flute and special 4-flute variants available
- 60° right hand and left hand threads
- Tip of included angle ground to a point
- Solid carbide -  $\pm 0.02$  ground in the USA

To find the right tool, visit the HSS web site [www.hartmann.com](http://www.hartmann.com)



Thread Size	Cutting DIA	HSA DIA	End Chamfer or Diameter	Flutes	Depth DIA	Thread Length	MATERIAL		HSS CODE	
							TEN 1	PRE 2	TEN 4	PRE 8
M3	3.0mm	3.0mm	0.2mm	1	3.0mm	30mm	30001	30 30	30001000	3000
M3	3.0mm	3.0mm	0.2mm	2	3.0mm	30mm	30002	30 30	30002000	3000
M3	3.0mm	3.0mm	0.2mm	4	3.0mm	30mm	30004	30 30	30004000	3000
M4	4.0mm	4.0mm	0.2mm	1	4.0mm	30mm	30001	30 40	30001000	3000
M4	4.0mm	4.0mm	0.2mm	2	4.0mm	30mm	30002	30 40	30002000	3000
M4	4.0mm	4.0mm	0.2mm	4	4.0mm	30mm	30004	30 40	30004000	3000
M5	5.0mm	5.0mm	0.2mm	1	5.0mm	30mm	30001	30 50	30001000	3000
M5	5.0mm	5.0mm	0.2mm	2	5.0mm	30mm	30002	30 50	30002000	3000
M5	5.0mm	5.0mm	0.2mm	4	5.0mm	30mm	30004	30 50	30004000	3000
M6	6.0mm	6.0mm	0.2mm	1	6.0mm	30mm	30001	30 60	30001000	3000
M6	6.0mm	6.0mm	0.2mm	2	6.0mm	30mm	30002	30 60	30002000	3000
M6	6.0mm	6.0mm	0.2mm	4	6.0mm	30mm	30004	30 60	30004000	3000
M8	8.0mm	8.0mm	0.2mm	1	8.0mm	30mm	30001	30 80	30001000	3000
M8	8.0mm	8.0mm	0.2mm	2	8.0mm	30mm	30002	30 80	30002000	3000
M8	8.0mm	8.0mm	0.2mm	4	8.0mm	30mm	30004	30 80	30004000	3000
M10	10.0mm	10.0mm	0.2mm	1	10.0mm	30mm	30001	30 100	30001000	3000
M10	10.0mm	10.0mm	0.2mm	2	10.0mm	30mm	30002	30 100	30002000	3000
M10	10.0mm	10.0mm	0.2mm	4	10.0mm	30mm	30004	30 100	30004000	3000
M12	12.0mm	12.0mm	0.2mm	1	12.0mm	30mm	30001	30 120	30001000	3000
M12	12.0mm	12.0mm	0.2mm	2	12.0mm	30mm	30002	30 120	30002000	3000
M12	12.0mm	12.0mm	0.2mm	4	12.0mm	30mm	30004	30 120	30004000	3000

## THREAD MILLING CUTTERS

Single Flute - UN Threads - For Hardened Steels



The chamfered edge prevents the tool from chipping the workpiece.

- Designed for threading hardened steels at 6000 ft/min
- Single flute form designed to drill accurate pitch diameters
- Case hardened and ground 501-56 threads
- Tip of included angle ground to a flat for increased wear resistance
- Large flute outer diameter and diameter relief for increased strength
- Both left hand and right hand threads - 1/8" shank diameter for high precision ball bearings
- Lubrication with Nano coating offers superior hardness and heat resistance
- Large cutting flute for increased chip removal - 1/8" OSG ground to the 100°

THREAD SIZE	PI (PITCH DIAMETER)	OUTER DIA (OD)	TOP FLAT	SHANK DIAMETER	MIN LENGTH OF TOOLBAR (L)	FLUTE LENGTH (L1)	SHANK LENGTH (L2)	LENGTH (L3)	OTHER AVAILABLE TOOLS	
									Code #	Price
1/8"	0.8438	0.8750	0.0050	0.8750	6.30	2	1.0	1.00	0000110	100.00
1/8"	0.8438	0.8750	0.0050	0.8750	1.0	0	1.0	1.00	0000110	100.00
1/8"	0.8438	0.8750	0.0050	0.8750	0.50	0	1.0	1.00	0000110	100.00
1/4"	1.3000	1.3125	0.0062	1.3125	6.30	2	1.0	1.00	0000110	100.00
1/4"	1.3000	1.3125	0.0062	1.3125	1.0	0	1.0	1.00	0000110	100.00
1/4"	1.3000	1.3125	0.0062	1.3125	0.50	0	1.0	1.00	0000110	100.00
3/8"	1.9688	1.9766	0.0044	1.9766	6.30	2	1.0	1.00	0000110	100.00
3/8"	1.9688	1.9766	0.0044	1.9766	1.0	0	1.0	1.00	0000110	100.00
3/8"	1.9688	1.9766	0.0044	1.9766	0.50	0	1.0	1.00	0000110	100.00
1/2"	2.6250	2.6375	0.0062	2.6375	6.30	2	1.0	1.00	0000110	100.00
1/2"	2.6250	2.6375	0.0062	2.6375	1.0	0	1.0	1.00	0000110	100.00
1/2"	2.6250	2.6375	0.0062	2.6375	0.50	0	1.0	1.00	0000110	100.00
5/8"	3.2688	3.2813	0.0062	3.2813	6.30	2	1.0	1.00	0000110	100.00
5/8"	3.2688	3.2813	0.0062	3.2813	1.0	0	1.0	1.00	0000110	100.00
5/8"	3.2688	3.2813	0.0062	3.2813	0.50	0	1.0	1.00	0000110	100.00
3/4"	3.9375	3.9500	0.0062	3.9500	6.30	2	1.0	1.00	0000110	100.00
3/4"	3.9375	3.9500	0.0062	3.9500	1.0	0	1.0	1.00	0000110	100.00
3/4"	3.9375	3.9500	0.0062	3.9500	0.50	0	1.0	1.00	0000110	100.00
7/8"	4.6188	4.6313	0.0062	4.6313	6.30	2	1.0	1.00	0000110	100.00
7/8"	4.6188	4.6313	0.0062	4.6313	1.0	0	1.0	1.00	0000110	100.00
7/8"	4.6188	4.6313	0.0062	4.6313	0.50	0	1.0	1.00	0000110	100.00
1"	5.3125	5.3250	0.0062	5.3250	6.30	2	1.0	1.00	0000110	100.00
1"	5.3125	5.3250	0.0062	5.3250	1.0	0	1.0	1.00	0000110	100.00
1"	5.3125	5.3250	0.0062	5.3250	0.50	0	1.0	1.00	0000110	100.00
1 1/8"	6.0000	6.0125	0.0062	6.0125	6.30	2	1.0	1.00	0000110	100.00
1 1/8"	6.0000	6.0125	0.0062	6.0125	1.0	0	1.0	1.00	0000110	100.00
1 1/8"	6.0000	6.0125	0.0062	6.0125	0.50	0	1.0	1.00	0000110	100.00
1 1/4"	6.7000	6.7125	0.0062	6.7125	6.30	2	1.0	1.00	0000110	100.00
1 1/4"	6.7000	6.7125	0.0062	6.7125	1.0	0	1.0	1.00	0000110	100.00
1 1/4"	6.7000	6.7125	0.0062	6.7125	0.50	0	1.0	1.00	0000110	100.00
1 3/8"	7.4000	7.4125	0.0062	7.4125	6.30	2	1.0	1.00	0000110	100.00
1 3/8"	7.4000	7.4125	0.0062	7.4125	1.0	0	1.0	1.00	0000110	100.00
1 3/8"	7.4000	7.4125	0.0062	7.4125	0.50	0	1.0	1.00	0000110	100.00
1 1/2"	8.1125	8.1250	0.0062	8.1250	6.30	2	1.0	1.00	0000110	100.00
1 1/2"	8.1125	8.1250	0.0062	8.1250	1.0	0	1.0	1.00	0000110	100.00
1 1/2"	8.1125	8.1250	0.0062	8.1250	0.50	0	1.0	1.00	0000110	100.00
1 3/4"	8.8375	8.8500	0.0062	8.8500	6.30	2	1.0	1.00	0000110	100.00
1 3/4"	8.8375	8.8500	0.0062	8.8500	1.0	0	1.0	1.00	0000110	100.00
1 3/4"	8.8375	8.8500	0.0062	8.8500	0.50	0	1.0	1.00	0000110	100.00
2"	9.5625	9.5750	0.0062	9.5750	6.30	2	1.0	1.00	0000110	100.00
2"	9.5625	9.5750	0.0062	9.5750	1.0	0	1.0	1.00	0000110	100.00
2"	9.5625	9.5750	0.0062	9.5750	0.50	0	1.0	1.00	0000110	100.00
2 1/8"	10.2875	10.3000	0.0062	10.3000	6.30	2	1.0	1.00	0000110	100.00
2 1/8"	10.2875	10.3000	0.0062	10.3000	1.0	0	1.0	1.00	0000110	100.00
2 1/8"	10.2875	10.3000	0.0062	10.3000	0.50	0	1.0	1.00	0000110	100.00
2 1/4"	11.0000	11.0125	0.0062	11.0125	6.30	2	1.0	1.00	0000110	100.00
2 1/4"	11.0000	11.0125	0.0062	11.0125	1.0	0	1.0	1.00	0000110	100.00
2 1/4"	11.0000	11.0125	0.0062	11.0125	0.50	0	1.0	1.00	0000110	100.00
2 3/8"	11.7125	11.7250	0.0062	11.7250	6.30	2	1.0	1.00	0000110	100.00
2 3/8"	11.7125	11.7250	0.0062	11.7250	1.0	0	1.0	1.00	0000110	100.00
2 3/8"	11.7125	11.7250	0.0062	11.7250	0.50	0	1.0	1.00	0000110	100.00
2 1/2"	12.4375	12.4500	0.0062	12.4500	6.30	2	1.0	1.00	0000110	100.00
2 1/2"	12.4375	12.4500	0.0062	12.4500	1.0	0	1.0	1.00	0000110	100.00
2 1/2"	12.4375	12.4500	0.0062	12.4500	0.50	0	1.0	1.00	0000110	100.00
2 3/4"	13.1625	13.1750	0.0062	13.1750	6.30	2	1.0	1.00	0000110	100.00
2 3/4"	13.1625	13.1750	0.0062	13.1750	1.0	0	1.0	1.00	0000110	100.00
2 3/4"	13.1625	13.1750	0.0062	13.1750	0.50	0	1.0	1.00	0000110	100.00
3"	13.9000	13.9125	0.0062	13.9125	6.30	2	1.0	1.00	0000110	100.00
3"	13.9000	13.9125	0.0062	13.9125	1.0	0	1.0	1.00	0000110	100.00
3"	13.9000	13.9125	0.0062	13.9125	0.50	0	1.0	1.00	0000110	100.00

