BENCHMARK™

CARBIDE

Main TOC

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CARBIDE

Carbide Cutting Tools

For over thirty years, Benchmark Carbide (a division of Custom Carbide Corporation) is committed to manufacturing the highest quality products, such as carbide end mills and reamers. We offer competitive pricing, and exceptional, responsive customer service. Our products are sold through industrial distributors throughout the continental United States and Canada.

Our company is located in Springfield, Massachusetts. The facility has state-of-the-art CNC machines run by highly-trained operators. We earned the reputation of providing cost effective premium quality American-made products to meet the specific needs of our customers. We offer an extensive line of products, featuring our best selling Aluminum series as well as our Patented Variable Helix End Mills. Our tools are offered with specialty coating to maximize tool life and increase speed and feed rates for usage applications.

Benchmark Carbide also offers optional services such as: regrinding of our products, specials with modifications (i.e. Weldon flats and radiuses). The CNC regrind criteria are set at a minimum of 10 pieces of the same item. All lesser quantities will be reground using conventional cutter grind methods. We also offer technical support such as speeds and feeds to assist the efficiency of production.

Please be sure to login into our company website, www.benchmarkcarbide.com and browse through our company information and catalog. We accept incoming orders through phone, fax, email, or online.
Our inside sales department is ready to work with you in answering all product questions and filling specific orders.

Main TOC

STANDARD TOLERANCES

Our state of the art equipment is designed to ensure consistency and accuracy tool after tool. Our standard cutting tools are manufactured to the following tolerances:

- Cutting Diameter on Standard End Mills: +.000/-.002
- Shank Diameter: -.0001/-.0004
- Ball Nose: +.000/-.002
- Radius: +.001/-001
- Cutting Diameter on Roughing End Mills: +.000/-.005
- Run out Tolerance: .0005 maximum shank to cutting diameter on all series except Long length and extra long length

MODIFICATIONS TO CATALOG STANDARDS

If you see a standard Benchmark Carbide end mill that comes close to what you need, but not exactly, we offer an array of standard tool alterations to suite your needs. Listed below are some of the most frequent alterations we perform on our cutting tools:

- Featured Coatings Available for All Tools
- Corner Radius
- Altered Length of Cut
- Weldon Flats
- Set Screw Flats
- Chamfers
- Coolant Grooves
- Necking

For more information, contact our customer service department, at www.benchmarkcarbide.com . We'll be glad to help.

SPECIALTY TOOLS

Whether it's your design, or one with which we assist, Benchmark Carbide is your source for special application cutting tools. We will put our years of experience to work for you when manufacturing the specific tool that you need.

From special diameters or geometries to tapered ball nose to form cutters, Benchmark Carbide should be your choice for specials. Please give us a call or fax a blueprint. We'll be glad to help.

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www.benchmarkcarbide.com

Toll free: 1-800-523-8570

Fax: 1-413-732-7831

WARNING!

Any cutting tool may break or shatter under improper use.
Government regulations require use of safety glasses and other appropriate safety equipment at all times in the vicinity of use.

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COATINGS

All of our tools are available in a variety of application specific coatings. Please see individual tool listings for stocked treatments and coatings. Other treatments and coatings are available upon request. These coatings are designed to enhance performance as well as the tool life. The chart below is a handy reference outlining the coating composition as well as the suggested application. If the material you are preparing to machine is not listed, please give us a call and we can help.

Code No. Composition	Characteristics	Applications
C1 Titanium Nitride (Tin) 	A general purpose coating which has excellent wear resistance, reduces friction and prevents galling.	Most Ferrous materials. Although it's unlikely, galling may occur in Titanium and Titanium alloys. (Not Recommended for aluminum.)
C4 Titanium Carbo Nitride (Tcin) 	An extremely hard coating on the surface of the tool which has outstanding wear and prevents galling.	Most ferrous, Non-ferrous and Non-Metallic materials very effective at higher speeds. Although it's unlikely galling may occur in Titanium and Titanium Alloys
C5 Zirconium Nitride (Zrn) 	A thin, hard coating that improves lubricity and increases oxidation resistance Specifically designed for machining abrasive and gummy materials.	Suitable for machining Aluminum Alloys, high silica Aluminum, Cast Iron, High Temperature Alloys, Stainless Steel and Glass filled plastics Not recommended for machining Carbon Steels.
C11 Aluminum Titanium Nitride (Altin) 	An extremely hard coating very similar to TIAIN with outstanding wear resistance ALTIN has a higher aluminum content which makes it harder and smoother than TIAIN.	Very effective in the same materials as TIAIN. Excellent for small depths of cut and excels in high speed and dry machining application
C21 Amorphous Diamond Coating 	Synthetic diamond. Low coefficient of friction. Approximately three times harder than TICN.	High abrasive applications graphite, fiberglass, ceramics

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Main TOC

ALUMINUM SERIES END MILLS – 2 FLUTE

ALUMINUM SERIES END MILLS – 3 FLUTE

VARIABLE HELIX V2 SERIES END MILLS – 4 FLUTE

VARIABLE HELIX V2 SERIES END MILLS – 3 FLUTE

Main TOC

VARIABLE HELIX V2 SERIES END MILLS – 5 FLUTE

VARIABLE HELIX V2 SERIES END MILLS – 3 FLUTE

HIGH PERFORMANCE SERIES END MILLS

Main TOC

ROUGHERS SERIES

ROUGHERS SERIES (Cont.)

GENERAL PURPOSE

HIGH PERFORMANCE – 6 & 8 FLUTE

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RUNNER CUTTERS

CHAMFER MILLS

REAMERS

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Recommended Speeds and Feeds Information for Aluminum

High Performance Zirconium Coated Aluminum End Mills

Type of Cut	Aluminum Alloys 6061-T6,7075-T6, 440, 356, 380, C61300	Depth of Cut (vs. Dia of tool)	SFM Speed	End Mill Diameter Chip Load Per Tooth 1/4"	3/8"	1/2"	5/8"	3/4"	1"
Shallow Slotting	< 32 HRC	< 50% of Dia.	1200+	0.0045	0.0071	0.0100	0.0123	0.0149	0.0200
	> 32 HRC		600+	0.0036	0.0057	0.0080	0.0098	0.0119	0.0160
Deep Slotting	< 32 HRC	75 -100% of Dia.	1200+	0.0036	0.0057	0.0080	0.0098	0.0119	0.0160
	> 32 HRC		600+	0.0027	0.0043	0.0060	0.0074	0.0089	0.0120
Medium Radial 1.0 X Dia Depth	< 32 HRC	30% x Dia. Radial	1200+	0.0045	0.0071	0.0100	0.0123	0.0149	0.0200
	> 32 HRC		600+	0.0036	0.0057	0.0080	0.0098	0.0119	0.0160
Heavy Radial 1.0 X Dia Depth	**< 32 HRC**	**50% x Dia. Radial**	**1200+**	**0.0036**	**0.0057**	**0.008**	**0.0098**	**0.01188**	**0.016**
Medium Radial 2.0 X Dia Depth	< 32 HRC	30% x Dia. Radial	1200+	0.0045	0.0071	0.0100	0.0123	0.0149	0.0200
	> 32 HRC		600+	0.0036	0.0057	0.0080	0.0098	0.0119	0.0160
Heavy Radial 2.0 X Dia Depth	**< 32 HRC**	**50% x Dia. Radial**	**1200+**	**0.0036**	**0.0057**	**0.008**	**0.0098**	**0.01188**	**0.016**
Finishing Medium Radial	< 32 HRC	< 25% of Dia.	1200+	0.0045	0.0071	0.0100	0.0123	0.0149	0.0200
	> 32 HRC		600+	0.0036	0.0057	0.0080	0.0098	0.0119	0.0160
Finishing Light Radial	**< 32 HRC**	**< 10% of Dia.**	**1200+**	**0.0045**	**0.00713**	**0.01**	**0.01225**	**0.01485**	**0.02**
Finishing	< 32 HRC	< .010 Radial Depth	1200+	0.0054	0.0086	0.0120	0.0147	0.0178	0.0240
	> 32 HRC		600+	0.0045	0.0071	0.0100	0.0123	0.0149	0.0200

Formulas

RPM= (SFM x 3.82)/tool diameter

IPM= number of flutes x RPM x chip load per tooth

The chart is a starting point based on a coated tool. Reduce rates up to 50% using an uncoated tool.

Important Disclaimer: The speed and feed rates are suggested as a general guideline. Machine type, horsepower, spindle speed limitations, toolholding & workholding devices all may impact a cutting tool's ability to perform properly. As a result BENCHMARK is not responsible for tool failure, part damage or injury that may be caused as a result.

Visit us at Benchmarkcarbide.com

250 SERIES - 2 FLUTE FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	EDP BRIGHT	EDP (ZIRCONIUM C5)
1/8	1/8	1/4	1-1/2	250-12504	250-12504-C5
1/8	1/8	5/16	1-1/2	250-12505	250-12505-C5
1/8	1/8	3/8	1-1/2	250-12506	250-12506-C5
1/8	1/8	1/2	2	250-12508	250-12508-C5
1/8	1/8	5/8	2	250-12510	250-12510-C5
1/8	1/8	3/4	2	250-12512	250-12512-C5
1/8	1/8	1	2-1/2	250-12516	250-12516-C5
5/32	3/16	5/16	2	250-15605	250-15605-C5
5/32	3/16	9/16	2	250-15609	250-15609-C5
3/16	3/16	5/16	2	250-18705	250-18705-C5
3/16	3/16	3/8	2	250-18706	250-18706-C5
3/16	3/16	5/8	2-1/2	250-18710	250-18710-C5
3/16	3/16	3/4	2-1/2	250-18712	250-18712-C5
3/16	3/16	1	2-1/2	250-18716	250-18716-C5
7/32	1/4	3/8	2-1/2	250-21806	250-21806-C5
7/32	1/4	3/4	2-1/2	250-21812	250-21812-C5
1/4	1/4	3/8	2-1/2	250-25006	250-25006-C5
1/4	1/4	1/2	2-1/2	250-25008	250-25008-C5
1/4	1/4	5/8	2-1/2	250-25010	250-25010-C5
1/4	1/4	3/4	2-1/2	250-25012	250-25012-C5
1/4	1/4	1	2-1/2	250-25016	250-25016-C5
1/4	1/4	1-1/8	2-1/2	250-25018	250-25018-C5
1/4	1/4	1-1/4	3	250-25020	250-25020-C5
1/4	1/4	1-1/2	3	250-25024	250-25024-C5
1/4	1/4	2	4	250-25032	250-25032-C5
9/32	5/16	7/16	2-1/2	250-28107	250-28107-C5
9/32	5/16	13/16	2-1/2	250-28113	250-28113-C5
5/16	5/16	7/16	2-1/2	250-31207	250-31207-C5
5/16	5/16	1/2	2-1/2	250-31208	250-31208-C5
5/16	5/16	13/16	2-1/2	250-31213	250-31213-C5
5/16	5/16	1-1/8	2-1/2	250-31218	250-31218-C5
5/16	5/16	1-1/4	3-1/2	250-31220	250-31220-C5
5/16	5/16	1-1/2	3-1/2	250-31224	250-31224-C5
5/16	5/16	2-1/8	4	250-31234	250-31234-C5
11/32	3/8	1/2	2-1/2	250-34308	250-34308-C5
11/32	3/8	1	2-1/2	250-34316	250-34316-C5
3/8	3/8	1/2	2-1/2	250-37508	250-37508-C5
3/8	3/8	5/8	2-1/2	250-37510	250-37510-C5
3/8	3/8	3/4	2-1/2	250-37512	250-37512-C5
3/8	3/8	1	2-1/2	250-37516	250-37516-C5
3/8	3/8	1-1/4	3	250-37520	250-37520-C5
3/8	3/8	1-1/2	4	250-37524	250-37524-C5
3/8	3/8	2	4	250-37532	250-37532-C5
3/8	3/8	2-1/2	6	250-37540	250-37540-C5
13/32	7/16	9/16	2-3/4	250-40609	250-40609-C5
13/32	7/16	1	2-3/4	250-40616	250-40616-C5

250 SERIES - 2 FLUTE FOR ALUMINUM

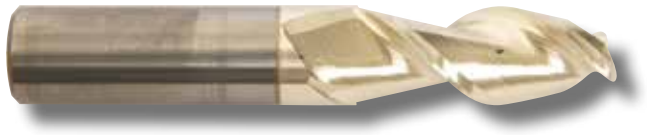
DIA	SHANK DIA	LOC	OAL	EDP BRIGHT	EDP (ZIRCONIUM C5)
7/16	7/16	9/16	2-3/4	250-43709	250-43709-C5
7/16	7/16	1	2-3/4	250-43716	250-43716-C5
7/16	7/16	2	4	250-43732	250-43732-C5
15/32	1/2	5/8	3	250-46810	250-46810-C5
15/32	1/2	1-1/4	3	250-46820	250-46820-C5
1/2	1/2	5/8	3	250-50010	250-50010-C5
1/2	1/2	3/4	3	250-50012	250-50012-C5
1/2	1/2	1	3	250-50016	250-50016-C5
1/2	1/2	1-1/4	3	250-50020	250-50020-C5
1/2	1/2	1-1/2	4	250-50024	250-50024-C5
1/2	1/2	2	4	250-50032	250-50032-C5
1/2	1/2	2-1/4	6	250-50036	250-50036-C5
1/2	1/2	2-1/2	6	250-50040	250-50040-C5
1/2	1/2	3-1/4	6	250-50052	250-50052-C5
1/2	1/2	4	8	250-50064	250-50064-C5
5/8	5/8	3/4	3-1/2	250-62512	250-62512-C5
5/8	5/8	1-1/4	3-1/2	250-62520	250-62520-C5
5/8	5/8	1-5/8	3-1/2	250-62526	250-62526-C5
5/8	5/8	2	5	250-62532	250-62532-C5
5/8	5/8	2-1/2	5	250-62540	250-62540-C5
5/8	5/8	2-3/4	5	250-62544	250-62544-C5
5/8	5/8	3-1/4	6	250-62552	250-62552-C5
5/8	5/8	4	8	250-62564	250-62564-C5
3/4	3/4	1	4	250-75016	250-75016-C5
3/4	3/4	1-1/2	4	250-75024	250-75024-C5
3/4	3/4	1-5/8	4	250-75026	250-75026-C5
3/4	3/4	2	5	250-75032	250-75032-C5
3/4	3/4	2-1/4	5	250-75036	250-75036-C5
3/4	3/4	2-1/2	5	250-75040	250-75040-C5
3/4	3/4	3	6	250-75048	250-75048-C5
3/4	3/4	3-1/4	6	250-75052	250-75052-C5
3/4	3/4	3-1/2	6	250-75056	250-75056-C5
3/4	3/4	4	7	250-75064	250-75064-C5
3/4	3/4	5	8	250-75080	250-75080-C5
1	1	1-1/4	5	250-10020	250-10020-C5
1	1	1-1/2	5	250-10024	250-10024-C5
1	1	2	5	250-10032	250-10032-C5
1	1	2-1/2	5	250-10040	250-10040-C5
1	1	3	6	250-10048	250-10048-C5
1	1	3-1/2	6	250-10056	250-10056-C5
1	1	4-1/8	7	250-10066	250-10066-C5
1	1	5-1/2	8	250-10088	250-10088-C5
1-1/4	1-1/4	1-1/4	4-1/2	250-1.2520	250-1.2520-C5
1-1/4	1-1/4	2	4-1/2	250-1.2532	250-1.2532-C5
1-1/4	1-1/4	3-1/4	6	250-1.2552	250-1.2552-C5
1-1/4	1-1/4	5	7-1/2	250-1.2580	250-1.2580-C5

WE CAN ADD RADIUS TO OUR TOOLS AND SHIP THE NEXT DAY
***ADD 3-4 DAYS FOR COATING**

250 SERIES - 2 FLUTE NECKED FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	(LBS) LENGTH BELOW SHK	EDP BRIGHT	EDP (ZIRCONIUM C5)
1/8	1/8	1/4	1-1/2	0	250-12504N0	250-12504N0-C5
1/8	1/8	1/4	1-1/2	1/2	250-12504N08	250-12504N08-C5
1/8	1/8	1/4	3	0	250-12504NS0	250-12504NS0-C5
1/8	1/8	1/4	3	1-3/8	250-12504NS22	250-12504NS22-C5
3/16	3/16	5/16	2	0	250-18705N0	250-18705N0-C5
3/16	3/16	5/16	2	1/2	250-18705N08	250-18705N08-C5
3/16	3/16	5/16	3	0	250-18705NS0	250-18705NS0-C5
3/16	3/16	5/16	3	1-3/8	250-18705NS22	250-18705NS22-C5
1/4	1/4	3/8	2-1/2	0	250-25006N0	250-25006N0-C5
1/4	1/4	3/8	2-1/2	1-1/8	250-25006N18	250-25006N18-C5
1/4	1/4	3/8	4	0	250-25006NS0	250-25006NS0-C5
1/4	1/4	3/8	4	2-1/8	250-25006NS34	250-25006NS34-C5
5/16	5/16	7/16	2-1/2	0	250-31207N0	250-31207N0-C5
5/16	5/16	7/16	2-1/2	1-1/8	250-31207N18	250-31207N18-C5
5/16	5/16	7/16	4	0	250-31207NS0	250-31207NS0-C5
5/16	5/16	7/16	4	2-1/8	250-31207NS34	250-31207NS34-C5
3/8	3/8	1/2	2-1/2	0	250-37508N0	250-37508N0-C5
3/8	3/8	1/2	2-1/2	1-1/8	250-37508N18	250-37508N18-C5
3/8	3/8	1/2	4	0	250-37508NS0	250-37508NS0-C5
3/8	3/8	1/2	4	2-1/8	250-37508NS34	250-37508NS34-C5
1/2	1/2	5/8	3	0	250-50010N0	250-50010N0-C5
1/2	1/2	5/8	3	1-3/8	250-50010N22	250-50010N22-C5
1/2	1/2	5/8	4	0	250-50010NS0-4	250-50010NS0-4-C5
1/2	1/2	5/8	4	2-3/8	250-50010NS38	250-50010NS38-C5
1/2	1/2	5/8	6	0	250-50010NS0-6	250-50010NS0-6-C5
1/2	1/2	5/8	6	3-3/8	250-50010NS54	250-50010NS54-C5
5/8	5/8	3/4	3-1/2	0	250-62512N0	250-62512N0-C5
5/8	5/8	3/4	3-1/2	1-5/8	250-62512N26	250-62512N26-C5
5/8	5/8	3/4	5	0	250-62512NS0-5	250-62512NS0-5-C5
5/8	5/8	3/4	5	2-3/8	250-62512NS38	250-62512NS38-C5
5/8	5/8	3/4	6	0	250-62512NS0-6	250-62512NS0-6-C5
5/8	5/8	3/4	6	3-3/8	250-62512NS54	250-62512NS54-C5
3/4	3/4	1	4	0	250-75016N0	250-75016N0-C5
3/4	3/4	1	4	1-5/8	250-75016N26	250-75016N26-C5
3/4	3/4	1	5	0	250-75016NS-5	250-75016NS-5-C5
3/4	3/4	1	5	2-1/2	250-75016NS40	250-75016NS40-C5
3/4	3/4	1	6	0	250-75016NS-6	250-75016NS-6-C5
3/4	3/4	1	6	3-3/8	250-75016NS54	250-75016NS54-C5
1	1	1-1/4	5	0	250-10020N0	250-10020N0-C5
1	1	1-1/4	5	2-1/8	250-10020N34	250-10020N34-C5
1	1	1-1/4	6	0	250-10020NS0-6	250-10020NS0-6-C5
1	1	1-1/4	6	3-3/8	250-10020NS54	250-10020NS54-C5
1	1	1-1/4	7	0	250-10020NS0-7	250-10020NS0-7-C5
1	1	1-1/4	7	4-3/8	250-10020NS70	250-10020NS70-C5

250 SERIES - 2 FLUTE WITH RADIUS FOR ALUMINUM



DIA	SHANK DIA	LOC	OAL	EDP WITH RADIUS
1/8	1/8	1/4	1-1/2	250-12504-010-C5
1/8	1/8	3/8	1-1/2	250-12506-010-C5
1/8	1/8	3/8	1-1/2	250-12506-020-C5
1/8	1/8	3/8	1-1/2	250-12506-030-C5
3/16	3/16	5/16	2	250-18705-020-C5
3/16	3/16	5/8	2-1/2	250-18710-010-C5
3/16	3/16	5/8	2-1/2	250-18710-020-C5
3/16	3/16	5/8	2-1/2	250-18710-030-C5
1/4	1/4	3/8	2-1/2	250-25006-015-C5
1/4	1/4	3/8	2-1/2	250-25006-020-C5
1/4	1/4	3/8	2-1/2	250-25006-030-C5
1/4	1/4	3/8	2-1/2	250-25006-060-C5
1/4	1/4	3/4	2-1/2	250-25012-010-C5
1/4	1/4	3/4	2-1/2	250-25012-015-C5
1/4	1/4	3/4	2-1/2	250-25012-020-C5
1/4	1/4	3/4	2-1/2	250-25012-030-C5
1/4	1/4	3/4	2-1/2	250-25012-045-C5
1/4	1/4	3/4	2-1/2	250-25012-060-C5
5/16	5/16	7/16	2-1/2	250-31207-020-C5
5/16	5/16	7/16	2-1/2	250-31207-030-C5
5/16	5/16	13/16	2-1/2	250-31213-020-C5
5/16	5/16	13/16	2-1/2	250-31213-030-C5
5/16	5/16	13/16	2-1/2	250-31213-060-C5
3/8	3/8	1/2	2-1/2	250-37508-020-C5
3/8	3/8	1/2	2-1/2	250-37508-030-C5
3/8	3/8	1/2	2-1/2	250-37508-045-C5
3/8	3/8	1	2-1/2	250-37516-020-C5
3/8	3/8	1	2-1/2	250-37516-030-C5
3/8	3/8	1	2-1/2	250-37516-045-C5
3/8	3/8	1	2-1/2	250-37516-060-C5
1/2	1/2	5/8	3	250-50010-015-C5
1/2	1/2	5/8	3	250-50010-020-C5
1/2	1/2	5/8	3	250-50010-030-C5
1/2	1/2	5/8	3	250-50010-060-C5
1/2	1/2	5/8	3	250-50010-090-C5
1/2	1/2	1-1/4	3	250-50020-015-C5
1/2	1/2	1-1/4	3	250-50020-020-C5
1/2	1/2	1-1/4	3	250-50020-030-C5
1/2	1/2	1-1/4	3	250-50020-060-C5
1/2	1/2	1-1/4	3	250-50020-090-C5
1/2	1/2	1-1/4	3	250-50020-120-C5
5/8	5/8	1-5/8	3-1/2	250-62526-030-C5
5/8	5/8	1-5/8	3-1/2	250-62526-060-C5
5/8	5/8	1-5/8	3-1/2	250-62526-090-C5
5/8	5/8	1-5/8	3-1/2	250-62526-120-C5
3/4	3/4	1	4	250-75016-060-C5
3/4	3/4	1	4	250-75016-090-C5
3/4	3/4	1	4	250-75016-120-C5
3/4	3/4	1-5/8	4	250-75026-060-C5
3/4	3/4	1-5/8	4	250-75026-090-C5
3/4	3/4	1-5/8	4	250-75026-120-C5
1	1	2	5	250-10032-060-C5
1	1	2	5	250-10032-090-C5
1	1	2	5	250-10032-120-C5

250 SERIES - 2 FLUTE BALL NOSE FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	EDP BRIGHT	EDP (ZIRCONIUM C5)
1/8	1/8	1/4	1-1/2	250-12504BN	250-12504BN-C5
1/8	1/8	1/2	2	250-12508BN	250-12508BN-C5
1/8	1/8	3/4	2	250-12512BN	250-12512BN-C5
3/16	3/16	5/16	2	250-18705BN	250-18705BN-C5
3/16	3/16	5/8	2-1/2	250-18710BN	250-18710BN-C5
3/16	3/16	1	2-1/2	250-18716BN	250-18716BN-C5
1/4	1/4	3/8	2-1/2	250-25006BN	250-25006BN-C5
1/4	1/4	3/4	2-1/2	250-25012BN	250-25012BN-C5
1/4	1/4	1-1/4	3	250-25020BN	250-25020BN-C5
5/16	5/16	7/16	2-1/2	250-31207BN	250-31207BN-C5
5/16	5/16	13/16	2-1/2	250-31213BN	250-31213BN-C5
5/16	5/16	1-1/4	3	250-31220BN	250-31220BN-C5
3/8	3/8	1/2	2-1/2	250-37508BN	250-37508BN-C5
3/8	3/8	1	2-1/2	250-37516BN	250-37516BN-C5
3/8	3/8	1-1/2	4	250-37524BN	250-37524BN-C5
7/16	7/16	9/16	2-3/4	250-43709BN	250-43709BN-C5
7/16	7/16	1	2-3/4	250-43716BN	250-43716BN-C5
7/16	7/16	2	4	250-43732BN	250-43732BN-C5
1/2	1/2	5/8	3	250-50010BN	250-50010BN-C5
1/2	1/2	1-1/4	3	250-50020BN	250-50020BN-C5
1/2	1/2	2	4	250-50032BN	250-50032BN-C5
5/8	5/8	3/4	3-1/2	250-62512BN	250-62512BN-C5
5/8	5/8	1-5/8	3-1/2	250-62526BN	250-62526BN-C5
5/8	5/8	2-1/2	5	250-62540BN	250-62540BN-C5
3/4	3/4	1	4	250-75016BN	250-75016BN-C5
3/4	3/4	1-5/8	4	250-75026BN	250-75026BN-C5
3/4	3/4	3-1/4	6	250-75052BN	250-75052BN-C5
1	1	1-1/4	5	250-10020BN	250-10020BN-C5
1	1	2	5	250-10032BN	250-10032BN-C5
1	1	3-1/4	6	250-10052BN	250-10052BN-C5

250 SERIES - 2 FLUTE NECKED BALL FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	(LBS) LENGTH BELOW SHANK	EDP BALL NOSE BRIGHT	EDP BALL NOSE (ZIRCONIUM C5)
1/4	1/4	3/8	2-1/2	0	250N25006-1 BN	250N25006-1 BN-C5
1/4	1/4	3/8	2-1/2	1-1/8	250N25006-2 BN	250N25006-2 BN-C5
1/4	1/4	3/8	4	0	250N25006-3 BN	250N25006-3 BN-C5
1/4	1/4	3/8	4	2-1/8	250N25006-4 BN	250N25006-4 BN-C5
5/16	5/16	7/16	2-1/2	0	250N31207-1 BN	250N31207-1 BN-C5
5/16	5/16	7/16	2-1/2	1-1/8	250N31207-2 BN	250N31207-2 BN-C5
5/16	5/16	7/16	4	0	250N31207-3 BN	250N31207-3 BN-C5
5/16	5/16	7/16	4	2-1/8	250N31207-4 BN	250N31207-4 BN-C5
3/8	3/8	1/2	2-1/2	0	250N37508-1 BN	250N37508-1 BN-C5
3/8	3/8	1/2	2-1/2	1-1/8	250N37508-2 BN	250N37508-2 BN-C5
3/8	3/8	1/2	4	0	250N37508-3 BN	250N37508-3 BN-C5
3/8	3/8	1/2	4	2-1/8	250N37508-4 BN	250N37508-4 BN-C5
1/2	1/2	5/8	3	0	250N50010-1 BN	250N50010-1 BN-C5
1/2	1/2	5/8	3	1-3/8	250N50010-2 BN	250N50010-2 BN-C5
1/2	1/2	5/8	4	0	250N50010-3 BN	250N50010-3 BN-C5
1/2	1/2	5/8	4	2-3/8	250N50010-4 BN	250N50010-4 BN-C5
1/2	1/2	5/8	6	0	250N50010-5 BN	250N50010-5 BN-C5
1/2	1/2	5/8	6	3-3/8	250N50010-6 BN	250N50010-6 BN-C5
5/8	5/8	3/4	3-1/2	0	250N62512-1 BN	250N62512-1 BN-C5
5/8	5/8	3/4	3-1/2	1-5/8	250N62512-2 BN	250N62512-2 BN-C5
5/8	5/8	3/4	5	0	250N62512-3 BN	250N62512-3 BN-C5
5/8	5/8	3/4	5	2-3/8	250N62512-4 BN	250N62512-4 BN-C5
5/8	5/8	3/4	6	0	250N62512-5 BN	250N62512-5 BN-C5
5/8	5/8	3/4	6	3-3/8	250N62512-6 BN	250N62512-6 BN-C5
3/4	3/4	1	4	0	250N75016-1 BN	250N75016-1 BN-C5
3/4	3/4	1	4	1-5/8	250N75016-2 BN	250N75016-2 BN-C5
3/4	3/4	1	5	0	250N75016-3 BN	250N75016-3 BN-C5
3/4	3/4	1	5	2-3/8	250N75016-4 BN	250N75016-4 BN-C5
3/4	3/4	1	6	0	250N75016-5 BN	250N75016-5 BN-C5
3/4	3/4	1	6	3-3/8	250N75016-6 BN	250N75016-6 BN-C5
1	1	1-1/4	5	0	250N10020-1 BN	250N10020-1 BN-C5
1	1	1-1/4	5	2-1/8	250N10020-2 BN	250N10020-2 BN-C5
1	1	1-1/4	6	0	250N10020-3 BN	250N10020-3 BN-C5
1	1	1-1/4	6	3-3/8	250N10020-4 BN	250N10020-4 BN-C5
1	1	1-1/4	7	0	250N10020-5 BN	250N10020-5 BN-C5
1	1	1-1/4	7	4-3/8	250N10020-6 BN	250N10020-6 BN-C5