\*Not available in countries with metric thread systems.

continued on next page

## THREAD MILLING CUTTERS

Single Form - UN Threads - For Hardened Steels (cont.)

(Continued from previous page)

CUTTER NO.	PIECE RANGE	CUTTER DIAMETER	TOP FLAT	CUTTER LENGTH	CUTTER LENGTH OF THREAD	PIECE LENGTH	CUTTER DIAMETER	CUTTER LENGTH	PIECE RANGE	
									TO 4"	PIECE
2	1.00	1.00	0.10	3.00	2.70	4	1.00	2.70	0.0000	0.00
4	2.00	1.00	0.10	3.00	2.70	4	1.50	2.70	0.0000	0.00
6	3.00	1.00	0.10	3.00	2.70	4	2.00	2.70	0.0000	0.00
8	4.00	1.00	0.10	3.00	2.70	4	2.50	2.70	0.0000	0.00
10	5.00	1.00	0.10	3.00	2.70	4	3.00	2.70	0.0000	0.00
12	6.00	1.00	0.10	3.00	2.70	4	3.50	2.70	0.0000	0.00
14	7.00	1.00	0.10	3.00	2.70	4	4.00	2.70	0.0000	0.00
16	8.00	1.00	0.10	3.00	2.70	4	4.50	2.70	0.0000	0.00
18	9.00	1.00	0.10	3.00	2.70	4	5.00	2.70	0.0000	0.00
20	10.00	1.00	0.10	3.00	2.70	4	5.50	2.70	0.0000	0.00
22	11.00	1.00	0.10	3.00	2.70	4	6.00	2.70	0.0000	0.00
24	12.00	1.00	0.10	3.00	2.70	4	6.50	2.70	0.0000	0.00
26	13.00	1.00	0.10	3.00	2.70	4	7.00	2.70	0.0000	0.00
28	14.00	1.00	0.10	3.00	2.70	4	7.50	2.70	0.0000	0.00
30	15.00	1.00	0.10	3.00	2.70	4	8.00	2.70	0.0000	0.00
32	16.00	1.00	0.10	3.00	2.70	4	8.50	2.70	0.0000	0.00
34	17.00	1.00	0.10	3.00	2.70	4	9.00	2.70	0.0000	0.00
36	18.00	1.00	0.10	3.00	2.70	4	9.50	2.70	0.0000	0.00
38	19.00	1.00	0.10	3.00	2.70	4	10.00	2.70	0.0000	0.00
40	20.00	1.00	0.10	3.00	2.70	4	10.50	2.70	0.0000	0.00
42	21.00	1.00	0.10	3.00	2.70	4	11.00	2.70	0.0000	0.00
44	22.00	1.00	0.10	3.00	2.70	4	11.50	2.70	0.0000	0.00
46	23.00	1.00	0.10	3.00	2.70	4	12.00	2.70	0.0000	0.00
48	24.00	1.00	0.10	3.00	2.70	4	12.50	2.70	0.0000	0.00
50	25.00	1.00	0.10	3.00	2.70	4	13.00	2.70	0.0000	0.00
52	26.00	1.00	0.10	3.00	2.70	4	13.50	2.70	0.0000	0.00
54	27.00	1.00	0.10	3.00	2.70	4	14.00	2.70	0.0000	0.00
56	28.00	1.00	0.10	3.00	2.70	4	14.50	2.70	0.0000	0.00
58	29.00	1.00	0.10	3.00	2.70	4	15.00	2.70	0.0000	0.00
60	30.00	1.00	0.10	3.00	2.70	4	15.50	2.70	0.0000	0.00
62	31.00	1.00	0.10	3.00	2.70	4	16.00	2.70	0.0000	0.00
64	32.00	1.00	0.10	3.00	2.70	4	16.50	2.70	0.0000	0.00
66	33.00	1.00	0.10	3.00	2.70	4	17.00	2.70	0.0000	0.00
68	34.00	1.00	0.10	3.00	2.70	4	17.50	2.70	0.0000	0.00
70	35.00	1.00	0.10	3.00	2.70	4	18.00	2.70	0.0000	0.00
72	36.00	1.00	0.10	3.00	2.70	4	18.50	2.70	0.0000	0.00
74	37.00	1.00	0.10	3.00	2.70	4	19.00	2.70	0.0000	0.00
76	38.00	1.00	0.10	3.00	2.70	4	19.50	2.70	0.0000	0.00
78	39.00	1.00	0.10	3.00	2.70	4	20.00	2.70	0.0000	0.00
80	40.00	1.00	0.10	3.00	2.70	4	20.50	2.70	0.0000	0.00
82	41.00	1.00	0.10	3.00	2.70	4	21.00	2.70	0.0000	0.00
84	42.00	1.00	0.10	3.00	2.70	4	21.50	2.70	0.0000	0.00
86	43.00	1.00	0.10	3.00	2.70	4	22.00	2.70	0.0000	0.00
88	44.00	1.00	0.10	3.00	2.70	4	22.50	2.70	0.0000	0.00
90	45.00	1.00	0.10	3.00	2.70	4	23.00	2.70	0.0000	0.00
92	46.00	1.00	0.10	3.00	2.70	4	23.50	2.70	0.0000	0.00
94	47.00	1.00	0.10	3.00	2.70	4	24.00	2.70	0.0000	0.00
96	48.00	1.00	0.10	3.00	2.70	4	24.50	2.70	0.0000	0.00
98	49.00	1.00	0.10	3.00	2.70	4	25.00	2.70	0.0000	0.00
100	50.00	1.00	0.10	3.00	2.70	4	25.50	2.70	0.0000	0.00
102	51.00	1.00	0.10	3.00	2.70	4	26.00	2.70	0.0000	0.00
104	52.00	1.00	0.10	3.00	2.70	4	26.50	2.70	0.0000	0.00
106	53.00	1.00	0.10	3.00	2.70	4	27.00	2.70	0.0000	0.00
108	54.00	1.00	0.10	3.00	2.70	4	27.50	2.70	0.0000	0.00
110	55.00	1.00	0.10	3.00	2.70	4	28.00	2.70	0.0000	0.00
112	56.00	1.00	0.10	3.00	2.70	4	28.50	2.70	0.0000	0.00
114	57.00	1.00	0.10	3.00	2.70	4	29.00	2.70	0.0000	0.00
116	58.00	1.00	0.10	3.00	2.70	4	29.50	2.70	0.0000	0.00
118	59.00	1.00	0.10	3.00	2.70	4	30.00	2.70	0.0000	0.00
120	60.00	1.00	0.10	3.00	2.70	4	30.50	2.70	0.0000	0.00
122	61.00	1.00	0.10	3.00	2.70	4	31.00	2.70	0.0000	0.00
124	62.00	1.00	0.10	3.00	2.70	4	31.50	2.70	0.0000	0.00
126	63.00	1.00	0.10	3.00	2.70	4	32.00	2.70	0.0000	0.00
128	64.00	1.00	0.10	3.00	2.70	4	32.50	2.70	0.0000	0.00
130	65.00	1.00	0.10	3.00	2.70	4	33.00	2.70	0.0000	0.00
132	66.00	1.00	0.10	3.00	2.70	4	33.50	2.70	0.0000	0.00
134	67.00	1.00	0.10	3.00	2.70	4	34.00	2.70	0.0000	0.00
136	68.00	1.00	0.10	3.00	2.70	4	34.50	2.70	0.0000	0.00
138	69.00	1.00	0.10	3.00	2.70	4	35.00	2.70	0.0000	0.00
140	70.00	1.00	0.10	3.00	2.70	4	35.50	2.70	0.0000	0.00
142	71.00	1.00	0.10	3.00	2.70	4	36.00	2.70	0.0000	0.00
144	72.00	1.00	0.10	3.00	2.70	4	36.50	2.70	0.0000	0.00
146	73.00	1.00	0.10	3.00	2.70	4	37.00	2.70	0.0000	0.00
148	74.00	1.00	0.10	3.00	2.70	4	37.50	2.70	0.0000	0.00
150	75.00	1.00	0.10	3.00	2.70	4	38.00	2.70	0.0000	0.00
152	76.00	1.00	0.10	3.00	2.70	4	38.50	2.70	0.0000	0.00
154	77.00	1.00	0.10	3.00	2.70	4	39.00	2.70	0.0000	0.00
156	78.00	1.00	0.10	3.00	2.70	4	39.50	2.70	0.0000	0.00
158	79.00	1.00	0.10	3.00	2.70	4	40.00	2.70	0.0000	0.00
160	80.00	1.00	0.10	3.00	2.70	4	40.50	2.70	0.0000	0.00
162	81.00	1.00	0.10	3.00	2.70	4	41.00	2.70	0.0000	0.00
164	82.00	1.00	0.10	3.00	2.70	4	41.50	2.70	0.0000	0.00
166	83.00	1.00	0.10	3.00	2.70	4	42.00	2.70	0.0000	0.00
168	84.00	1.00	0.10	3.00	2.70	4	42.50	2.70	0.0000	0.00
170	85.00	1.00	0.10	3.00	2.70	4	43.00	2.70	0.0000	0.00
172	86.00	1.00	0.10	3.00	2.70	4	43.50	2.70	0.0000	0.00
174	87.00	1.00	0.10	3.00	2.70	4	44.00	2.70	0.0000	0.00
176	88.00	1.00	0.10	3.00	2.70	4	44.50	2.70	0.0000	0.00
178	89.00	1.00	0.10	3.00	2.70	4	45.00	2.70	0.0000	0.00
180	90.00	1.00	0.10	3.00	2.70	4	45.50	2.70	0.0000	0.00
182	91.00	1.00	0.10	3.00	2.70	4	46.00	2.70	0.0000	0.00
184	92.00	1.00	0.10	3.00	2.70	4	46.50	2.70	0.0000	0.00
186	93.00	1.00	0.10	3.00	2.70	4	47.00	2.70	0.0000	0.00
188	94.00	1.00	0.10	3.00	2.70	4	47.50	2.70	0.0000	0.00
190	95.00	1.00	0.10	3.00	2.70	4	48.00	2.70	0.0000	0.00
192	96.00	1.00	0.10	3.00	2.70	4	48.50	2.70	0.0000	0.00
194	97.00	1.00	0.10	3.00	2.70	4	49.00	2.70	0.0000	0.00
196	98.00	1.00	0.10	3.00	2.70	4	49.50	2.70	0.0000	0.00
198	99.00	1.00	0.10	3.00	2.70	4	50.00	2.70	0.0000	0.00
200	100.00	1.00	0.10	3.00	2.70	4	50.50	2.70	0.0000	0.00
202	101.00	1.00	0.10	3.00	2.70	4	51.00	2.70	0.0000	0.00
204	102.00	1.00	0.10	3.00	2.70	4	51.50	2.70	0.0000	0.00
206	103.00	1.00	0.10	3.00	2.70	4	52.00	2.70	0.0000	0.00
208	104.00	1.00	0.10	3.00	2.70	4	52.50	2.70	0.0000	0.00
210	105.00	1.00	0.10	3.00	2.70	4	53.00	2.70	0.0000	0.00
212	106.00	1.00	0.10	3.00	2.70	4	53.50	2.70	0.0000	0.00
214	107.00	1.00	0.10	3.00	2.70	4	54.00	2.70	0.0000	0.00
216	108.00	1.00	0.10	3.00	2.70	4	54.50	2.70	0.0000	0.00
218	109.00	1.00	0.10	3.00	2.70	4	55.00	2.70	0.0000	0.00
220	110.00	1.00	0.10	3.00	2.70	4	55.50	2.70	0.0000	0.00
222	111.00	1.00	0.10	3.00	2.70	4	56.00	2.70	0.0000	0.00
224	112.00	1.00	0.10	3.00	2.70	4	56.50	2.70	0.0000	0.00
226	113.00	1.00	0.10	3.00	2.70	4	57.00	2.70	0.0000	0.00
228	114.00	1.00	0.10	3.00	2.70	4	57.50	2.70	0.0000	0.00
230	115.00	1.00	0.10	3.00	2.70	4	58.00	2.70	0.0000	0.00
232	116.00	1.00	0.10	3.00	2.70	4	58.50	2.70		