251 SERIES - 2 FLUTE V² VARIABLE HELIX FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	EDP BRIGHT	EDP (ZIRCONIUM C5)
1/4	1/4	3/8	2-1/2	251S2500	251S2500-C5
1/4	1/4	3/4	2-1/2	251-2500	251-2500-C5
5/16	5/16	7/16	2-1/2	251S3125	251S3125-C5
5/16	5/16	13/16	2-1/2	251-3125	251-3125-C5
3/8	3/8	1/2	2-1/2	251S3750	251S3750-C5
3/8	3/8	1	2-1/2	251-3750	251-3750-C5
7/16	7/16	9/16	2-3/4	251S4375	251S4375-C5
7/16	7/16	1	2-3/4	251-4375	251-4375-C5
1/2	1/2	5/8	3	251S5000	251S5000-C5
1/2	1/2	1-1/4	3	251-5000	251-5000-C5
5/8	5/8	3/4	3-1/2	251S6250	251S6250-C5
5/8	5/8	1-5/8	3-1/2	251-6250	251-6250-C5
3/4	3/4	1	4	251S7500	251S7500-C5
3/4	3/4	1-5/8	4	251-7500	251-7500-C5
1	1	1-1/4	4	251S1000	251S1000-C5
1	1	2	4	251-1000	251-1000-C5

*PATENTED VARIABLE HELIX
*ARC END DESIGN
*RAMPING

*CENTER CLEARANCE TO REMOVE TRAPPED HEAT
*CENTER CLEARANCE FOR ADDITIONAL COOLANT

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Patented Changing Helix Design Patent No. 7,001,113 B2

250MM SERIES - 2 FLUTE METRIC SQUARE END FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	250MM SERIES EDP 2 FLUTE (ZIRCONIUM C5)
4.0 (.1575)	4.0 (.1575)	12.0 (.4724)	50.0 (1.9685)	250MM-01575-C5
5.0 (.1969)	6.0 (.2362)	16.0 (.6299)	65.0 (2.5591)	250MM-01969-C5
6.0 (.2362)	6.0 (.2362)	19.0 (.7480)	65.0 (2.5591)	250MM-02362-C5
7.0 (.2756)	8.0 (.3150)	19.0 (.7480)	65.0 (2.5591)	250MM-02756-C5
8.0 (.3150)	8.0 (.3150)	19.0 (.7480)	65.0 (2.5591)	250MM-03150-C5
10.0 (.3937)	10.0 (.3937)	24.0 (.9449)	70.0 (2.7559)	250MM-03937-C5
12.0 (.4724)	12.0 (.4724)	32.0 (1.2598)	75.0 (2.9528)	250MM-04724-C5
16.0 (.6299)	16.0 (.6299)	40.0 (1.5748)	100.0 (3.9370)	250MM-06299-C5
20.0 (.7874)	20.0 (.7874)	32.0 (1.2598)	100.0 (3.9370)	250MM-07874-C5
25.0 (.9843)	25.0 (.9843)	38.0 (1.4961)	100.0 (3.9370)	250MM-09843-C5

250MM - BN SERIES - 2 FLUTE METRIC BALL NOSE END FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	250MM SERIES EDP 2 FLUTE BALL NOSE (ZIRCONIUM C5)
4.0 (.1575)	4.0 (.1575)	12.0 (.4724)	50.0 (1.9685)	250MM-01575BN-C5
5.0 (.1969)	6.0 (.2362)	16.0 (.6299)	65.0 (2.5591)	250MM-01969BN-C5
6.0 (.2362)	6.0 (.2362)	19.0 (.7480)	65.0 (2.5591)	250MM-02362BN-C5
7.0 (.2756)	8.0 (.3150)	19.0 (.7480)	65.0 (2.5591)	250MM-02756BN-C5
8.0 (.3150)	8.0 (.3150)	19.0 (.7480)	65.0 (2.5591)	250MM-03150BN-C5
10.0 (.3937)	10.0 (.3937)	24.0 (.9449)	70.0 (2.7559)	250MM-03937BN-C5
12.0 (.4724)	12.0 (.4724)	32.0 (1.2598)	75.0 (2.9528)	250MM-04724BN-C5
16.0 (.6299)	16.0 (.6299)	40.0 (1.5748)	100.0 (3.9370)	250MM-06299BN-C5
20.0 (.7874)	20.0 (.7874)	32.0 (1.2598)	100.0 (3.9370)	250MM-07874BN-C5
25.0 (.9843)	25.0 (.9843)	38.0 (1.4961)	100.0 (3.9370)	250MM-09843BN-C5

237 SERIES - 2 FLUTE WITH RADIUS & NECK FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	(LBS) LENGTH BELOW SHANK	RAD	EDP (ZIRCONIUM C5)
3/8	3/8	1/2	2-1/2	0	.015	237N03750-C5
3/8	3/8	1/2	2-1/2	7/8	.015	237N3750-C5
3/8	3/8	1/2	3	0	.015	237NM03750-C5
3/8	3/8	1/2	3	1-3/8	.015	237NM3750-C5
3/8	3/8	1/2	4	0	.015	237NL03750-C5
3/8	3/8	1/2	4	2-3/8	.015	237NL3750-C5
1/2	1/2	5/8	3	0	.020	237N05000-C5
1/2	1/2	5/8	3	1-1/8	.020	237N5000-C5
1/2	1/2	5/8	4	0	.020	237NM05000-C5
1/2	1/2	5/8	4	2-1/8	.020	237NM5000-C5
1/2	1/2	5/8	6	0	.020	237NL05000-C5
1/2	1/2	5/8	6	3-1/8	.020	237NL5000-C5
5/8	5/8	3/4	4	0	.030	237N06250-C5
5/8	5/8	3/4	4	1-5/8	.030	237N6250-C5
5/8	5/8	3/4	5	0	.030	237NM06250-C5
5/8	5/8	3/4	5	2-5/8	.030	237NM6250-C5
5/8	5/8	3/4	6	0	.030	237NL06250-C5
5/8	5/8	3/4	6	3-5/8	.030	237NL6250-C5
3/4	3/4	1	4	0	.030	237N07500-C5
3/4	3/4	1	4	1-7/8	.030	237N7500-C5
3/4	3/4	1	5	0	.030	237NM07500-C5
3/4	3/4	1	5	2-7/8	.030	237NM7500-C5
3/4	3/4	1	6	0	.030	237NL07500-C5
3/4	3/4	1	6	3-7/8	.030	237NL7500-C5
1	1	1-1/4	4	0	.045	237N01000-C5
1	1	1-1/4	4	1-5/8	.045	237N1000-C5
1	1	1-1/4	5	0	.045	237NM01000-C5
1	1	1-1/4	5	2-5/8	.045	237NM1000-C5
1	1	1-1/4	6	0	.045	237NL01000-C5
1	1	1-1/4	6	3-5/8	.045	237NL1000-C5

350 SERIES - 3 FLUTE FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	EDP BRIGHT	EDP (ZIRCONIUM C5)
1/8	1/8	1/4	1-1/2	350-12504	350-12504-C5
1/8	1/8	5/16	1-1/2	350-12505	350-12505-C5
1/8	1/8	3/8	1-1/2	350-12506	350-12506-C5
1/8	1/8	1/2	2	350-12508	350-12508-C5
1/8	1/8	5/8	2	350-12510	350-12510-C5
1/8	1/8	3/4	2	350-12512	350-12512-C5
1/8	1/8	1	2-1/2	350-12516	350-12516-C5
5/32	3/16	5/16	2	350-15605	350-15605-C5
5/32	3/16	9/16	2	350-15609	350-15609-C5
3/16	3/16	5/16	2	350-18705	350-18705-C5
3/16	3/16	3/8	2	350-18706	350-18706-C5
3/16	3/16	5/8	2-1/2	350-18710	350-18710-C5
3/16	3/16	3/4	2-1/2	350-18712	350-18712-C5
3/16	3/16	1	2-1/2	350-18716	350-18716-C5
7/32	1/4	3/8	2-1/2	350-21806	350-21806-C5
7/32	1/4	3/4	2-1/2	350-21812	350-21812-C5
1/4	1/4	3/8	2-1/2	350-25006	350-25006-C5
1/4	1/4	1/2	2-1/2	350-25008	350-25008-C5
1/4	1/4	5/8	2-1/2	350-25010	350-25010-C5
1/4	1/4	3/4	2-1/2	350-25012	350-25012-C5
1/4	1/4	1	2-1/2	350-25016	350-25016-C5
1/4	1/4	1-1/8	2-1/2	350-25018	350-25018-C5
1/4	1/4	1-1/4	3	350-25020	350-25020-C5
1/4	1/4	1-1/2	3	350-25024	350-25024-C5
1/4	1/4	2	4	350-25032	350-25032-C5
9/32	5/16	7/16	2-1/2	350-28107	350-28107-C5
9/32	5/16	13/16	2-1/2	350-28113	350-28113-C5
5/16	5/16	7/16	2-1/2	350-31207	350-31207-C5
5/16	5/16	1/2	2-1/2	350-31208	350-31208-C5
5/16	5/16	13/16	2-1/2	350-31213	350-31213-C5
5/16	5/16	1-1/8	2-1/2	350-31218	350-31218-C5
5/16	5/16	1-1/4	3-1/2	350-31220	350-31220-C5
5/16	5/16	1-1/2	3-1/2	350-31224	350-31224-C5
5/16	5/16	2-1/8	4	350-31234	350-31234-C5
11/32	3/8	1/2	2-1/2	350-34308	350-34308-C5
11/32	3/8	1	2-1/2	350-34316	350-34316-C5
3/8	3/8	1/2	2-1/2	350-37508	350-37508-C5
3/8	3/8	5/8	2-1/2	350-37510	350-37510-C5
3/8	3/8	3/4	2-1/2	350-37512	350-37512-C5
3/8	3/8	1	2-1/2	350-37516	350-37516-C5
3/8	3/8	1-1/4	3	350-37520	350-37520-C5
3/8	3/8	1-1/2	4	350-37524	350-37524-C5
3/8	3/8	2	4	350-37532	350-37532-C5
3/8	3/8	2-1/2	6	350-37540	350-37540-C5

CONTINUED...

350 SERIES - 3 FLUTE FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	EDP BRIGHT	EDP (ZIRCONIUM C5)
13/32	7/16	9/16	2-3/4	350-40609	350-40609-C5
13/32	7/16	1	2-3/4	350-40616	350-40616-C5
7/16	7/16	9/16	2-3/4	350-43709	350-43709-C5
7/16	7/16	1	2-3/4	350-43716	350-43716-C5
7/16	7/16	2	4	350-43732	350-43732-C5
15/32	1/2	5/8	3	350-46810	350-46810-C5
15/32	1/2	1-1/4	3	350-46820	350-46820-C5
1/2	1/2	5/8	3	350-50010	350-50010-C5
1/2	1/2	3/4	3	350-50012	350-50012-C5
1/2	1/2	1	3	350-50016	350-50016-C5
1/2	1/2	1-1/4	3	350-50020	350-50020-C5
1/2	1/2	1-1/2	4	350-50024	350-50024-C5
1/2	1/2	2	4	350-50032	350-50032-C5
1/2	1/2	2-1/4	6	350-50036	350-50036-C5
1/2	1/2	2-1/2	6	350-50040	350-50040-C5
1/2	1/2	3-1/4	6	350-50052	350-50052-C5
1/2	1/2	4	8	350-50064	350-50064-C5
5/8	5/8	3/4	3-1/2	350-62512	350-62512-C5
5/8	5/8	1-1/4	3-1/2	350-62520	350-62520-C5
5/8	5/8	1-5/8	3-1/2	350-62526	350-62526-C5
5/8	5/8	2	5	350-62532	350-62532-C5
5/8	5/8	2-1/2	5	350-62540	350-62540-C5
5/8	5/8	2-3/4	5	350-62544	350-62544-C5
5/8	5/8	3-1/4	6	350-62552	350-62552-C5
5/8	5/8	4	8	350-62564	350-62564-C5
3/4	3/4	1	4	350-75016	350-75016-C5
3/4	3/4	1-1/2	4	350-75024	350-75024-C5
3/4	3/4	1-5/8	4	350-75026	350-75026-C5
3/4	3/4	2	5	350-75032	350-75032-C5
3/4	3/4	2-1/4	5	350-75036	350-75036-C5
3/4	3/4	2-1/2	5	350-75040	350-75040-C5
3/4	3/4	3	6	350-75048	350-75048-C5
3/4	3/4	3-1/4	6	350-75052	350-75052-C5
3/4	3/4	3-1/2	6	350-75056	350-75056-C5
3/4	3/4	4	7	350-75064	350-75064-C5
3/4	3/4	5	8	350-75080	350-75080-C5
1	1	1-1/4	5	350-10020	350-10020-C5
1	1	1-1/2	5	350-10024	350-10024-C5
1	1	2	5	350-10032	350-10032-C5
1	1	2-1/2	5	350-10040	350-10040-C5
1	1	3	6	350-10048	350-10048-C5
1	1	3-1/2	6	350-10056	350-10056-C5
1	1	4-1/8	7	350-10066	350-10066-C5
1	1	5-1/2	8	350-10088	350-10088-C5
1-1/4	1-1/4	1-1/4	4-1/2	350-1.2520	350-1.2520-C5
1-1/4	1-1/4	2	4-1/2	350-1.2532	350-1.2532-C5
1-1/4	1-1/4	3-1/4	6	350-1.2552	350-1.2552-C5
1-1/4	1-1/4	5	7-1/2	350-1.2580	350-1.2580-C5

350 SERIES - 3 FLUTE NECKED FOR ALUMINUM

DIA	SHANK DIA	LOC	(LBS) LENGTH BELOW SHK	OAL	EDP BRIGHT	EDP (ZIRCONIUM C5)
1/8	1/8	1/4	0	1-1/2	350-12504N0	350-12504N0-C5
1/8	1/8	1/4	1/2	1-1/2	350-12504N08	350-12504N08-C5
1/8	1/8	1/4	0	3	350-12504NS0	350-12504NS0-C5
1/8	1/8	1/4	1-3/8	3	350-12504NS22	350-12504NS22-C5
3/16	3/16	5/16	0	2	350-18705N0	350-18705N0-C5
3/16	3/16	5/16	1/2	2	350-18705N08	350-18705N08-C5
3/16	3/16	5/16	0	3	350-18705NS0	350-18705NS0-C5
3/16	3/16	5/16	1-3/8	3	350-18705NS22	350-18705NS22-C5
1/4	1/4	3/8	0	2-1/2	350-25006N0	350-25006N0-C5
1/4	1/4	3/8	1-1/8	2-1/2	350-25006N18	350-25006N18-C5
1/4	1/4	3/8	0	4	350-25006NS0	350-25006NS0-C5
1/4	1/4	3/8	2-1/8	4	350-25006NS34	350-25006NS34-C5
1/4	1/4	3/4	0	4	350-25012NS0	350-25012NS0-C5
1/4	1/4	3/4	2-1/8	4	350-25012NS34	350-25012NS34-C5
5/16	5/16	7/16	0	2-1/2	350-31207N0	350-31207N0-C5
5/16	5/16	7/16	1-1/8	2-1/2	350-31207N18	350-31207N18-C5
5/16	5/16	7/16	0	4	350-31207NS0	350-31207NS0-C5
5/16	5/16	7/16	2-1/8	4	350-31207NS34	350-31207NS34-C5
5/16	5/16	13/16	0	4	350-31213NS0	350-31213NS0-C5
5/16	5/16	13/16	2-1/8	4	350-31213NS34	350-31213NS34-C5
3/8	3/8	1/2	0	2-1/2	350-37508N0	350-37508N0-C5
3/8	3/8	1/2	1-1/8	2-1/2	350-37508N18	350-37508N18-C5
3/8	3/8	1/2	0	4	350-37508NS0	350-37508NS0-C5
3/8	3/8	1/2	2-1/8	4	350-37508NS34	350-37508NS34-C5
3/8	3/8	1	0	4	350-37516NS0	350-37516NS0-C5
3/8	3/8	1	2-1/8	4	350-37516NS34	350-37516NS34-C5
1/2	1/2	5/8	0	3	350-50010N0	350-50010N0-C5
1/2	1/2	5/8	1-3/8	3	350-50010N22	350-50010N22-C5
1/2	1/2	5/8	0	4	350-50010NS0-4	350-50010NS0-4-C5
1/2	1/2	5/8	2-3/8	4	350-50010NS38	350-50010NS38-C5
1/2	1/2	5/8	0	6	350-50010NS0-6	350-50010NS0-6-C5
1/2	1/2	5/8	3-3/8	6	350-50010NS54	350-50010NS54-C5
1/2	1/2	1-1/4	0	6	350-50020NS0-6	350-50020NS0-6-C5
1/2	1/2	1-1/4	3-3/8	6	350-50020NS54	350-50020NS54-C5
5/8	5/8	3/4	0	3-1/2	350-62512N0	350-62512N0-C5
5/8	5/8	3/4	1-5/8	3-1/2	350-62512N26	350-62512N26-C5
5/8	5/8	3/4	0	5	350-62512NS0-5	350-62512NS0-5-C5
5/8	5/8	3/4	2-3/8	5	350-62512NS38	350-62512NS38-C5
5/8	5/8	3/4	0	6	350-62512NS0-6	350-62512NS0-6-C5
5/8	5/8	3/4	3-3/8	6	350-62512NS54	350-62512NS54-C5
5/8	5/8	1-5/8	0	6	350-62526NS0-6	350-62526NS0-6-C5
5/8	5/8	1-5/8	3-3/8	6	350-62526NS54	350-62526NS54-C5
3/4	3/4	1	0	4	350-75016N0	350-75016N0-C5
3/4	3/4	1	1-5/8	4	350-75016N26	350-75016N26-C5
3/4	3/4	1	0	5	350-75016NS0-5	350-75016NS0-5-C5
3/4	3/4	1	2-1/2	5	350-75016NS40	350-75016NS40-C5
3/4	3/4	1	0	6	350-75016NS0-6	350-75016NS0-6-C5
3/4	3/4	1	3-3/8	6	350-75016NS54	350-75016NS54-C5
3/4	3/4	1-5/8	0	6	350-75026NS0-6	350-75026NS0-6-C5
3/4	3/4	1-5/8	3-3/8	6	350-75026NS54	350-75026NS54-C5
1	1	1-1/4	0	5	350-10020N0	350-10020N0-C5
1	1	1-1/4	2-1/8	5	350-10020N34	350-10020N34-C5
1	1	1-1/4	0	6	350-10020NS0-6	350-10020NS0-6-C5
1	1	1-1/4	3-3/8	6	350-10020NS54	350-10020NS54-C5
1	1	1-1/4	0	7	350-10020NS0-7	350-10020NS0-7-C5
1	1	1-1/4	4-3/8	7	350-10020NS70	350-10020NS70-C5
1	1	2	0	7	350-10032NS0-7	350-10032NS0-7-C5
1	1	2	4-3/8	7	350-10032NS0-70	350-10032NS0-70-C5

350 Series - Finisher with Wiper Flats
Highly Polished Flutes

DIA	SHANK DIA	LOC	OAL	EDP (ZIRCONIUM C5)
1/8	1/8	1/4	1-1/2	350-12504-WF-C5
1/8	1/8	1/2	2	350-12508-WF-C5
1/8	1/8	3/4	2	350-12512-WF-C5
3/16	3/16	5/16	2	350-18705-WF-C5
3/16	3/16	5/8	2-1/2	350-18710-WF-C5
3/16	3/16	3/4	2-1/2	350-18712-WF-C5
1/4	1/4	3/8	2-1/2	350-25006-WF-C5
1/4	1/4	3/4	2-1/2	350-25012-WF-C5
1/4	1/4	1-1/4	3	350-25020-WF-C5
5/16	5/16	7/16	2-1/2	350-31207-WF-C5
5/16	5/16	13/16	2-1/2	350-31213-WF-C5
5/16	5/16	1-1/4	3-1/2	350-31220-WF-C5
3/8	3/8	1/2	2-1/2	350-37508-WF-C5
3/8	3/8	1	2-1/2	350-37516-WF-C5
3/8	3/8	1-1/2	4	350-37524-WF-C5
1/2	1/2	5/8	3	350-50010-WF-C5
1/2	1/2	1-1/4	3	350-50020-WF-C5
1/2	1/2	2	4	350-50032-WF-C5
1/2	1/2	3-1/4	6	350-50052-WF-C5
5/8	5/8	3/4	3-1/2	350-62512-WF-C5
5/8	5/8	1-5/8	3-1/2	350-62526-WF-C5
5/8	5/8	2-1/2	5	350-62540-WF-C5
3/4	3/4	1	4	350-75016-WF-C5
3/4	3/4	1-5/8	4	350-75026-WF-C5
3/4	3/4	2-1/2	5	350-75040-WF-C5
3/4	3/4	3-1/4	6	350-75052-WF-C5
1	1	1-1/4	5	350-10020-WF-C5
1	1	2	5	350-10032-WF-C5
1	1	3	6	350-10048-WF-C5

350 Series With (Wiper Flat) Speeds & Feeds

Type of Cut	Radial Step Over	SFM	1/4	3/8	1/2	5/8	3/4	1"
Shallow Slotting	100%	1200+	0.005	0.007	0.010	0.012	0.015	0.020
		600+	0.004	0.006	0.008	0.010	0.012	0.016
Deep Slotting	100%	1200+	0.004	0.006	0.008	0.010	0.012	0.016
		600+	0.003	0.004	0.006	0.007	0.009	0.012
Medium Radial 1.0 X Dia. Depth	30% x Dia. Radial	1200+	0.005	0.007	0.010	0.012	0.015	0.020
		600+	0.004	0.006	0.008	0.010	0.012	0.016
Heavy Radial 1.0 X Dia. Depth	50% x Dia. Radial	1200+	0.004	0.006	0.008	0.010	0.012	0.016
Medium Radial 2.0 X Dia Depth	30% x Dia. Radial	1200+	0.005	0.007	0.010	0.012	0.015	0.020
		600+	0.004	0.006	0.008	0.010	0.012	0.016
Heavy Radial 2.0 X Dia Depth	50% x Dia. Radial	1200+	0.004	0.006	0.008	0.010	0.012	0.016
Finishing Medium Radial	<25% of Dia.	1200+	0.005	0.007	0.010	0.012	0.015	0.020
		600+	0.004	0.006	0.008	0.010	0.012	0.016
Finishing Light Radial	<10% of Dia.	1200+	0.005	0.007	0.010	0.012	0.014	0.020
Finishing	<.010" Radial Depth	1200+	0.005	0.009	0.012	0.015	0.018	0.024
		600+	0.005	0.007	0.01	0.012	0.015	0.02

Test Example

Tool#	350-37516-C5-WF	
Material:	6061 AL	
RPM:	8000	
FPT/IPM	0.004 FPT	96 IPM
Axial Depth:	0.250	
Radial Depth:	0.375	
Load Meter	60%	
RMS Floor	36.6	
RMS Wall	25.4	

350 SERIES - 3 FLUTE WITH RADIUS FOR ALUMINUM

RADIUS SIZE

DIA	SHANK DIA	LOC	OAL	EDP WITH RADIUS (ZIRCONIUM C5)
1/8	1/8	3/8	1-1/2	350-12506-020-C5
1/8	1/8	3/8	1-1/2	350-12506-030-C5
3/16	3/16	5/8	2-1/2	350-18710-010-C5
3/16	3/16	5/8	2-1/2	350-18710-030-C5
1/4	1/4	3/8	2-1/2	350-25006-010-C5
1/4	1/4	3/8	2-1/2	350-25006-015-C5
1/4	1/4	3/8	2-1/2	350-25006-020-C5
1/4	1/4	3/8	2-1/2	350-25006-030-C5
1/4	1/4	3/8	2-1/2	350-25006-045-C5
1/4	1/4	3/8	2-1/2	350-25006-060-C5
1/4	1/4	3/4	2-1/2	350-25012-010-C5
1/4	1/4	3/4	2-1/2	350-25012-015-C5
1/4	1/4	3/4	2-1/2	350-25012-020-C5
1/4	1/4	3/4	2-1/2	350-25012-030-C5
1/4	1/4	3/4	2-1/2	350-25012-045-C5
1/4	1/4	3/4	2-1/2	350-25012-060-C5
1/4	1/4	1-1/4	3	350-25020-010-C5
1/4	1/4	1-1/4	3	350-25020-015-C5
1/4	1/4	1-1/4	3	350-25020-020-C5
1/4	1/4	1-1/4	3	350-25020-030-C5
1/4	1/4	1-1/4	3	350-25020-045-C5
1/4	1/4	1-1/4	3	350-25020-060-C5
5/16	5/16	13/16	2-1/2	350-31213-060-C5
3/8	3/8	1/2	2-1/2	350-37508-020-C5
3/8	3/8	1/2	2-1/2	350-37508-030-C5
3/8	3/8	1/2	2-1/2	350-37508-045-C5
3/8	3/8	1/2	2-1/2	350-37508-060-C5
3/8	3/8	1/2	2-1/2	350-37508-090-C5
3/8	3/8	1/2	2-1/2	350-37508-120-C5
3/8	3/8	1	2-1/2	350-37516-020-C5
3/8	3/8	1	2-1/2	350-37516-030-C5
3/8	3/8	1	2-1/2	350-37516-045-C5
3/8	3/8	1	2-1/2	350-37516-060-C5
3/8	3/8	1	2-1/2	350-37516-090-C5
3/8	3/8	1	2-1/2	350-37516-120-C5
3/8	3/8	1-1/4	3	350-37520-020-C5
3/8	3/8	1-1/4	3	350-37520-030-C5
3/8	3/8	1-1/4	3	350-37520-045-C5
3/8	3/8	1-1/4	3	350-37520-060-C5
3/8	3/8	1-1/4	3	350-37520-090-C5
3/8	3/8	1-1/4	3	350-37520-120-C5
3/8	3/8	2	4	350-37532-020-C5
3/8	3/8	2	4	350-37532-030-C5
3/8	3/8	2	4	350-37532-045-C5
3/8	3/8	2	4	350-37532-060-C5
3/8	3/8	2	4	350-37532-090-C5
3/8	3/8	2	4	350-37532-120-C5

350 SERIES - 3 FLUTE WITH RADIUS FOR ALUMINUM

RADIUS SIZE

DIA	SHANK DIA	LOC	OAL	EDP WITH RADIUS (ZIRCONIUM C5)
1/2	1/2	5/8	3	350-50010-020-C5
1/2	1/2	5/8	3	350-50010-030-C5
1/2	1/2	5/8	3	350-50010-060-C5
1/2	1/2	5/8	3	350-50010-090-C5
1/2	1/2	5/8	3	350-50010-120-C5
1/2	1/2	1-1/4	3	350-50020-020-C5
1/2	1/2	1-1/4	3	350-50020-030-C5
1/2	1/2	1-1/4	3	350-50020-060-C5
1/2	1/2	1-1/4	3	350-50020-090-C5
1/2	1/2	1-1/4	3	350-50020-120-C5
1/2	1/2	1-1/2	3	350-50024-020-C5
1/2	1/2	1-1/2	3	350-50024-030-C5
1/2	1/2	1-1/2	3	350-50024-060-C5
1/2	1/2	1-1/2	3	350-50024-090-C5
1/2	1/2	1-1/2	3	350-50024-120-C5
1/2	1/2	2	4	350-50032-020-C5
1/2	1/2	2	4	350-50032-030-C5
1/2	1/2	2	4	350-50032-060-C5
1/2	1/2	2	4	350-50032-090-C5
1/2	1/2	2	4	350-50032-120-C5
5/8	5/8	1-5/8	3-1/2	350-62526-020-C5
5/8	5/8	1-5/8	3-1/2	350-62526-030-C5
5/8	5/8	1-5/8	3-1/2	350-62526-060-C5
5/8	5/8	1-5/8	3-1/2	350-62526-090-C5
5/8	5/8	1-5/8	3-1/2	350-62526-120-C5
3/4	3/4	1	4	350-75016-030-C5
3/4	3/4	1	4	350-75016-060-C5
3/4	3/4	1	4	350-75016-090-C5
3/4	3/4	1	4	350-75016-120-C5
3/4	3/4	1-5/8	4	350-75026-030-C5
3/4	3/4	1-5/8	4	350-75026-060-C5
3/4	3/4	1-5/8	4	350-75026-090-C5
3/4	3/4	1-5/8	4	350-75026-120-C5
3/4	3/4	2	5	350-75032-030-C5
3/4	3/4	2	5	350-75032-060-C5
3/4	3/4	2	5	350-75032-090-C5
3/4	3/4	2	5	350-75032-120-C5
3/4	3/4	3	6	350-75048-030-C5
3/4	3/4	3	6	350-75048-060-C5
3/4	3/4	3	6	350-75048-090-C5
3/4	3/4	3	6	350-75048-120-C5
1	1	2	5	350-10032-060-C5
1	1	2	5	350-10032-090-C5
1	1	2	5	350-10032-120-C5