# THREAD MILLING CUTTERS

## Single Flute - Metric - For Hardened Steels



Top or bottom edge  
ground for  
improved  
finish

- Designed for threading hardened steels 45-55HRC
- Single flute form designed to cut without chip clog
- Long flute and external 30° chamfer thread
- Top of threaded edge ground to a flat for increased wear resistance
- Large tip outer diameter and extended length for improved strength
- 0.01mm flat head and right hand threads - 100 degree clearance for high precision tool holders
- Special combination ATN Nano coating offers excellent hardness and heat resistance
- Select available grade for improved edge retention - CBN grade in the USA

TOOL NO.	ITEM NUMBER	ITEM DIA.	TOP FLAT	ITEM DIA.	ITEM DEPTH OF THREAD	FLUTE	ITEM DIA.	ITEM LENGTH	ITEM WEIGHT (GROSS)	
									10.000	2.000
001	040	1.0000	01	01.00	0.1500	0	0.70	30.00	1.1000	22.00
002	050	1.2000	01	10.00	0.2000	0	0.70	30.00	1.5000	35.00
003	060	1.5000	01	10.00	0.2500	0	0.70	30.00	1.8000	40.00
004	080	1.8000	01	10.00	0.3000	0	0.70	30.00	2.1000	45.00
005	100	2.0000	01	10.00	0.3500	0	0.70	30.00	2.4000	50.00
006	120	2.2000	01	10.00	0.4000	0	0.70	30.00	2.7000	55.00
007	150	2.5000	01	10.00	0.4500	0	0.70	30.00	3.0000	60.00
008	200	3.0000	01	10.00	0.5000	0	0.70	30.00	3.6000	75.00
009	250	3.5000	01	10.00	0.5500	0	0.70	30.00	4.2000	90.00
010	300	4.0000	01	10.00	0.6000	0	0.70	30.00	4.8000	105.00
011	400	5.0000	01	10.00	0.7000	0	0.70	30.00	6.0000	135.00
012	500	6.0000	01	10.00	0.8000	0	0.70	30.00	7.2000	165.00
013	600	7.0000	01	10.00	0.9000	0	0.70	30.00	8.4000	195.00
014	800	8.0000	01	10.00	1.0000	0	0.70	30.00	10.0000	225.00
015	100	10.0000	01	10.00	1.2000	0	0.70	30.00	12.0000	270.00
016	120	12.0000	01	10.00	1.4000	0	0.70	30.00	14.4000	324.00

Weights subject to tolerance 0.05g, 0.01g or 0.02g depending on grade



# THREAD MILLING CUTTERS

## Tri-Form™ - LH 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 spirals for extra milling time, up to 50% of typical thread
- Three-flute and bevel design reduces tool pressure and deflection resulting in accurate threads
- Sub-optimal SP LH threads - 1 Add to our larger thread of the same size
- All grades tolerant for high pressure tool holders
- Lower generation 4216 HSS coating offers superior hardness and heat resistance
- Heat-treated grade for maximum stability - Made ground in the USA

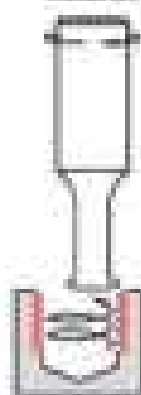
Nominal Size	Cutting Diameter	Length of Cut	HSS Diameter	Max Depth of Thread	Flutes	Bevel Diameter	Bevel Length	Part Number	
								PH	PHSS
1/4"	.400	.500	.400	0.050	3	.500	0.125	99991120	99991120
5/16"	.460	.575	.460	0.050	3	.560	0.125	99991120	99991120
3/8"	.480	.600	.480	0.050	3	.580	0.125	99991120	99991120
7/16"	.540	.675	.540	0.050	3	.640	0.125	99991120	99991120
1/2"	.600	.750	.600	0.050	3	.700	0.125	99991120	99991120
9/16"	.660	.825	.660	0.050	3	.760	0.125	99991120	99991120
5/8"	.720	.900	.720	0.050	3	.820	0.125	99991120	99991120
11/16"	.780	.975	.780	0.050	3	.880	0.125	99991120	99991120
3/4"	.840	1.050	.840	0.050	3	.940	0.125	99991120	99991120
13/16"	.900	1.125	.900	0.050	3	1.000	0.125	99991120	99991120
7/8"	.960	1.200	.960	0.050	3	1.060	0.125	99991120	99991120
15/16"	1.020	1.275	1.020	0.050	3	1.120	0.125	99991120	99991120
1"	1.080	1.350	1.080	0.050	3	1.180	0.125	99991120	99991120
1 1/16"	1.140	1.425	1.140	0.050	3	1.240	0.125	99991120	99991120
1 1/8"	1.200	1.500	1.200	0.050	3	1.300	0.125	99991120	99991120
1 1/4"	1.260	1.575	1.260	0.050	3	1.360	0.125	99991120	99991120
1 3/8"	1.320	1.650	1.320	0.050	3	1.420	0.125	99991120	99991120
1 1/2"	1.380	1.725	1.380	0.050	3	1.480	0.125	99991120	99991120

### Tri-Form Thread Mills

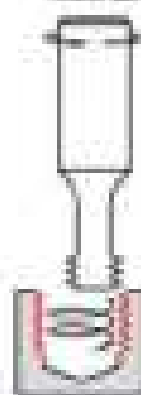
Our Tri-Form Thread Mills are unlike traditional right-hand thread mills, as they have a left-hand cut, left-hand spiral design.

- Improves thread accuracy and surface finish by chip-removal from the top to the bottom of a hole.
- Tri-Form Thread Mills eliminate the need to drill when engaging the tool which reduces radial pressure and deflection.

Traditional Right-Handed Thread Mill



Tri-Form Thread Mill



## THREAD MILLING CUTTERS

### Multi-Flute - LH Threads



- Multi-fluted and available with left-hand
- Single-flute, double and left-hand threads
- Flute to cut larger threads at the same speed
- Various sizes
- Solid carbide
- ISO ground on the shaft

ORDER SIZE	OUTER DIAMETER	LENGTH OF CUT	FLUTE DEPTH	INNER DIAMETER	TOTAL LENGTH	ISO CODE		DIN CODE		ISO CODE	
						HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
1/16"	4.8	1.0	0.1	1.8	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
3/32"	4.8	1.0	0.1	1.8	2	HTA 1	HTA 2	HTA 1	HTA 2		
1/8"	9.5	1.0	0.1	3.8	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
3/16"	9.5	1.0	0.1	3.8	2	HTA 1	HTA 2	HTA 1	HTA 2		
1/4"	19.0	1.0	0.1	7.6	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
5/16"	19.0	1.0	0.1	7.6	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
3/8"	28.5	1.0	0.1	11.4	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
7/16"	28.5	1.0	0.1	11.4	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
1/2"	38.0	1.0	0.1	15.2	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
9/16"	38.0	1.0	0.1	15.2	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
5/8"	47.5	1.0	0.1	19.0	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
11/16"	47.5	1.0	0.1	19.0	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
3/4"	57.0	1.0	0.1	23.8	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
13/16"	57.0	1.0	0.1	23.8	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
7/8"	66.5	1.0	0.1	27.6	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
15/16"	66.5	1.0	0.1	27.6	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
1"	76.0	1.0	0.1	31.4	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
1 1/16"	76.0	1.0	0.1	31.4	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
1 1/8"	85.5	1.0	0.1	35.2	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
1 1/4"	85.5	1.0	0.1	35.2	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
1 3/8"	95.0	1.0	0.1	39.0	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
1 1/2"	95.0	1.0	0.1	39.0	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
1 5/8"	104.5	1.0	0.1	42.8	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
1 3/4"	104.5	1.0	0.1	42.8	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
1 7/8"	114.0	1.0	0.1	46.6	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
2"	114.0	1.0	0.1	46.6	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
2 1/16"	123.5	1.0	0.1	50.4	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
2 1/8"	123.5	1.0	0.1	50.4	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
2 1/4"	133.0	1.0	0.1	54.2	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
2 3/8"	133.0	1.0	0.1	54.2	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
2 1/2"	142.5	1.0	0.1	58.0	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
2 5/8"	142.5	1.0	0.1	58.0	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
2 3/4"	152.0	1.0	0.1	61.8	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
2 7/8"	152.0	1.0	0.1	61.8	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2
3"	161.5	1.0	0.1	65.6	2	HTA 1	HTA 2	HTA 1	HTA 2	HTA 1	HTA 2

\*Always use...

## THREAD MILLING CUTTERS

Multi-Form - UN Threads - For Hardened Steels



- Designed for threading hardened steels 40-60 Hrc
- ISO standard and external ISO UN threads
- Mill right hand and left hand threads
- Mill internal square threads of the same pitch
- Features hole design reduces chatter and tap forces and produces more accurate threads
- Latest generation HSS tools using 5th generation coatings and heat treatment
- Hole coolant guide for maximum tool life
- ISO ground to the tip

Toolset Size	Cutting Diameter	Length of Cut	Flutes	Thread Diameter	Thread Length	Set of 20 Tools	
						Part No.	Price
1/8"	100	100	8	1/8"	1"	WMT1000	100.00
1/4"	100	100	8	1/4"	1"	WMT1000	100.00
3/8"	100	100	8	3/8"	1"	WMT1000	100.00
1/2"	100	100	8	1/2"	1"	WMT1000	100.00
5/8"	100	100	8	5/8"	1"	WMT1000	100.00
3/4"	100	100	8	3/4"	1"	WMT1000	100.00
1"	100	100	8	1"	1"	WMT1000	100.00
1 1/4"	100	100	8	1 1/4"	1"	WMT1000	100.00
1 1/2"	100	100	8	1 1/2"	1"	WMT1000	100.00
1 3/4"	100	100	8	1 3/4"	1"	WMT1000	100.00
2"	100	100	8	2"	1"	WMT1000	100.00
2 1/4"	100	100	8	2 1/4"	1"	WMT1000	100.00
2 1/2"	100	100	8	2 1/2"	1"	WMT1000	100.00
2 3/4"	100	100	8	2 3/4"	1"	WMT1000	100.00
3"	100	100	8	3"	1"	WMT1000	100.00

## THREAD MILLING CUTTERS

### Multi-Form - NPT Threads



- Manufactured and ground to National Pipe Thread (NPT) threads
- Mills right handed and left hand threads
- Finish faces
- Chamfer ends
- CNC ground in the USA



Thread Size	Shank Diameter	Length of Cut	Flutes	Shank Diameter	Overall Length	Standard		With Chamfer		Full Chamfer	
						Part 1	Part 2	Part 1	Part 2	Part 1	Part 2
1/8" NPT	.312	.312	6	.312	2.14		1.92	1.92	1.92	1.92	1.92
1/4" NPT	.375	.375	6	.375	2		1.75	1.75	1.75	1.75	1.75
3/8" NPT	.437	.437	6	.437	2.14		1.92	1.92	1.92	1.92	1.92
1/2" NPT	.500	.500	6	.500	2.28		2.06	2.06	2.06	2.06	2.06
5/8" NPT	.625	.625	6	.625	2		1.75	1.75	1.75	1.75	1.75

## THREAD MILLING CUTTERS

### NPT Tapered End Mills - Square



- 1.47° angle for precision of particular to national standard NPT thread milling
- Length of cut and flutes designed for range of standard NPT diameters
- 4 Flutes
- Finish cutting
- Chamfer ends
- CNC ground in the USA

1.47° Angle for NPT Threads



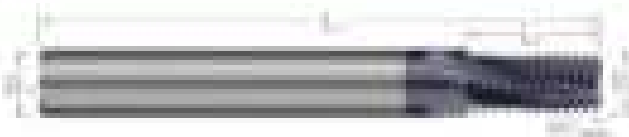
Thread Size	Shank Diameter	Length of Cut	Shank Diameter	Overall Length	Standard		With Chamfer	
					Part 1	Part 2	Part 1	Part 2
1/8"	.312	.312	.312	2		1.75	1.75	
1/4"	.375	.375	.375	2.14		1.92	1.92	
3/8"	.437	.437	.437	2		1.75	1.75	