350 SERIES - 3 FLUTE BALL NOSE FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	EDP BRIGHT	EDP (ZIRCONIUM C5)
1/4	1/4	3/8	2-1/2	350-25006BN	350-25006BN-C5
1/4	1/4	3/4	2-1/2	350-25012BN	350-25012BN-C5
1/4	1/4	1-1/4	3	350-25020BN	350-25020BN-C5
5/16	5/16	7/16	2-1/2	350-31207BN	350-31207BN-C5
5/16	5/16	13/16	2-1/2	350-31213BN	350-31213BN-C5
5/16	5/16	1-1/4	3	350-31220BN	350-31220BN-C5
3/8	3/8	1/2	2-1/2	350-37508BN	350-37508BN-C5
3/8	3/8	1	2-1/2	350-37516BN	350-37516BN-C5
3/8	3/8	1-1/2	4	350-37524BN	350-37524BN-C5
7/16	7/16	9/16	2-3/4	350-43709BN	350-43709BN-C5
7/16	7/16	1	2-3/4	350-43716BN	350-43716BN-C5
7/16	7/16	2	4	350-43732BN	350-43732BN-C5
1/2	1/2	5/8	3	350-50010BN	350-50010BN-C5
1/2	1/2	1-1/4	3	350-50020BN	350-50020BN-C5
1/2	1/2	2	4	350-50032BN	350-50032BN-C5
5/8	5/8	3/4	3-1/2	350-62512BN	350-62512BN-C5
5/8	5/8	1-5/8	3-1/2	350-62526BN	350-62526BN-C5
5/8	5/8	2-1/2	5	350-62540BN	350-62540BN-C5
3/4	3/4	1	4	350-75016BN	350-75016BN-C5
3/4	3/4	1-5/8	4	350-75026BN	350-75026BN-C5
3/4	3/4	3-1/4	6	350-75052BN	350-75052BN-C5
1	1	1-1/4	5	350-10020BN	350-10020BN-C5
1	1	2	5	350-10032BN	350-10032BN-C5
1	1	3-1/2	6	350-10056BN	350-10056BN-C5

350 SERIES - 3 FLUTE NECKED BALL NOSE FOR ALUMINUM

SHANK DIA	SHANK DIA	LOC	(LBS) LENGTH BELOW SHK	OAL	EDP BALL NOSE BRIGHT	EDP BALL NOSE (ZIRCONIUM C5)
1/4	1/4	3/8	0	2-1/2	350N25006-1 BN	350N25006-1 BN-C5
1/4	1/4	3/8	1-1/8	2-1/2	350N25006-2 BN	350N25006-2 BN-C5
1/4	1/4	3/8	0	4	350N25006-3 BN	350N25006-3 BN-C5
1/4	1/4	3/8	2-1/8	4	350N25006-4 BN	350N25006-4 BN-C5
5/16	5/16	7/16	0	2-1/2	350N31207-1 BN	350N31207-1 BN-C5
5/16	5/16	7/16	1-1/8	2-1/2	350N31207-2 BN	350N31207-2 BN-C5
5/16	5/16	7/16	0	4	350N31207-3 BN	350N31207-3 BN-C5
5/16	5/16	7/16	2-1/8	4	350N31207-4 BN	350N31207-4 BN-C5
3/8	3/8	1/2	0	2-1/2	350N37508-1 BN	350N37508-1 BN-C5
3/8	3/8	1/2	1-1/8	2-1/2	350N37508-2 BN	350N37508-2 BN-C5
3/8	3/8	1/2	0	4	350N37508-3 BN	350N37508-3 BN-C5
3/8	3/8	1/2	2-1/8	4	350N37508-4 BN	350N37508-4 BN-C5
1/2	1/2	5/8	0	3	350N50010-1 BN	350N50010-1 BN-C5
1/2	1/2	5/8	1-3/8	3	350N50010-2 BN	350N50010-2 BN-C5
1/2	1/2	5/8	0	4	350N50010-3 BN	350N50010-3 BN-C5
1/2	1/2	5/8	2-3/8	4	350N50010-4 BN	350N50010-4 BN-C5
1/2	1/2	5/8	0	6	350N50010-5 BN	350N50010-5 BN-C5
1/2	1/2	5/8	3-3/8	6	350N50010-6 BN	350N50010-6 BN-C5
5/8	5/8	3/4	0	3-1/2	350N62512-1 BN	350N62512-1 BN-C5
5/8	5/8	3/4	1-5/8	3-1/2	350N62512-2 BN	350N62512-2 BN-C5
5/8	5/8	3/4	0	5	350N62512-3 BN	350N62512-3 BN-C5
5/8	5/8	3/4	2-3/8	5	350N62512-4 BN	350N62512-4 BN-C5
5/8	5/8	3/4	0	6	350N62512-5 BN	350N62512-5 BN-C5
5/8	5/8	3/4	3-3/8	6	350N62512-6 BN	350N62512-6 BN-C5
3/4	3/4	1	0	4	350N75016-1 BN	350N75016-1 BN-C5
3/4	3/4	1	1-5/8	4	350N75016-2 BN	350N75016-2 BN-C5
3/4	3/4	1	0	5	350N75016-3 BN	350N75016-3 BN-C5
3/4	3/4	1	2-3/8	5	350N75016-4 BN	350N75016-4 BN-C5
3/4	3/4	1	0	6	350N75016-5 BN	350N75016-5 BN-C5
3/4	3/4	1	3-3/8	6	350N75016-6 BN	350N75016-6 BN-C5
1	1	1-1/4	0	5	350N10020-1 BN	350N10020-1 BN-C5
1	1	1-1/4	2-1/8	5	350N10020-2 BN	350N10020-2 BN-C5
1	1	1-1/4	0	6	350N10020-3 BN	350N10020-3 BN-C5
1	1	1-1/4	3-3/8	6	350N10020-4 BN	350N10020-4 BN-C5
1	1	1-1/4	0	7	350N10020-5 BN	350N10020-5 BN-C5
1	1	1-1/4	4-3/8	7	350N10020-6 BN	350N10020-6 BN-C5

550 SERIES - 5 FLUTE FOR ALUMINUM
37 DEGREE HELIX ANGLE

DIA	SHANK DIA	LOC	OAL	EDP BRIGHT	EDP (ZIRCONIUM C5)
1/4	1/4	3/8	2-1/2	550-25006	550-25006-C5
1/4	1/4	3/4	2-1/2	550-25012	550-25012-C5
1/4	1/4	1-1/4	3	550-25020	550-25020-C5
5/16	5/16	7/16	2-1/2	550-31207	550-31207-C5
5/16	5/16	13/16	2-1/2	550-31213	550-31213-C5
5/16	5/16	1-1/4	3-1/2	550-31220	550-31220-C5
3/8	3/8	1/2	2-1/2	550-37508	550-37508-C5
3/8	3/8	1	2-1/2	550-37516	550-37516-C5
3/8	3/8	1-1/4	3	550-37520	550-37520-C5
3/8	3/8	2	4	550-37532	550-37532-C5
1/2	1/2	5/8	3	550-50010	550-50010-C5
1/2	1/2	1-1/4	3	550-50020	550-50020-C5
1/2	1/2	2	4	550-50032	550-50032-C5
1/2	1/2	3-1/4	6	550-50052	550-50052-C5
5/8	5/8	3/4	3-1/2	550-62512	550-62512-C5
5/8	5/8	1-5/8	3-1/2	550-62526	550-62526-C5
5/8	5/8	2-1/2	5	550-62540	550-62540-C5
3/4	3/4	1	4	550-75016	550-75016-C5
3/4	3/4	1-5/8	4	550-75026	550-75026-C5
3/4	3/4	2-1/4	5	550-75036	550-75036-C5
3/4	3/4	3	6	550-75048	550-75048-C5
1"	1"	1-1/4	5	550-10020	550-10020-C5
1"	1"	2	5	550-10032	550-10032-C5
1"	1"	2-1/2	5	550-10040	550-10040-C5
1"	1"	3	6	550-10048	550-10048-C5

350 SERIES - 3 FLUTE NECKED WITH RADIUS FOR ALUMINUM

RADIUS SIZE

DIA	SHANK DIA	LOC	(LBS) LENGTH BELOW SHK	OAL	EDP WITH RADIUS (ZIRCONIUM C5)
1/4	1/4	3/8	1-1/8	2-1/2	350-25006N18-015-C5
1/4	1/4	3/4	2-1/8	4	350-25012NS34-015-C5
5/16	5/16	7/16	1-1/8	2-1/2	350-31207N18-015-C5
5/16	5/16	13/16	2-1/8	4	350-31213NS34-015-C5
3/8	3/8	1/2	2-1/8	4	350-37508NS34-030-C5
1/2	1/2	5/8	3-3/8	6	350-50010NS54-030-C5
5/8	5/8	3/4	3-3/8	6	350-62512NS54-030-C5
3/4	3/4	1	3-3/8	6	350-75016NS54-030-C5
1	1	1-1/4	3-3/8	6	350-10020NS54-030-C5

CBC350 SERIES - 3 FLUTE CHIPBREAKERS
WITH CHAMFER FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	EDP (ZIRCONIUM C5)
3/8	3/8	1/2	2-1/2	CBC350-37508-C5
3/8	3/8	1	2-/12	CBC350-37516-C5
3/8	3/8	1-1/2	4	CBC350-37524-C5
1/2	1/2	5/8	3	CBC350-50010-C5
1/2	1/2	1-1/4	3	CBC350-50020-C5
1/2	1/2	1-1/2	4	CBC350-50024-C5
1/2	1/2	2	4	CBC350-50032-C5
5/8	5/8	3/4	3-1/2	CBC350-62512-C5
5/8	5/8	1-5/8	3-1/2	CBC350-62526-C5
5/8	5/8	2	5	CBC350-62532-C5
5/8	5/8	2-1/2	5	CBC350-62540-C5
3/4	3/4	1	4	CBC350-75016-C5
3/4	3/4	1-5/8	4	CBC350-75026-C5
3/4	3/4	2	5	CBC350-75032-C5
3/4	3/4	3	6	CBC350-75048-C5
1	1	2	5	CBC350-10032-C5

OTHER SIZES MADE-TO ORDER

CBC350 SERIES - 3 FLUTE CHIPBREAKERS
WITH NECK AND CHAMFER FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	(LBS) LENGTH BELOW SHK	EDP (ZIRCONIUM C5)
1/2	1/2	1-1/4	6	3-3/8	CBC350-50020NS54-C5
5/8	5/8	1-5/8	6	3-3/8	CBC350-62526NS54-C5
3/4	3/4	1-5/8	6	3-3/8	CBC350-75026NS54-C5

351 SERIES - 3 FLUTE V²
VARIABLE HELIX FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	EDP BRIGHT	EDP (ZIRCONIUM C5)
1/4	1/4	3/8	2-1/2	351S2500	351S2500-C5
1/4	1/4	3/4	2-1/2	351-2500	351-2500-C5
5/16	5/16	7/16	2-1/2	351S3125	351S3125-C5
5/16	5/16	13/16	2-1/2	351-3125	351-3125-C5
3/8	3/8	1/2	2-1/2	351S3750	351S3750-C5
3/8	3/8	1	2-1/2	351-3750	351-3750-C5
7/16	7/16	9/16	2-3/4	351S4375	351S4375-C5
7/16	7/16	1	2-3/4	351-4375	351-4375-C5
1/2	1/2	5/8	3	351S5000	351S5000-C5
1/2	1/2	1-1/4	3	351-5000	351-5000-C5
5/8	5/8	3/4	3-1/2	351S6250	351S6250-C5
5/8	5/8	1-5/8	3-1/2	351-6250	351-6250-C5
3/4	3/4	1	4	351S7500	351S7500-C5
3/4	3/4	1-5/8	4	351-7500	351-7500-C5
1	1	1-1/4	4	351S1000	351S1000-C5
1	1	2	4	351-1000	351-1000-C5

Patented Changing Helix Design Patent No. 7,001,113 B2

*PATENTED VARIABLE HELIX
*ARC END DESIGN
*RAMPING

*CENTER CLEARANCE TO REMOVE TRAPPED HEAT
*CENTER CLEARANCE FOR ADDITIONAL COOLANT

350MM SERIES - 3 FLUTE METRIC SQUARE END FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	350MM SERIES EDP 3 FLUTE (ZIRCONIUM C5)
4.0 (.1575)	4.0 (.1575)	12.0 (.4724)	50.0 (1.9685)	350MM-01575-C5
5.0 (.1969)	6.0 (.2362)	16.0 (.6299)	65.0 (2.5591)	350MM-01969-C5
6.0 (.2362)	6.0 (.2362)	19.0 (.7480)	65.0 (2.5591)	350MM-02362-C5
7.0 (.2756)	8.0 (.3150)	19.0 (.7480)	65.0 (2.5591)	350MM-02756-C5
8.0 (.3150)	8.0 (.3150)	19.0 (.7480)	65.0 (2.5591)	350MM-03150-C5
10.0 (.3937)	10.0 (.3937)	24.0 (.9449)	70.0 (2.7559)	350MM-03937-C5
12.0 (.4724)	12.0 (.4724)	32.0 (1.2598)	75.0 (2.9528)	350MM-04724-C5
16.0 (.6299)	16.0 (.6299)	40.0 (1.5748)	100.0 (3.9370)	350MM-06299-C5
20.0 (.7874)	20.0 (.7874)	32.0 (1.2598)	100.0 (3.9370)	350MM-07874-C5
25.0 (.9843)	25.0 (.9843)	38.0 (1.4961)	100.0 (3.9370)	350MM-09843-C5

350MM-BN SERIES - 3 FLUTE METRIC BALL NOSE END FOR ALUMINUM

DIA	SHANK DIA	LOC	OAL	350MM SERIES EDP 3 FLUTE BALL NOSE (ZIRCONIUM C5)
4.0 (.1575)	4.0 (.1575)	12.0 (.4724)	50.0 (1.9685)	350MM-01575BN-C5
5.0 (.1969)	6.0 (.2362)	16.0 (.6299)	65.0 (2.5591)	350MM-01969BN-C5
6.0 (.2362)	6.0 (.2362)	19.0 (.7480)	65.0 (2.5591)	350MM-02362BN-C5
7.0 (.2756)	8.0 (.3150)	19.0 (.7480)	65.0 (2.5591)	350MM-02756BN-C5
8.0 (.3150)	8.0 (.3150)	19.0 (.7480)	65.0 (2.5591)	350MM-03150BN-C5
10.0 (.3937)	10.0 (.3937)	24.0 (.9449)	70.0 (2.7559)	350MM-03937BN-C5
12.0 (.4724)	12.0 (.4724)	32.0 (1.2598)	75.0 (2.9528)	350MM-04724BN-C5
16.0 (.6299)	16.0 (.6299)	40.0 (1.5748)	100.0 (3.9370)	350MM-06299BN-C5
20.0 (.7874)	20.0 (.7874)	32.0 (1.2598)	100.0 (3.9370)	350MM-07874BN-C5
25.0 (.9843)	25.0 (.9843)	38.0 (1.4961)	100.0 (3.9370)	350MM-09843BN-C5

SR350 Series - 3 Flute Stub Roughers For Aluminum

CUTTER DIA	SHANK DIA	LOC	OAL	EDP
1/4	1/4	3/8	2	SR350-2500-C5
5/16	5/16	7/16	2	SR350-3125-C5
3/8	3/8	1/2	2	SR350-3750-C5
1/2	1/2	5/8	2-1/2	SR350-5000-C5
5/8	5/8	3/4	3	SR350-6250-C5
3/4	3/4	7/8	3	SR350-7500-C5
1	1	1	3	SR350-1000-C5

R350 Series - 3 Flute Regular Roughers for Aluminum

CUTTER DIA	SHANK DIA	LOC	OAL	EDP
1/4	1/4	3/4	2-1/2	R350-2500-C5
5/16	5/16	7/8	2-1/2	R350-3125-C5
3/8	3/8	7/8	2-1/2	R350-3750-C5
1/2	1/2	1	3	R350-5000-C5
5/8	5/8	1-1/4	3-1/2	R350-6250-C5
3/4	3/4	1-1/2	4	R350-7500-C5
1	1	1-1/2	4	R350-1000-C5

R350 Series - Speeds & Feeds

Type of Cut	Radial Step Over	SFM	1/4	3/8	1/2	5/8	3/4	1"
		1200+	0.009	0.014	0.020	0.025	0.030	0.040
Shallow Slotting	<50% of Dia.	600+	0.007	0.011	0.016	0.020	0.024	0.032
		1200+	0.007	0.011	0.016	0.020	0.024	0.032
Deep Slotting	50 - 75% of Dia.	600+	0.005	0.009	0.012	0.015	0.018	0.024
Medium Radial		1200+	0.009	0.014	0.020	0.025	0.030	0.040
1.0 X Dia. Depth	30% x Dia. Radial	600+	0.007	0.011	0.016	0.020	0.024	0.032
Heavy Radial		1200+	0.007	0.011	0.016	0.020	0.024	0.032
1.0 X Dia. Depth	50% x Dia. Radial		0.000	0.000	0.000	0.000	0.000	0.000
Medium Radial		1200+	0.009	0.014	0.020	0.025	0.030	0.040
2.0 X Dia Depth	30% x Dia. Radial	600+	0.007	0.011	0.016	0.020	0.024	0.032
Heavy Radial								
2.0 X Dia Depth	50% x Dia. Radial	1200+	0.007	0.011	0.016	0.020	0.024	0.032

Test Example

Tool#	R350-6250
Material:	6061 AL
RPM:	13000
FPT/IPM	0.0128 1680 IPM
Axial Depth:	0.250
Radial Depth:	0.500
Load Meter	60%

446 AND 436 SERIES V² CHIP LOADS

MATERIALS	Carbon Steels	Alloy Steels	Stainless Steels 300 Series	Stainless Steels 400 Series	Cast Irons	High Temp Alloys	Titanium Alloys 446T
Description	10XX, 11XX, 1, 3XX, 15XX	40XX, 41XX, 42XX, 43XX, 46XX, 86XXSeries	304, 304L, 316, 316L, 312, Invar Kovar	420, 430F, 416, 420F, 440L		Inconel 625/718, A 286, Haynes	Wrought 6AL-4V,ASTM 1,2,3 6A1-25N-4ZR-2MO-51
SFM > 32 RC	360 - 420	180 - 260	250 - 300	360 - 420	140 - 300	100 - 160	200 – 250
SFM > 32 RC	220 - 280	140 - 220	200 - 260	220 - 280	80 - 140	60 - 120	160 – 200
1/4 Slotting	0.0011	0.0011	0.0011	0.0011	0.0011	0.0009	0.0011
Heavy Radial	0.0011	0.0014	0.0011	0.0014	0.0011	0.0009	0.0013
Finishing Light	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
5/16 S	0.0015	0.0015	0.0015	0.0015	0.0013	0.0011	0.0013
H R	0.0018	0.0016	0.0015	0.0015	0.0013	0.0011	0.0015
FL R	0.0018	0.0017	0.0018	0.0017	0.0017	0.0013	0.0016
3/8 S	0.0018	0.0018	0.0018	0.0018	0.0018	0.0014	0.0018
H R	0.0018	0.0021	0.0018	0.0021	0.0018	0.0014	0.002
FL R	0.003	0.003	0.003	0.003	0.0028	0.003	0.0021
1/2 S	0.0025	0.0025	0.0025	0.0025	0.0028	0.002	0.0025
H R	0.0025	0.003	0.0025	0.003	0.0025	0.002	0.0028
FL R	0.003	0.003	0.003	0.003	0.0028	0.003	0.003
5/8 S	0.0031	0.0031	0.0031	0.0031	0.0031	0.0025	0.0031
H R	0.0031	0.0037	0.0031	0.0037	0.0031	0.0025	0.0034
FL R	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037
3/4 S	0.0037	0.0037	0.0037	0.0037	0.0037	0.003	0.0037
H R	0.0037	0.0045	0.0037	0.0045	0.0037	0.003	0.0042
FL R	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045
1" S	0.005	0.005	0.005	0.005	0.005	0.004	0.005
H R	0.005	0.006	0.005	0.006	0.005	0.004	0.0056
FL R	0.006	0.006	0.006	0.006	0.006	0.006	0.006

Deep Slotting = 3/4 - 1 x DIA
Heavy Radial = 1.0 x DIA Depth
50 % x DIA Radial
Finishing Light = <10% of DIA Radial

436 SERIES - 4 FLUTE V² VARIABLE HELIX WITH RADIUS

SIZE	SHANK DIA	LOC	OAL	EDP
1/8	1/8	1/4	1-1/2	436S1250-010-C11
1/8	1/8	1/2	1-1/2	436-1250-010-C11
1/8	1/8	1/2	1-1/2	436-1250-020-C11
5/32	5/32	3/8	2	436S1562-010-C11
5/32	5/32	1/2	2	436-1562-010-C11
3/16	3/16	3/8	2	436S1875-010-C11
3/16	3/16	5/8	2	436-1875-010-C11
3/16	3/16	3/4	3	436L1875-010-C11
3/16	3/16	5/8	2	436-1875-020-C11
7/32	1/4	3/8	2	436S2188-015-C11
7/32	1/4	3/4	2-1/2	436-2188-015-C11
7/32	1/4	1-1/4	3	436L2188-015-C11
1/4	1/4	3/8	2	436S2500-015-C11
1/4	1/4	3/8	2	436S2500-030-C11
1/4	1/4	3/8	2	436S2500-060-C11
1/4	1/4	3/4	2-1/2	436-2500-010-C11
1/4	1/4	3/4	2-1/2	436-2500-015-C11
1/4	1/4	3/4	2-1/2	436-2500-020-C11
1/4	1/4	3/4	2-1/2	436-2500-030-C11
1/4	1/4	3/4	2-1/2	436-2500-060-C11
1/4	1/4	1-1/4	3	436L2500-015-C11
9/32	5/16	7/16	2	436S2812-015-C11
9/32	5/16	5/8	2-1/2	436-2812-015-C11
5/16	5/16	7/16	2	436S3125-020-C11
5/16	5/16	13/16	2-1/2	436-3125-020-C11
5/16	5/16	13/16	2-1/2	436-3125-030-C11
5/16	5/16	13/16	2-1/2	436-3125-060-C11
3/8	3/8	1/2	2	436S3750-020-C11
3/8	3/8	1/2	2	436S3750-030-C11
3/8	3/8	1/2	2	436S3750-060-C11
3/8	3/8	1	2-1/2	436-3750-015-C11
3/8	3/8	1	2-1/2	436-3750-020-C11
3/8	3/8	1	2-1/2	436-3750-030-C11
3/8	3/8	1	2-1/2	436-3750-045-C11
3/8	3/8	1	2-1/2	436-3750-060-C11
7/16	7/16	9/16	2-1/2	436S4375-020-C11
7/16	7/16	1	2-3/4	436-4375-020-C11
1/2	1/2	5/8	2-1/2	436S5000-010-C11
1/2	1/2	5/8	2-1/2	436S5000-015-C11

CONTINUED...

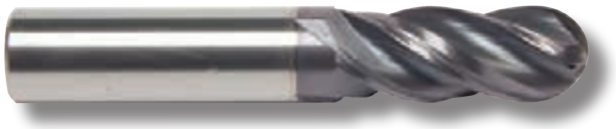
436 SERIES - 4 FLUTE V² VARIABLE HELIX WITH RADIUS

1/2	1/2	5/8	2-1/2	436S5000-020-C11
1/2	1/2	5/8	2-1/2	436S5000-030-C11
1/2	1/2	5/8	2-1/2	436S5000-060-C11
1/2	1/2	5/8	2-1/2	436S5000-090-C11
1/2	1/2	5/8	2-1/2	436S5000-120-C11
1/2	1/2	1-1/4	3	436-5000-010-C11
1/2	1/2	1-1/4	3	436-5000-015-C11
1/2	1/2	1-1/4	3	436-5000-020-C11
1/2	1/2	1-1/4	3	436-5000-030-C11
1/2	1/2	1-1/4	3	436-5000-060-C11
1/2	1/2	1-1/4	3	436-5000-090-C11
1/2	1/2	1-1/4	3	436-5000-120-C11
1/2	1/2	2	4	436L5000-010-C11
1/2	1/2	2	4	436L5000-015-C11
1/2	1/2	2	4	436L5000-020-C11
1/2	1/2	2	4	436L5000-030-C11
1/2	1/2	2	4	436L5000-060-C11
1/2	1/2	2	4	436L5000-090-C11
1/2	1/2	2	4	436L5000-120-C11
5/8	5/8	3/4	3	436S6250-025-C11
5/8	5/8	1-5/8	3-1/2	436-6250-025-C11
5/8	5/8	1-5/8	3-1/2	436-6250-060-C11
5/8	5/8	1-5/8	3-1/2	436-6250-120-C11
3/4	3/4	1	3	436S7500-030-C11
3/4	3/4	1-5/8	4	436-7500-020-C11
3/4	3/4	1-5/8	4	436-7500-030-C11
3/4	3/4	1-5/8	4	436-7500-060-C11
3/4	3/4	1-5/8	4	436-7500-120-C11
1	1	1-1/4	3	436S1000-035-C11
1	1	2	4	436-1000-035-C11

436 SERIES - 4 FLUTE NECKED VARIABLE HELIX WITH RADIUS

DIA	SHANK DIA	LOC	(LBS) LENGTH BELOW SHANK	RADIUS	OAL	EDP
1/4	1/4	3/8	2-1/8	0.020	4	436N2500-020-C11
1/4	1/4	3/8	2-1/8	0.030	4	436N2500-030-C11
5/16	5/16	7/16	2-1/8	0.020	4	436N3125-020-C11
3/8	3/8	1/2	2-1/8	0.020	4	436N3750-020-C11
3/8	3/8	1/2	2-1/8	0.030	4	436N3750-030-C11
3/8	3/8	1/2	2-1/8	0.060	4	436N3750-060-C11
1/2	1/2	5/8	2-3/8	0.030	4	436N5000-030-C11
1/2	1/2	5/8	2-3/8	0.060	4	436N5000-060-C11
1/2	1/2	5/8	2-3/8	0.120	4	436N5000-120-C11
1/2	1/2	5/8	3-3/8	0.030	6	436NL5000-030-C11
1/2	1/2	5/8	3-3/8	0.060	6	436NL5000-060-C11
1/2	1/2	5/8	3-3/8	0.120	6	436NL5000-120-C11
5/8	5/8	3/4	2-3/8	0.030	5	436N6250-030-C11
5/8	5/8	3/4	3-3/8	0.030	6	436NL6250-030-C11
3/4	3/4	1	2-3/8	0.030	5	436N7500-030-C11
3/4	3/4	1	2-3/8	0.060	5	436N7500-060-C11
3/4	3/4	1	3-3/8	0.030	6	436NL7500-030-C11
3/4	3/4	1	3-3/8	0.060	6	436NL7500-060-C11
1	1	1-1/4	2-3/8	0.030	5	436N1000-030-C11
1	1	1-1/4	2-3/8	0.060	5	436N1000-060-C11
1	1	1-1/4	2-3/8	0.120	5	436N1000-120-C11

436 SERIES - 4 FLUTE V² VARIABLE HELIX BALL NOSE



DIA	SHANK DIA	LOC	OAL	EDP ALTIN (C11)
1/4	1/4	3/8	2	436S2500BN-C11
1/4	1/4	3/4	2-1/2	436-2500BN-C11
5/16	5/16	7/16	2	436S3125BN-C11
5/16	5/16	13/16	2-1/2	436-3125BN-C11
3/8	3/8	1/2	2	436S3750BN-C11
3/8	3/8	1	2-1/2	436-3750BN-C11
7/16	7/16	9/16	2-1/2	436S4375BN-C11
7/16	7/16	1	2-3/4	436-4375BN-C11
1/2	1/2	5/8	2-1/2	436S5000BN-C11
1/2	1/2	1-1/4	3	436-5000BN-C11
5/8	5/8	3/4	3	436S6250BN-C11
5/8	5/8	1-5/8	3-1/2	436-6250BN-C11
3/4	3/4	1	3	436S7500BN-C11
3/4	3/4	1-5/8	4	436-7500BN-C11
1	1	1-1/4	3	436S1000BN-C11
1	1	2	4	436-1000BN-C11