NPT Thread Pitch Chart

Thread Size	Threads Per Inch	Standard End Thread
1/8"	1.47	Standard
1/4"	1.47	Standard
3/8"	1.47	Standard
1/2"	1.47	Standard

## THREAD MILLING CUTTERS

Multi-Form - NPTF Threads



- Capable of cutting both standard and non-standard (NPTF) threads
- 100% right hand and left hand threads
- Integral Flutes
- Water coolant
- ISO ground to the 100



THREAD SIZE	MACH CUTTER DIAMETER	LENGTH IN CUT	FLUTES	SHANK DIAMETER	OVERALL LENGTH	CUTTING FLUTE		LEFT HAND FLUTE	
						ITEM #	PRICE	ITEM #	PRICE
1/4-20x2	.625	.625	8	.500	2.100	74000	175.00	74000-10	167.00
1/4-28x2	.625	.625	8	.500	2.100	74001	167.00	74001-10	167.00
1/2-13x4	.625	.625	4	.500	2.100	74002	200.00	74002-10	190.00
1/2-20x4	.625	1.125	8	.500	2.100	74003	200.00	74003-10	177.00



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## THREAD MILLING CUTTERS

### Multi-Flute - Metric



- Multi-fluted and tapered 50° chamfer threads
- High speed steel and carbide inserts
- Also for serrated threads at the same price (1) Metric Series (2) International
- ISO 9001 in the USA

HARVEY CODE	CUTTER IN MILLIMETER	LENGTH OF TOOL	FLUTES	SHANK IN MILLIMETER	TYPICAL LENGTH	WEIGHTS		TOTAL WEIGHT	
						TOOL A	TOOL B	TOOL A	TOOL B
HM 100	100	100	6	10	3	1000	100.00	1000.00	100.00
HM 125	125	125	6	12.5	3	1000	125.00	1000.00	125.00
HM 150	150	150	6	15	3	1000	150.00	1000.00	150.00
HM 175	175	175	6	17.5	3	1000	175.00	1000.00	175.00
HM 200	200	200	6	20	3	1000	200.00	1000.00	200.00
HM 250	250	250	6	25	3	1000	250.00	1000.00	250.00
HM 300	300	300	6	30	3	1000	300.00	1000.00	300.00
HM 350	350	350	6	35	3	1000	350.00	1000.00	350.00
HM 400	400	400	6	40	3	1000	400.00	1000.00	400.00
HM 450	450	450	6	45	3	1000	450.00	1000.00	450.00
HM 500	500	500	6	50	3	1000	500.00	1000.00	500.00
HM 550	550	550	6	55	3	1000	550.00	1000.00	550.00
HM 600	600	600	6	60	3	1000	600.00	1000.00	600.00
HM 650	650	650	6	65	3	1000	650.00	1000.00	650.00
HM 700	700	700	6	70	3	1000	700.00	1000.00	700.00
HM 750	750	750	6	75	3	1000	750.00	1000.00	750.00
HM 800	800	800	6	80	3	1000	800.00	1000.00	800.00
HM 850	850	850	6	85	3	1000	850.00	1000.00	850.00
HM 900	900	900	6	90	3	1000	900.00	1000.00	900.00
HM 950	950	950	6	95	3	1000	950.00	1000.00	950.00

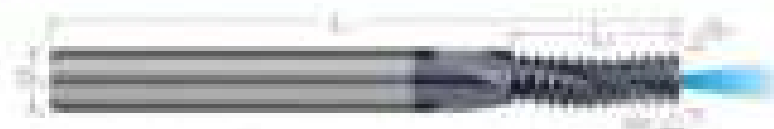


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## THREAD MILLING CUTTERS

Multi-Form - Constant-Through - UN Threads



Constant-Through for  
One-Flute

- Constant-Through design for maximum chip removal in blind holes
- Mills right-hand and left-hand 60° UN threads
- Also in cut larger threads of the same pitch
- Multiple-Flute • Single-Flute • CNC ground to the 100

Thread Size	Cutter Diameter	Length of Cut	Flutes	Shank Diameter	Overall Length	Metric		UN Thread	
						Part 1	Part 2	Part 1	Part 2
1/8"-18	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
1/4"-20	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
1/4"-28	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
3/8"-24	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
1/2"-20	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
1/2"-28	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
5/8"-18	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
5/8"-24	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
3/4"-16	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
3/4"-20	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
3/4"-28	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
7/8"-14	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
7/8"-20	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
1"-14	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00
1"-20	1.00	0.75	4	0.75	2.00	1.00	1.00	1.00	1.00

## THREAD MILLING CUTTERS

Multi-Form - Constant-Through - Metric



Constant-Through for  
One-Flute

- Constant-Through design for maximum chip removal in blind holes
- Mills right-hand and left-hand 60° Metric threads
- Also in cut larger threads of the same pitch
- Multiple-Flute • Single-Flute • CNC ground to the 100

Thread Size	Cutter Diameter	Length of Cut	Flutes	Shank Diameter	Overall Length	Metric		UN Thread	
						Part 1	Part 2	Part 1	Part 2
M3x0.5	3.00	2.25	4	2.25	4.00	3.00	3.00	3.00	3.00
M4x0.7	4.00	3.00	4	3.00	5.00	4.00	4.00	4.00	4.00
M5x0.8	5.00	3.75	4	3.75	6.00	5.00	5.00	5.00	5.00
M6x1.0	6.00	4.50	4	4.50	7.00	6.00	6.00	6.00	6.00
M8x1.25	8.00	6.00	4	6.00	9.00	8.00	8.00	8.00	8.00
M10x1.5	10.00	7.50	4	7.50	11.00	10.00	10.00	10.00	10.00

## THREAD MILLING CUTTERS

Multi-Flute - Long Flute - UN Threads



Designed for  
Deep Threaded  
Applications

- Designed for deep threaded applications
- Large outer diameter for maximum strength
- Due to increased outer diameter, these are designed to achieve 80% or more
- Flute length 80% of flute width
- Wide chip form and wet flood threads
- Able to cut larger threads at the same speed
- Patent Pending
- Solid carbide
- CNC ground to the USA

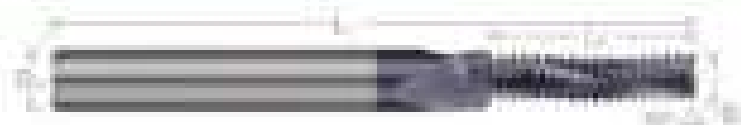
ITEM #	CUTTER DIAMETER	LENGTH OF CUT	FLUTES	CUTTING DIAMETER	TOTAL LENGTH	MATERIAL		SPIN SPEED		FEED RATES	
						PMMA	SS304	PMMA	SS304	PMMA	SS304
0140	1/8"	1/4"	2	1/8"	2"	80710	1000	80710-01	1000	80710-01	1000
0141	3/16"	3/8"	2	3/16"	2"	80710	1000	80710-02	1000	80710-02	1000
0142	1/4"	1/2"	2	1/4"	2"	80710	1000	80710-03	1000	80710-03	1000
0143	5/16"	5/8"	2	5/16"	2"	80710	1000	80710-04	1000	80710-04	1000
0144	3/8"	3/4"	2	3/8"	2"	80710	1000	80710-05	1000	80710-05	1000
0145	1/2"	1"	2	1/2"	2"	80710	1000	80710-06	1000	80710-06	1000
0146	5/8"	1 1/4"	2	5/8"	2"	80710	1000	80710-07	1000	80710-07	1000
0147	3/4"	1 1/2"	2	3/4"	2"	80710	1000	80710-08	1000	80710-08	1000
0148	7/8"	1 3/4"	2	7/8"	2"	80710	1000	80710-09	1000	80710-09	1000
0149	1"	1 3/4"	2	1"	2"	80710	1000	80710-10	1000	80710-10	1000
0150	1 1/8"	1 3/4"	2	1 1/8"	2"	80710	1000	80710-11	1000	80710-11	1000
0151	1 1/4"	1 3/4"	2	1 1/4"	2"	80710	1000	80710-12	1000	80710-12	1000
0152	1 1/2"	1 3/4"	2	1 1/2"	2"	80710	1000	80710-13	1000	80710-13	1000
0153	1 3/4"	1 3/4"	2	1 3/4"	2"	80710	1000	80710-14	1000	80710-14	1000
0154	1 7/8"	1 3/4"	2	1 7/8"	2"	80710	1000	80710-15	1000	80710-15	1000
0155	2"	1 3/4"	2	2"	2"	80710	1000	80710-16	1000	80710-16	1000