436 SERIES - 4 FLUTE V² VARIABLE HELIX NECKED BALL NOSE

DIA	SHANK DIA	LOC	LBS LENGTH BELOW SHANK	OAL	ALTIN (C11)
1/4	1/4	3/8	2-1/8	4	436N2500BN-C11
5/16	5/16	7/16	2-1/8	4	436N3125BN-C11
3/8	3/8	1/2	2-1/8	4	436N3750BN-C11
1/2	1/2	5/8	2-3/8	4	436N5000BN-C11
1/2	1/2	5/8	3-3/8	6	436NL5000BN-C11
5/8	5/8	3/4	2-3/8	5	436N6250BN-C11
5/8	5/8	3/4	3-3/8	6	436NL6250BN-C11
3/4	3/4	1	2-3/8	5	436N7500BN-C11
3/4	3/4	1	3-3/8	6	436NL7500BN-C11
1	1	1-1/4	2-3/8	5	436N1000BN-C11
1	1	1-1/4	3-3/8	6	436NL1000BN-C11
1	1	1-1/4	4-3/8	7	436NXL1000BN-C11

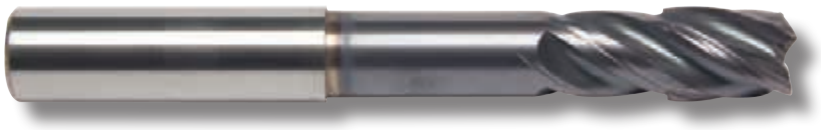
Patented Changing Helix Design Patent No. 7,001,113 B2

446 SERIES - 4 FLUTE V² VARIABLE HELIX
STUB, REG, LONG, WITH CHAMFER AND SQUARE END

DIA	SHANK DIA	LOC	OAL	ALTIN (C11)	ALTIN (C11)
1/8	1/8	1/4	1-1/2	446S1250-C11	446S1250SQ-C11
1/8	1/8	1/2	1-1/2	446-1250-C11	446-1250SQ-C11
1/8	1/8	3/4	3	446L1250-C11	446L1250SQ-C11
5/32	3/16	3/8	2	446S1562-C11	446S1562SQ-C11
5/32	3/16	1/2	2	446-1562-C11	446-1562SQ-C11
3/16	3/16	3/8	2	446S1875-C11	446S1875SQ-C11
3/16	3/16	5/8	2	446-1875-C11	446-1875SQ-C11
3/16	3/16	3/4	3	446L1875-C11	446L1875SQ-C11
7/32	1/4	3/8	2	446S2188-C11	446S2188SQ-C11
7/32	1/4	3/4	2-1/2	446-2188-C11	446-2188SQ-C11
1/4	1/4	3/8	2	446S2500-C11	446S2500SQ-C11
1/4	1/4	3/4	2-1/2	446-2500-C11	446-2500SQ-C11
1/4	1/4	1-1/4	3	446L2500-C11	446L2500SQ-C11
9/32	5/16	5/8	2-1/2	446-2812-C11	446-2812SQ-C11
5/16	5/16	7/16	2	446S3125-C11	446S3125SQ-C11
5/16	5/16	13/16	2-1/2	446-3125-C11	446-3125SQ-C11
5/16	5/16	1-3/8	3	446L3125-C11	446L3125SQ-C11
11/32	3/8	13/16	2-1/2	446-3438-C11	446-3438SQ-C11
3/8	3/8	1/2	2	446S3750-C11	446S3750SQ-C11
3/8	3/8	1	2-1/2	446-3750-C11	446-3750SQ-C11
3/8	3/8	1-1/2	4	446L3750-C11	446L3750SQ-C11
7/16	7/16	9/16	2-1/2	446S4375-C11	446S4375SQ-C11
7/16	7/16	1	2-3/4	446-4375-C11	446-4375SQ-C11
7/16	7/16	2	4	446L4375-C11	446L4375SQ-C11
1/2	1/2	5/8	2-1/2	446S5000-C11	446S5000SQ-C11
1/2	1/2	1-1/4	3	446-5000-C11	446-5000SQ-C11
1/2	1/2	2	4	446L5000-C11	446L5000SQ-C11
9/16	9/16	1-1/8	3-1/2	446-5625-C11	446-5625SQ-C11
5/8	5/8	3/4	3	446S6250-C11	446S6250SQ-C11
5/8	5/8	1-5/8	3-1/2	446-6250-C11	446-6250SQ-C11
5/8	5/8	2-1/4	5	446L6250-C11	446L6250SQ-C11
3/4	3/4	1	3	446S7500-C11	446S7500SQ-C11
3/4	3/4	1-5/8	4	446-7500-C11	446-7500SQ-C11
3/4	3/4	2-1/4	5	446L7500-C11	446L7500SQ-C11
1	1	1-1/4	3	446S1000-C11	446S1000SQ-C11
1	1	2	4	446-1000-C11	446-1000SQ-C11
1	1	3-1/4	6	446L1000-C11	446L1000SQ-C11

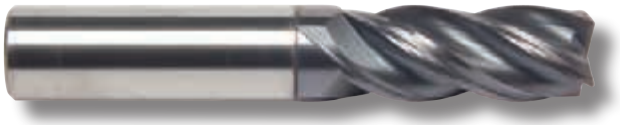
Patented Changing Helix Design Patent No. 7,001,113 B2

446 SERIES - 4 FLUTE V² VARIABLE HELIX NECKED WITH CHAMFER



DIA	SHANK DIA	LOC	(LBS) LENGTH BELOW SHK	OAL	ALTIN (C11)
1/4	1/4	3/8	2-1/8	4	446N2500-C11
5/16	5/16	7/16	2-1/8	4	446N3125-C11
3/8	3/8	1/2	2-1/8	4	446N3750-C11
1/2	1/2	5/8	2-3/8	4	446N5000-C11
1/2	1/2	5/8	3-3/8	6	446NL5000-C11
5/8	5/8	3/4	2-3/8	5	446N6250-C11
5/8	5/8	3/4	3-3/8	6	446NL6250-C11
3/4	3/4	1	2-3/8	5	446N7500-C11
3/4	3/4	1	3-3/8	6	446NL7500-C11
1	1	1-1/4	2-3/8	5	446N1000-C11
1	1	1-1/4	3-3/8	6	446NL1000-C11
1	1	1-1/4	4-3/8	7	446NXL1000-C11

446T SERIES - 4 FLUTE V² VARIABLE HELIX (FOR TITANIUM) WITH CHAMFER



DIA	SHANK DIA	CHAMFER	LOC	OAL	ALTIN (C11)
1/4	1/4	45 X .010	3/8	2	446TS2500-C11
1/4	1/4	45 X .010	3/4	2-1/2	446T-2500-C11
5/16	5/16	45 X .010	7/16	2	446TS3125-C11
5/16	5/16	45 X .010	13/16	2-1/2	446T-3125-C11
3/8	3/8	45 X .015	1/2	2	446TS3750-C11
3/8	3/8	45 X .015	1	2-1/2	446T-3750-C11
7/16	7/16	45 X .015	9/16	2-1/2	446TS4375-C11
7/16	7/16	45 X .015	1	2-3/4	446T-4375-C11
1/2	1/2	45 X .015	5/8	2-1/2	446TS5000-C11
1/2	1/2	45 X .015	1-1/4	3	446T-5000-C11
5/8	5/8	45 X .015	3/4	3	446TS6250-C11
5/8	5/8	45 X .015	1-5/8	3-1/2	446T-6250-C11
3/4	3/4	45 X .020	1	3	446TS7500-C11
3/4	3/4	45 X .020	1-5/8	4	446T-7500-C11
1	1	45 X .025	1-1/4	3	446TS1000-C11
1	1	45 X .025	2	4	446T-1000-C11

Patented Changing Helix Design Patent No. 7,001,113 B2

CBC 446 SERIES - 4 FLUTE V² VARIABLE HELIX STUB, REG, WITH CHAMFER AND CHIPBREAKERS

DIA	SHANK DIA	LOC	OAL	EDP ALTIN (C11)
1/4	1/4	3/8	2	CBC446S2500-C11
1/4	1/4	3/4	2-1/2	CBC446-2500-C11
5/16	5/16	7/16	2	CBC446S3125-C11
5/16	5/16	13/16	2-1/2	CBC446-3125-C11
3/8	3/8	1/2	2	CBC446S3750-C11
3/8	3/8	1	2-1/2	CBC446-3750-C11
7/16	7/16	9/16	2-1/2	CBC446S4375-C11
7/16	7/16	1	2-3/4	CBC446-4375-C11
1/2	1/2	5/8	2-1/2	CBC446S5000-C11
1/2	1/2	1-1/4	3	CBC446-5000-C11
5/8	5/8	3/4	3	CBC446S6250-C11
5/8	5/8	1-5/8	3-1/2	CBC446-6250-C11
3/4	3/4	1	3	CBC446S7500-C11
3/4	3/4	1-5/8	4	CBC446-7500-C11
1	1	1-1/4	3	CBC446S1000-C11
1	1	2	4	CBC446-1000-C11

CBC 446 SERIES - 4 FLUTE V² VARIABLE HELIX NECKED WITH CHAMFER AND CHIPBREAKERS

DIA	SHANK DIA	LOC	(LBS) LENGTH BELOW SHK	OAL	EDP ALTIN (C11)
1/4	1/4	3/8	2-1/8	4	CBC446N2500-C11
3/8	3/8	1/2	2-1/8	4	CBC446N3750-C11
1/2	1/2	5/8	2-3/8	4	CBC446N5000-C11
1/2	1/2	5/8	3-3/8	6	CBC446NL5000-C11
5/8	5/8	3/4	3-3/8	6	CBC446NL6250-C11
3/4	3/4	1	3-3/8	6	CBC446NL7500-C11
1	1	1-1/4	3-3/8	6	CBC446NL1000-C11

Patented Changing Helix Design Patent No. 7,001,113 B2

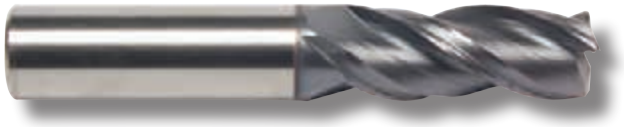
BENCHMARK™

CARBIDE

A Division of Custom Carbide Corporation

Main TOC Tech Info

336 SERIES - 3 FLUTE V² VARIABLE HELIX WITH RADIUS (EVERY FLUTE IS DIFFERENT)



DIA	SHANK DIA	LOC	RADIUS	OAL	EDP ALTIN (C11)
1/4	1/4	3/8	.015 - .020	2	336S2500-C11
1/4	1/4	3/4	.015 - .020	2-1/2	336-2500-C11
5/16	5/16	7/16	.015 - .020	2	336S3125-C11
5/16	5/16	13/16	.015 - .020	2-1/2	336-3125-C11
3/8	3/8	1/2	.015 - .020	2	336S3750-C11
3/8	3/8	1	.015 - .020	2-1/2	336-3750-C11
7/16	7/16	9/16	.015 - .020	2-1/2	336S4375-C11
7/16	7/16	1	.015 - .020	2-3/4	336-4375-C11
1/2	1/2	5/8	.030 - .035	2-1/2	336S5000-C11
1/2	1/2	1-1/4	.030 - .035	3	336-5000-C11
5/8	5/8	3/4	.030 - .035	3	336S6250-C11
5/8	5/8	1-5/8	.030 - .035	3-1/2	336-6250-C11
3/4	3/4	1	.030 - .035	3	336S7500-C11
3/4	3/4	1-5/8	.030 - .035	4	336-7500-C11
1	1	1-1/4	.030 - .035	3	336S1000-C11
1	1	2	.030 - .035	4	336-1000-C11

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Patented Changing Helix Design Patent No. 7,001,113 B2

546 SERIES V² 5 FLUTE CHIP LOADS

MATERIALS		Carbon Steels	Alloy Steels	Stainless Steels 300 Series	Stainless Steels 400 Series	Cast Irons	High Temp Alloys	Titanium Alloys
Description		10XX, 11XX 13XX, 15XX	40XX, 41XX, 42XX, 43XX, 46XX, 86XX Series	304, 304L, 316, 316L, 312, Invar Kovar	420, 430F, 416, 420F, 44 OL		Inconel 625/718, A286, Haynes	
SFM < 32 RC		360 - 420	180 - 260	250 - 300	360 - 420	140 - 300	100 - 160	200 - 250
SFM > 32 RC		220 - 280	140 - 220	200 - 260	220 - 280	80 - 140	60 - 120	160 - 200
1/4	MR	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
	FMR	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
	F	0.0023	0.002	0.002	0.002	0.002	0.002	0.0023
5/16	MR	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017
	FMR	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017	0.0017
	F	0.0027	0.0025	0.0025	0.0025	0.0025	0.0025	0.0027
3/8	MR	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021
	FMR	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021
	F	0.1136	0.0032	0.0032	0.0032	0.0032	0.0032	0.0036
1/2	MR	0.003	0.003	0.003	0.003	0.003	0.003	0.003
	FMR	0.003	0.003	0.003	0.003	0.003	0.003	0.003
	F	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.005
5/8	MR	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037
	FMR	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037	0.0037
	F	0.0061	0.0055	0.0055	0.0055	0.0055	0.0055	0.0061
3/4	MR	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045
	FMR	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045	0.0045
	F	0.0074	0.0067	0.006	0.006	0.0067	0.0067	0.0074
1"	MR	0.006	0.006	0.006	0.006	0.006	0.006	0.006
	FMR	0.006	0.006	0.006	0.006	0.006	0.006	0.006
	F	0.01	0.009	0.009	0.009	0.009	0.009	0.001