\*Always Use



## THREAD MILLING CUTTERS

Multi-Flute - Long Flute - Metric



Designed for  
 Long Threaded  
 Applications

- Designed for deep threaded applications
- Large outer diameter for maximum strength
- Dual-fluted outer diameter, tool are designed to achieve 80% thread
- Same external OD as standard only
- 80% tight flutes and low thread recess
- Able to cut larger diameters in the same year
- Metric sizes
- Stock options
- CNC ground to the 100%

Thread Size	Cutter Diameter	Length of Cut	Flutes	Inner Diameter	Fluting Length	Material		CNC Grind	
						PMMA	PMH	T10-A	T10-B
M10.00	100	250	4	114	2	PMMA	141.00	PMMA-10	144.00
M12.00	100	287	4	120	2.100	PMMA	146.00	PMMA-12	150.00
M14.00	100	300	4	126	2.100	PMMA	149.00	PMMA-14	157.00
M16.00	100	300	4	132	2.100	PMMA	152.00	PMMA-16	160.00
M18.00	100	300	4	138	2.100	PMMA	155.00	PMMA-18	163.00
M20.00	100	300	4	144	2.100	PMMA	158.00	PMMA-20	166.00
M22.00	100	300	4	150	2.100	PMMA	161.00	PMMA-22	169.00



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# THREAD MILLING CUTTERS

## Thread Relief Cutter



- Tool designed to relieve stress concentrations at corners of internal and external threads
- Used to produce chamfered edges (relieving operation) to avoid damaging the thread (see p. 11)
- Greater chamfering occurs over partial threads or lead threads
- Parting feature at base to achieve maximum thread depth
- Center cutting
- Solid carbide
- ISO ground to the finish



D1 (D2)	L1 (D2)	L1	R1 (D2)	R1 (D2)	D1 (D2)	L1 (D2)	D1 (D2)	L1 (D2)	D1 (D2)	L1 (D2)	OPERATION		CUTTING SPEED	
											V <sub>C</sub>	PR <sub>MAX</sub>	V <sub>C</sub>	PR <sub>MAX</sub>
100	100	100	100	100	100	100	100	100	100	100	10000	10.00	10000.00	10.00
125	125	125	125	125	125	125	125	125	125	125	11000	11.00	11000.00	11.00
150	150	150	150	150	150	150	150	150	150	150	12000	12.00	12000.00	12.00
175	175	175	175	175	175	175	175	175	175	175	13000	13.00	13000.00	13.00
200	200	200	200	200	200	200	200	200	200	200	14000	14.00	14000.00	14.00
225	225	225	225	225	225	225	225	225	225	225	15000	15.00	15000.00	15.00
250	250	250	250	250	250	250	250	250	250	250	16000	16.00	16000.00	16.00
275	275	275	275	275	275	275	275	275	275	275	17000	17.00	17000.00	17.00
300	300	300	300	300	300	300	300	300	300	300	18000	18.00	18000.00	18.00
325	325	325	325	325	325	325	325	325	325	325	19000	19.00	19000.00	19.00
350	350	350	350	350	350	350	350	350	350	350	20000	20.00	20000.00	20.00
375	375	375	375	375	375	375	375	375	375	375	21000	21.00	21000.00	21.00
400	400	400	400	400	400	400	400	400	400	400	22000	22.00	22000.00	22.00
425	425	425	425	425	425	425	425	425	425	425	23000	23.00	23000.00	23.00
450	450	450	450	450	450	450	450	450	450	450	24000	24.00	24000.00	24.00
475	475	475	475	475	475	475	475	475	475	475	25000	25.00	25000.00	25.00
500	500	500	500	500	500	500	500	500	500	500	26000	26.00	26000.00	26.00


## TOOL HOLDERS

Introduce a high standard and equipment offering of Tool Holders and Collets, including Extended Reach Tool Holders, Solid DR Imaged Tool Holders, Saw Arms, DR Collets, DR Performance Collets, and accompanying kits and wrenches. When your machine shop installs a family Tool Holder and Collet, you can rest assured that your machine tool performance will be repeatable.

### Tool Holders 007

Extended Reach Tool Holders & Collets  007

Solid DR Imaged Tool Holders  007

Solid DR Imaged Tool Holders - Custom Perfor.  007

Saw Arms  007

### Collets 011

DR Collets  011

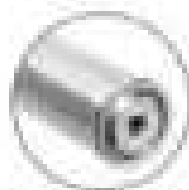
DR Performance Collets  011

## TOOL HOLDERS

### Extended Reach Tool Holders & Collars



- Collar gripping collar with powder coat finish
- Most economical tool holder design with most open features
- High pressure (maximum) and torque
- Maximum T.I.R. of .002" over length of collar portion
- Quick tool change
- Clean through design
- Size weight reduced
- Collar not available - choose from many sizes
- See fitting ring from maximum T.I.R.
- Use with rods, tubes, and shafts



Newer Blasting Collar Design Shows Proof For Speed

#### Tool Holders

GRADE 51 500 TPI	SMALL LENGTH	NEW DESIGN Quick Tool Change	
		TYPE A	TYPE B
10	6	2800	3000
10	6	2800	3000
10	6	2800	3000

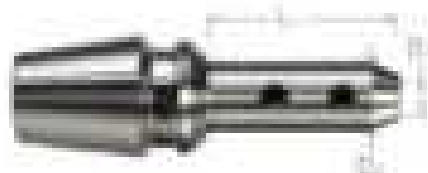
#### Collars

	OD (I.D.) INCH	TYPE A	
		TYPE A	TYPE B
	10	3000	3000
	10	3000	3000
	10	3000	3000
	10	3000	3000
	10	3000	3000



## TOOL HOLDERS

### Solid ER Integrated Tool Holders



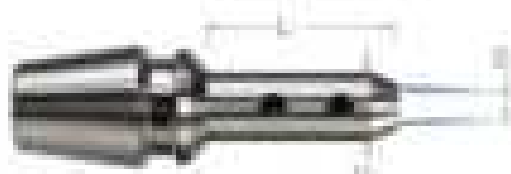
- Precision taper integrated holder that can rotate the tool for multiple spindle applications
- Designed for T30 ER3 Control and Milling Centers
- Works with any ER holder or spindle
- Multiple versions - 11 Maximum T30 at 1:1000"
- Capable of quick change and included stop screw
- Stop screw can be adjusted from both ends of holder



SPINDLE DIAMETER	HAULT DIAMETER	MAXIMUM LENGTH	NAME	TAPER CONNECTION	
D <sub>1</sub>	D <sub>2</sub>	L		THRU #	PRICE
1/4"	3/8"	18"	1000	3000	\$60.00
1/2"	3/4"	18"	1001	3000	\$60.00
3/8"	1/2"	18"	1002	3000	\$60.00
1/2"	3/4"	18"	1003	3000	\$60.00
3/4"	1 1/8"	18"	1004	3000	\$60.00
1"	1 1/4"	18"	1005	3000	\$60.00

## TOOL HOLDERS

### Solid ER Integrated Tool Holders - Coolant Through



- Precision taper integrated holder that allows for the need for multiple spindle applications
- Designed for T30 ER3 Control and Milling Centers
- Works with any ER holder or spindle
- Multiple versions
- Maximum T30 at 1:1000"
- Capable of quick change and included stop screw
- Compatible with coolant through holders
- Stop screw can be adjusted from both ends of holder



SPINDLE DIAMETER	HAULT DIAMETER	MAXIMUM LENGTH	NAME	TAPER CONNECTION	
D <sub>1</sub>	D <sub>2</sub>	L		THRU #	PRICE
1/4"	3/8"	18"	1006	3000	\$60.00

## SAW ARBORS

### Straight Shank



- Maximum I.P.M. of 3000\*
- Straight shank arbor for clearing or mulching applications
- Qty. and material

ARBOR DIAMETER	ARBOR LENGTH	FLANGE DIAMETER	FLANGE LENGTH	FLANGE DIAMETER	FLANGE LENGTH	NET DIAMETER	NET LENGTH	FINISH LENGTH (to Flange or End)	UNIT WEIGHT	
D1	L1	D2	L2	D3	L3	D4	L4	D5	PICT	NET
1/2"	12"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	12"	12"	0.150	0.1775
3/4"	12"	1 3/4"	1 3/4"	1 3/4"	1 3/4"	1 3/4"	12"	12"	0.200	0.2175
1"	12"	2"	1 3/4"	2"	1 3/4"	2"	12"	12"	0.250	0.2175
1 1/2"	12"	2 1/2"	2 1/2"	2 1/2"	2 1/2"	2 1/2"	12"	12"	0.300	0.2175

For Sizing Specs, see pages 285-287



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## ER COLLETS

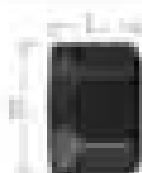


- Maximum T<sub>1</sub> R of 0.004"
- High polished finish helps reduce vibration
- Material not used exceeds 1000 degrees

ER #	ER COLLET		ER COLLETS	
	ER #	ER #	ER #	ER #
ER1	1.0	1.0	ER1	1.0
ER2	1.5	1.5	ER2	1.5
ER3	2.0	2.0	ER3	2.0
ER4	2.5	2.5	ER4	2.5
ER5	3.0	3.0	ER5	3.0
ER6	3.5	3.5	ER6	3.5
ER7	4.0	4.0	ER7	4.0
ER8	4.5	4.5	ER8	4.5
ER9	5.0	5.0	ER9	5.0

## ER COLLETS

ER1-9

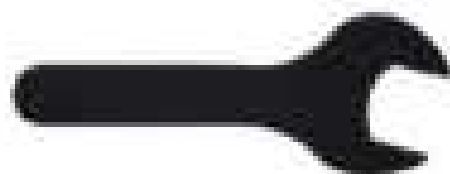


- Special anti-rust coating increases lifespan precision of tool shaft

ER #	ER COLLET		ER COLLETS		ER COLLETS	
	ER #	ER #	ER #	ER #	ER #	ER #
ER1	1.0	1.0	ER1	1.0	ER1	1.0
ER2	1.5	1.5	ER2	1.5	ER2	1.5
ER3	2.0	2.0	ER3	2.0	ER3	2.0
ER4	2.5	2.5	ER4	2.5	ER4	2.5

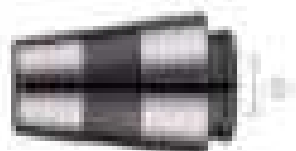
## ER COLLETS

Wrench



ER #	ER COLLET			ER COLLETS	
	ER #	ER #	ER #	ER #	ER #
ER1	1.0	1.0	ER1	ER1	ER1
ER2	1.5	1.5	ER2	ER2	ER2
ER3	2.0	2.0	ER3	ER3	ER3
ER4	2.5	2.5	ER4	ER4	ER4

## ER PERFORMANCE COLLETS



- Operates, the profile design reduces chatter vibration and improves rigidity during tool changes
- Maximum V.R. of 0.002"
- Works with any ER tools in stock
- High precision finish from stock condition
- Hardened and chrome plated separately

SIZE	SIZE RANGE	CLAMP RANGE	ER PERFORMANCE COLLET	
			TOTAL L	INSIDE L
ER1	1/8"	1/8" - 1/2"	2.000"	1.875"
ER2	1/4"	1/4" - 3/4"	2.500"	2.375"
ER3	3/8"	3/8" - 1 1/4"	3.000"	2.875"
ER4	1/2"	1/2" - 1 3/4"	3.500"	3.375"

## ER PERFORMANCE COLLETS

### Nuts



- Process increased clamping pressure on tool shank which reduces vibration and increases tool life
- Allows collet to go further into the collet socket, creating a truly permanent lock
- Reduces spring force, saving increased clamping pressure of tool shank

SIZE	CLAMP RANGE	OUT LENGTH	TOTAL SIZE	CLAMP TYPING	ER PERFORMANCE NUT	
					TOTAL L	INSIDE L
ER1	1/8" - 1/2"	1.500"	2.000" ± 0.001"	1/8" & 1/2"	0.875"	0.875"
ER2	1/4" - 3/4"	1.750"	2.500" ± 0.001"	1/4" & 3/4"	1.125"	1.125"

## ER PERFORMANCE COLLETS

### Wirecutters



SIZE	LENGTH	INSIDE LENGTH	WIRECUTTING	ER PERFORMANCE WIRECUTTER	
				TOTAL L	INSIDE L
ER1	These are made for ER1 ER tools only				
ER2	1.500"	1.125"	0.001"	0.875"	0.875"





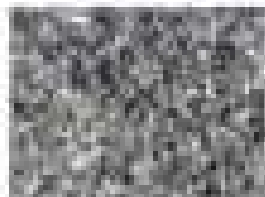
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How to Avoid Common Part Finish Problems



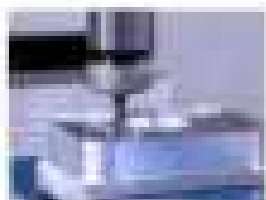
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Why Plus-Coat Matters



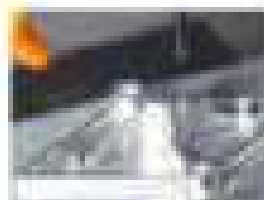
Ultimate Machining Guide



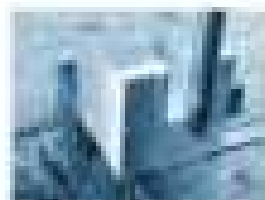
How to Avoid 4 Major Types of Tool Wear



Ball Nose Milling Strategy



Current Equipment: How to Machine Curves



Introduction to High Efficiency Milling

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## COATINGS & SUBSTRATES CHART

Coating Substrate	FW Fusion Welding (1)	AIFW Air-Fusion Welding (2)	AIFW Non-Ferrous Air-Fusion Welding (3)
Applications Benefits:	<ul style="list-style-type: none"> <li>• Good &amp; perfect coating for protecting ferrous materials</li> </ul>	<ul style="list-style-type: none"> <li>• Not perfect with coating in ferrous materials</li> <li>• Excellent heat treatment resistance and hardness</li> <li>• Superior high speed systems at modest temperatures, especially for the wet blowing flame heat cure</li> <li>• Superior strength with heat in both compression and tension (thermal expansion, contraction and creep) and resistance to wear and tear</li> <li>• Excellent in all weathering, including outdoor applications, where thermal shock may occur</li> <li>• Not recommended for use in wetting and diffusion applications</li> </ul>	<ul style="list-style-type: none"> <li>• Excellent coating for non-ferrous materials</li> <li>• Good protection of ferrous materials when in presence of other non-ferrous materials. This includes stainless steels, heat treatment and mechanical and electrical alloys</li> <li>• Superior strength, exceeded for 10,000 cycles using 100% wet hydrogen flame applied to secondary metallurgical steels, some aluminum alloys and titanium</li> <li>• Not recommended for use in wetting and diffusion applications</li> </ul>
Materials:	<b>Ferrous Materials &amp; Exotic Metals</b>		
	Steel & Ferrous Alloy Steels	Aluminum, Magnesium, and other non-ferrous materials	Aluminum alloys, Titanium alloys, Inconel alloys, Hastelloy alloys, and other non-ferrous materials
Color:	Black	Black, Blue, White	Black, Blue
Weldable:	Weldable	Not weldable	Non-Ferrous Not weldable
Residual (at 6.25):	Low (at 6.25)	Low (at 6.25)	Low (at 6.25)
Coefficient of Expansion:	~1	~1	~1
Coating Thickness (microns):	1 - 5	1 - 5	1 - 5
Max. Working Temp:	1000 F	1000 F	1000 F

NOTES: (1) Information and use should also consider heat-treatment practices and curing methods. Data presented is based on the general application practice for protecting ferrous coatings / substrates.

## COATINGS & SUBSTRATES CHART

Zn	TiO <sub>2</sub>	Amorphous Diamond	CVD Diamond (4 µm)	CVD Diamond (7 µm)	PCD Diamond
<ul style="list-style-type: none"> <li>High refractive index (2.00)</li> <li>High thermal conductivity</li> <li>High electrical conductivity</li> <li>High chemical stability</li> <li>High mechanical strength</li> <li>High wear resistance</li> <li>High corrosion resistance</li> <li>High adhesion</li> <li>High flexibility</li> <li>High durability</li> <li>High biocompatibility</li> <li>High biodegradability</li> <li>High cytocompatibility</li> <li>High hemocompatibility</li> <li>High thromboresistance</li> <li>High antibacterial activity</li> <li>High antifouling activity</li> <li>High self-cleaning activity</li> <li>High photocatalytic activity</li> <li>High UV protection</li> <li>High UV curing</li> <li>High UV stability</li> <li>High UV resistance</li> <li>High UV absorption</li> <li>High UV emission</li> <li>High UV scattering</li> <li>High UV reflection</li> <li>High UV transmission</li> <li>High UV absorption</li> <li>High UV emission</li> <li>High UV scattering</li> <li>High UV reflection</li> <li>High UV transmission</li> </ul>	<ul style="list-style-type: none"> <li>High refractive index (2.40)</li> <li>High thermal conductivity</li> <li>High electrical conductivity</li> <li>High chemical stability</li> <li>High mechanical strength</li> <li>High wear resistance</li> <li>High corrosion resistance</li> <li>High adhesion</li> <li>High flexibility</li> <li>High durability</li> <li>High biocompatibility</li> <li>High biodegradability</li> <li>High cytocompatibility</li> <li>High hemocompatibility</li> <li>High thromboresistance</li> <li>High antibacterial activity</li> <li>High antifouling activity</li> <li>High self-cleaning activity</li> <li>High photocatalytic activity</li> <li>High UV protection</li> <li>High UV curing</li> <li>High UV stability</li> <li>High UV resistance</li> <li>High UV absorption</li> <li>High UV emission</li> <li>High UV scattering</li> <li>High UV reflection</li> <li>High UV transmission</li> <li>High UV absorption</li> <li>High UV emission</li> <li>High UV scattering</li> <li>High UV reflection</li> <li>High UV transmission</li> </ul>	<ul style="list-style-type: none"> <li>High refractive index (2.40)</li> <li>High thermal conductivity</li> <li>High electrical conductivity</li> <li>High chemical stability</li> <li>High mechanical strength</li> <li>High wear resistance</li> <li>High corrosion resistance</li> <li>High adhesion</li> <li>High flexibility</li> <li>High durability</li> <li>High biocompatibility</li> <li>High biodegradability</li> <li>High cytocompatibility</li> <li>High hemocompatibility</li> <li>High thromboresistance</li> <li>High antibacterial activity</li> <li>High antifouling activity</li> <li>High self-cleaning activity</li> <li>High photocatalytic activity</li> <li>High UV protection</li> <li>High UV curing</li> <li>High UV stability</li> <li>High UV resistance</li> <li>High UV absorption</li> <li>High UV emission</li> <li>High UV scattering</li> <li>High UV reflection</li> <li>High UV transmission</li> <li>High UV absorption</li> <li>High UV emission</li> <li>High UV scattering</li> <li>High UV reflection</li> <li>High UV transmission</li> </ul>	<ul style="list-style-type: none"> <li>High refractive index (2.40)</li> <li>High thermal conductivity</li> <li>High electrical conductivity</li> <li>High chemical stability</li> <li>High mechanical strength</li> <li>High wear resistance</li> <li>High corrosion resistance</li> <li>High adhesion</li> <li>High flexibility</li> <li>High durability</li> <li>High biocompatibility</li> <li>High biodegradability</li> <li>High cytocompatibility</li> <li>High hemocompatibility</li> <li>High thromboresistance</li> <li>High antibacterial activity</li> <li>High antifouling activity</li> <li>High self-cleaning activity</li> <li>High photocatalytic activity</li> <li>High UV protection</li> <li>High UV curing</li> <li>High UV stability</li> <li>High UV resistance</li> <li>High UV absorption</li> <li>High UV emission</li> <li>High UV scattering</li> <li>High UV reflection</li> <li>High UV transmission</li> <li>High UV absorption</li> <li>High UV emission</li> <li>High UV scattering</li> <li>High UV reflection</li> <li>High UV transmission</li> </ul>	<ul style="list-style-type: none"> <li>High refractive index (2.40)</li> <li>High thermal conductivity</li> <li>High electrical conductivity</li> <li>High chemical stability</li> <li>High mechanical strength</li> <li>High wear resistance</li> <li>High corrosion resistance</li> <li>High adhesion</li> <li>High flexibility</li> <li>High durability</li> <li>High biocompatibility</li> <li>High biodegradability</li> <li>High cytocompatibility</li> <li>High hemocompatibility</li> <li>High thromboresistance</li> <li>High antibacterial activity</li> <li>High antifouling activity</li> <li>High self-cleaning activity</li> <li>High photocatalytic activity</li> <li>High UV protection</li> <li>High UV curing</li> <li>High UV stability</li> <li>High UV resistance</li> <li>High UV absorption</li> <li>High UV emission</li> <li>High UV scattering</li> <li>High UV reflection</li> <li>High UV transmission</li> <li>High UV absorption</li> <li>High UV emission</li> <li>High UV scattering</li> <li>High UV reflection</li> <li>High UV transmission</li> </ul>	<ul style="list-style-type: none"> <li>High refractive index (2.40)</li> <li>High thermal conductivity</li> <li>High electrical conductivity</li> <li>High chemical stability</li> <li>High mechanical strength</li> <li>High wear resistance</li> <li>High corrosion resistance</li> <li>High adhesion</li> <li>High flexibility</li> <li>High durability</li> <li>High biocompatibility</li> <li>High biodegradability</li> <li>High cytocompatibility</li> <li>High hemocompatibility</li> <li>High thromboresistance</li> <li>High antibacterial activity</li> <li>High antifouling activity</li> <li>High self-cleaning activity</li> <li>High photocatalytic activity</li> <li>High UV protection</li> <li>High UV curing</li> <li>High UV stability</li> <li>High UV resistance</li> <li>High UV absorption</li> <li>High UV emission</li> <li>High UV scattering</li> <li>High UV reflection</li> <li>High UV transmission</li> <li>High UV absorption</li> <li>High UV emission</li> <li>High UV scattering</li> <li>High UV reflection</li> <li>High UV transmission</li> </ul>
<b>Non-Ferrous &amp; Non-Metallic Materials</b>					
Aluminum	Aluminum	Aluminum	Aluminum	Aluminum	Aluminum
Steel	Steel	Steel	Steel	Steel	Steel
Titanium	Titanium	Titanium	Titanium	Titanium	Titanium
Copper	Copper	Copper	Copper	Copper	Copper
Silver	Silver	Silver	Silver	Silver	Silver
Gold	Gold	Gold	Gold	Gold	Gold
Inconel	Inconel	Inconel	Inconel	Inconel	Inconel
Kovar	Kovar	Kovar	Kovar	Kovar	Kovar

PLEASE NOTE: Information and test results were collected from multiple sources and testing methods. They provided is intended to be a general guide only and should not be used for product development or quality control purposes.

## INDEX BY SERIES ID

Series ID	Year	Series ID	Year	Series ID	Year	Series ID	Year	Series ID	Year
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1000	42	1000	410	1000	40	1000	380	1000	38
1000	47	1000	410	1000	40	1000	377	1000	38
1000	47	1000	420	1000	40	1000	377	1000	38
1000	74	1000	400	1000	40	1000	370	1000	38
1000	80	1000	400	1000	40	1000	370	1000	38
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0002	0102	1102	2002	3002	4002
0003	0103	1103	2003	3003	4003
0004	0104	1104	2004	3004	4004
0005	0105	1105	2005	3005	4005
0006	0106	1106	2006	3006	4006
0007	0107	1107	2007	3007	4007
0008	0108	1108	2008	3008	4008
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0012	0112	1112	2012	3012	4012
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0014	0114	1114	2014	3014	4014
0015	0115	1115	2015	3015	4015
0016	0116	1116	2016	3016	4016
0017	0117	1117	2017	3017	4017
0018	0118	1118	2018	3018	4018
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0026	0126	1126	2026	3026	4026
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0033	0133	1133	2033	3033	4033
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81704 14	81706 17	81708 20	81710 23	81712 26	81714 29
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81704 17	81706 20	81708 23	81710 26	81712 29	81714 32
81704 18	81706 21	81708 24	81710 27	81712 30	81714 33
81704 19	81706 22	81708 25	81710 28	81712 31	81714 34
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81704 46	81706 49	81708 52	81710 55	81712 58	81714 61
81704 47	81706 50	81708 53	81710 56	81712 59	81714 62
81704 48	81706 51	81708 54	81710 57	81712 60	81714 63
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81704 84	81706 87	81708 90	81710 93	81712 96	81714 99
81704 85	81706 88	81708 91	81710 94	81712 97	81714 100



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# 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.harveypformance.com/tool-libraries](http://www.harveypformance.com/tool-libraries)

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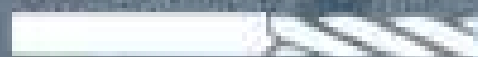
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Product Name	Price	Product Name	Price
Auto Feed Thread Mill	400.000	Variable Feed Drill Bits	270.000
CoPI Thread	400.000	Worming Gears	4.000.000
CoAX Holes	100.000	Super Cool Bits	20.000
Coax Variable Feeding Cutters	400.000	Support Tools Support Cutters	100.000
CoS Standard Drill Bits	200.000	Support Tools Drill Bits	100
Coaxing Feed Cutters	400.000	Tool Wipes	1.000.000
Coax Cooling Feed Mill	200.000	Special Feed Mill	40.000
Coax Variable Cutters	111	Special Feeding System	400.000
Coaxial Feed Cutters	10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80	Special Feed Cutters	100
Coaxing Way Thread Cutters	100	Thru-Hole	100.000
Coaxial Thread Mill	400.000	Tool Holders	500.000
CoS Drill Bits	20.000	Tool-Free Thread Mill	400
Coax	10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80	Tool Wipes	100.000
Coax Cutters	100.000	Unconventional Feed Mill	270.000
CoS Drill	100	Co-Through	400.000, 450.000, 500.000, 550.000, 600.000
CoS Milling Machine	400	Variable Feed Feed Mill	100.000, 150.000, 200.000, 250.000
Coax Feed Thread Mill	400.000	Work Station	100.000
Coax Feed	100.000	Workshop Tools Station	100.000

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