Medium Radial = 1.0 x Dia Depth
<20% x Dia Radial

Finishing Medium Radial - <10% of Dia
Finishing - < .010 Radial Depth

Main TOC

546 SERIES - 5 FLUTE V² VARIABLE HELIX FOR FINISHING

DIA	SHANK DIA	LOC	OAL	EDP ALTIN (C11)
1/8	1/8	1/4	1-1/2	546S1250-C11
1/8	1/8	1/2	1-1/2	546-1250-C11
1/8	1/8	3/4	3	546L1250-C11
3/16	3/16	3/8	2	546S1875-C11
3/16	3/16	5/8	2	546-1875-C11
3/16	3/16	3/4	3	546L1875-C11
1/4	1/4	3/8	2	546S2500-C11
1/4	1/4	3/4	2-1/2	546-2500-C11
1/4	1/4	1-1/4	3	546L2500-C11
5/16	5/16	7/16	2	546S3125-C11
5/16	5/16	13/16	2-1/2	546-3125-C11
5/16	5/16	1-3/8	3	546L3125-C11
3/8	3/8	1/2	2	546S3750-C11
3/8	3/8	1	2-1/2	546-3750-C11
3/8	3/8	1-1/2	4	546L3750-C11
7/16	7/16	9/16	2-1/2	546S4375-C11
7/16	7/16	1	2-3/4	546-4375-C11
7/16	7/16	2	4	546L4375-C11
1/2	1/2	5/8	2-1/2	546S5000-C11
1/2	1/2	1-1/4	3	546-5000-C11
1/2	1/2	2	4	546L5000-C11
1/2	1/2	3	6	546X5000-C11
5/8	5/8	3/4	3	546S6250-C11
5/8	5/8	1-5/8	3-1/2	546-6250-C11
5/8	5/8	2-1/4	5	546L6250-C11
5/8	5/8	3-1/4	6	546X6250-C11
3/4	3/4	1	3	546S7500-C11
3/4	3/4	1-5/8	4	546-7500-C11
3/4	3/4	2-1/4	5	546L7500-C11
3/4	3/4	3-1/4	6	546X7500-C11
1	1	1-1/4	3	546S1000-C11
1	1	2	4	546-1000-C11
1	1	3-1/4	6	546L1000-C11

Patented Changing Helix Design Patent No. 7,001,113 B2

546 SERIES - 5 FLUTE NECKED VARIABLE HELIX

DIA	SHANK DIA	LOC	(LBS) LENGTH BELOW SHANK	OAL	EDP
1/4	1/4	3/8	2-1/8	4	546N2500-C11
5/16	5/16	7/16	2-1/8	4	546N3125-C11
3/8	3/8	1/2	2-1/8	4	546N3750-C11
1/2	1/2	5/8	2-3/8	4	546N5000-C11
1/2	1/2	5/8	3-3/8	6	546NL5000-C11
5/8	5/8	3/4	2-3/8	5	546N6250-C11
5/8	5/8	3/4	3-3/8	6	546NL6250-C11
3/4	3/4	1	2-3/8	5	546N7500-C11
3/4	3/4	1	3-3/8	6	546NL7500-C11
1	1	1-1/4	2-3/8	5	546N1000-C11
1	1	1-1/4	3-3/8	6	546NL1000-C11
1	1	1-1/4	4-3/8	7	546NXL1000-C11

Patented Changing Helix Design Patent No. 7,001,113 B2

546 SERIES - 5 FLUTE V² VARIABLE HELIX WITH RADIUS

RADIUS SIZE

DIA	SHANK DIA	LOC	OAL	EDP ALTIN (C11)
1/4	1/4	3/4	2-1/2	546-2500-010-C11
1/4	1/4	3/4	2-1/2	546-2500-015-C11
1/4	1/4	3/4	2-1/2	546-2500-020-C11
1/4	1/4	3/4	2-1/2	546-2500-025-C11
1/4	1/4	3/4	2-1/2	546-2500-030-C11
1/4	1/4	3/4	2-1/2	546-2500-035-C11
1/4	1/4	3/4	2-1/2	546-2500-045-C11
1/4	1/4	3/4	2-1/2	546-2500-060-C11
3/8	3/8	1	2-1/2	546-3750-010-C11
3/8	3/8	1	2-1/2	546-3750-015-C11
3/8	3/8	1	2-1/2	546-3750-020-C11
3/8	3/8	1	2-1/2	546-3750-025-C11
3/8	3/8	1	2-1/2	546-3750-030-C11
3/8	3/8	1	2-1/2	546-3750-035-C11
3/8	3/8	1	2-1/2	546-3750-040-C11
3/8	3/8	1	2-1/2	546-3750-045-C11
3/8	3/8	1	2-1/2	546-3750-060-C11
3/8	3/8	1	2-1/2	546-3750-090-C11
3/8	3/8	1	2-1/2	546-3750-120-C11
1/2	1/2	1-1/4	3	546-5000-010-C11
1/2	1/2	1-1/4	3	546-5000-015-C11
1/2	1/2	1-1/4	3	546-5000-020-C11
1/2	1/2	1-1/4	3	546-5000-025-C11
1/2	1/2	1-1/4	3	546-5000-030-C11
1/2	1/2	1-1/4	3	546-5000-035-C11
1/2	1/2	1-1/4	3	546-5000-040-C11
1/2	1/2	1-1/4	3	546-5000-045-C11
1/2	1/2	1-1/4	3	546-5000-060-C11
1/2	1/2	1-1/4	3	546-5000-090-C11
1/2	1/2	1-1/4	3	546-5000-120-C11
5/8	5/8	1-5/8	3	546-6250-015-C11
5/8	5/8	1-5/8	3	546-6250-020-C11
5/8	5/8	1-5/8	3	546-6250-025-C11
5/8	5/8	1-5/8	3	546-6250-030-C11
5/8	5/8	1-5/8	3	546-6250-045-C11
5/8	5/8	1-5/8	3	546-6250-060-C11
3/4	3/4	1-5/8	4	546-7500-015-C11
3/4	3/4	1-5/8	4	546-7500-020-C11
3/4	3/4	1-5/8	4	546-7500-025-C11
3/4	3/4	1-5/8	4	546-7500-030-C11
3/4	3/4	1-5/8	4	546-7500-045-C11
3/4	3/4	1-5/8	4	546-7500-060-C11
3/4	3/4	1-5/8	4	546-7500-090-C11
3/4	3/4	1-5/8	4	546-7500-125-C11
3/4	3/4	1-5/8	4	546-7500-150-C11
1	1	2	4	546-1000-060-C11
1	1	2	4	546-1000-090-C11
1	1	2	4	546-1000-125-C11
1	1	2	4	546-1000-150-C11

Patented Changing Helix Design Patent No. 7,001,113 B2

546 SERIES - 5 FLUTE NECKED VARIABLE HELIX WITH RADIUS

DIA	SHANK DIA	LOC	(LBS) LENGTH BELOW SHANK	RADIUS	OAL	EDP
1/4	1/4	3/8	2-1/8	0.020	4	546N2500-020-C11
1/4	1/4	3/8	2-1/8	0.030	4	546N2500-030-C11
5/16	5/16	7/16	2-1/8	0.020	4	546N3125-020-C11
3/8	3/8	1/2	2-1/8	0.020	4	546N3750-020-C11
3/8	3/8	1/2	2-1/8	0.030	4	546N3750-030-C11
3/8	3/8	1/2	2-1/8	0.060	4	546N3750-060-C11
1/2	1/2	5/8	2-3/8	0.030	4	546N5000-030-C11
1/2	1/2	5/8	2-3/8	0.060	4	546N5000-060-C11
1/2	1/2	5/8	2-3/8	0.120	4	546N5000-120-C11
1/2	1/2	5/8	3-3/8	0.030	6	546NL5000-030-C11
1/2	1/2	5/8	3-3/8	0.060	6	546NL5000-060-C11
1/2	1/2	5/8	3-3/8	0.120	6	546NL5000-120-C11
5/8	5/8	3/4	2-3/8	0.030	5	546N6250-030-C11
5/8	5/8	3/4	3-3/8	0.030	6	546NL6250-030-C11
3/4	3/4	1	2-3/8	0.030	5	546N7500-030-C11
3/4	3/4	1	2-3/8	0.060	5	546N7500-060-C11
3/4	3/4	1	3-3/8	0.030	6	546NL7500-030-C11
3/4	3/4	1	3-3/8	0.060	6	546NL7500-060-C11
1	1	1-1/4	2-3/8	0.030	5	546N1000-030-C11
1	1	1-1/4	2-3/8	0.060	5	546N1000-060-C11
1	1	1-1/4	2-3/8	0.120	5	546N1000-120-C11

Patented Changing Helix Design Patent No. 7,001,113 B2

361 SERIES - 3 FLUTE V² VARIABLE HELIX

DIA	SHANK DIA	LOC	OAL	EDP ALTIN (C11)
1/4	1/4	3/8	2	361S2500-C11
1/4	1/4	3/4	2-1/2	361-2500-C11
5/16	5/16	7/16	2	361S3125-C11
5/16	5/16	13/16	2-1/2	361-3125-C11
3/8	3/8	1/2	2	361S3750-C11
3/8	3/8	1	2-1/2	361-3750-C11
7/16	7/16	9/16	2-1/2	361S4375-C11
7/16	7/16	1	2-3/4	361-4375-C11
1/2	1/2	5/8	2-1/2	361S5000-C11
1/2	1/2	1-1/4	3	361-5000-C11
5/8	5/8	3/4	3	361S6250-C11
5/8	5/8	1-5/8	3-1/2	361-6250-C11
3/4	3/4	1	3	361S7500-C11
3/4	3/4	1-5/8	4	361-7500-C11
1	1	1-1/4	3	361S1000-C11
1	1	2	4	361-1000-C11

Patented Changing Helix Design Patent No. 7,001,113 B2

437 Series Speed & Feeds

Type of Cut	SS - Alloys	Depth of Cut (vs. Dia of tool)	SFM Speed	End Mill Diameter Chip Load Per Tooth 1/4"	3/8"	1/2"	5/8"	3/4"	1"
Shallow Slotting	< 32	< 50% of Dia.	400 - 420	0.0014	0.0021	0.0030	0.0037	0.0045	0.0060
	> 32		260 - 280	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 42		180 - 220	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Deep Slotting	< 32	75 -100% of Dia.	360 - 380	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 32		220 - 240	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
	> 42		160 - 200	0.0008	0.0012	0.0017	0.0021	0.0025	0.0034
Medium Radial 1.0 X Dia Depth	< 32	30% x Dia. Radial	400 - 420	0.0014	0.0021	0.0030	0.0037	0.0045	0.0060
	> 32		260 - 280	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 42		180 - 220	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Heavy Radial 1.0 X Dia Depth	< 32	50% x Dia. Radial	400 - 420	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 32		260 - 280	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
	> 42		180 - 220	0.0008	0.0012	0.0017	0.0021	0.0025	0.0034
Medium Radial 2.0 X Dia Depth	< 32	30% x Dia. Radial	360 - 380	0.0013	0.0020	0.0028	0.0034	0.0042	0.0056
	> 32		220 - 240	0.0011	0.0017	0.0024	0.0029	0.0036	0.0048
	> 42		160 - 200	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Heavy Radial 2.0 X Dia Depth	< 32	50% x Dia. Radial	360 - 380	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
	> 32		220 - 240	0.0007	0.0011	0.0015	0.0018	0.0022	0.0030
	> 42		160 - 200	0.0008	0.0012	0.0017	0.0021	0.0025	0.0034
Finishing Medium Radial	< 32	< 25% of Dia.	360 - 380	0.0013	0.0020	0.0028	0.0034	0.0042	0.0056
	> 32		220 - 240	0.0011	0.0017	0.0024	0.0029	0.0036	0.0048
	> 42		160 - 200	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Finishing Light Radial	< 32	< 10% of Dia.	400 - 420	0.0014	0.0021	0.0030	0.0037	0.0045	0.0060
	> 32		260 - 280	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 42		180 - 220	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Finishing	< 32	< .010 Radial Depth	400 - 420	0.0023	0.0036	0.0050	0.0061	0.0074	0.0100
	> 32		260 - 280	0.0020	0.0032	0.0045	0.0055	0.0067	0.0090
	> 42		180 - 220	0.0018	0.0029	0.0040	0.0049	0.0059	0.0080

Formulas

RPM= (SFM x 3.82)/tool diameter

IPM= number of flutes x RPM x chip load per tooth

The chart is a starting point based on a coated tool. Reduce rates up to 50% using an uncoated tool.

Important Disclaimer: The speed and feed rates are suggested as a general guideline. Machine type, horsepower, spindle speed limitations, toolholding & workholding devices all may impact a cutting tools ability to perform properly. As a result BENCHMARK is not responsible for tool failure, part damage or injury that may be caused as a result.

437 Hard Metals / Exotics (>32 RC) Series

- Variably indexed to reduce harmonics and improve surface finish.
- New edge technology to reduce HP and increase metal removal.
- Flats available upon request.
- Offered both square and with radii.
- Extended reach also in stock.

Steels to Titanium and other exotic alloys.
These complimentary series cover most applications, from slotting to peripheral milling.

Application:

Cutter: 437S3750 (3/8" 4 flute)
Material: 403 Stainless Steel
Chip Per Tooth: .0012"
Axial DOC: .300
RPM: 4200
Radial engagement: full slot
Load: 0 - 10%
Feedrate: 20 IPM/ 413 SFM
Part Count: 800 Pockets
Reduced Cycle By: 50%

CUTTER DIA.	SHANK DIA.	LOC	OAL	RAD		EDP
1/8	1/8	1/4	2	-	4 FLUTE	437S1250-C11
1/8	1/8	1/4	2	.010	4 FLUTE	437S1250-010-C11
1/8	1/8	1/4	2	.020	4 FLUTE	437S1250-020-C11
1/8	1/8	1/2	2	-	4 FLUTE	437-1250-C11
1/8	1/8	1/2	2	.010	4 FLUTE	437-1250-010-C11
1/8	1/8	1/2	2	.020	4 FLUTE	437-1250-020-C11
3/16	3/16	5/16	2	-	4 FLUTE	437S1875-C11
3/16	3/16	5/16	2	.010	4 FLUTE	437S1875-010-C11
3/16	3/16	5/16	2	.020	4 FLUTE	437S1875-020-C11
3/16	3/16	9/16	2	-	4 FLUTE	437-1875-C11
3/16	3/16	9/16	2	.010	4 FLUTE	437-1875-010-C11
3/16	3/16	9/16	2	.020	4 FLUTE	437-1875-020-C11

CUTTER DIA.	SHANK DIA.	LOC	OAL	RAD		EDP
1/4	1/4	3/8	2-1/2	-	4 FLUTE	437S2500-C11
1/4	1/4	3/8	2-1/2	.010	4 FLUTE	437S2500-010-C11
1/4	1/4	3/8	2-1/2	.020	4 FLUTE	437S2500-020-C11
1/4	1/4	3/4	2-1/2	-	4 FLUTE	437-2500-C11
1/4	1/4	3/4	2-1/2	.010	4 FLUTE	437-2500-010-C11
1/4	1/4	3/4	2-1/2	.020	4 FLUTE	437-2500-020-C11
1/4	1/4	3/4	2-1/2	.030	4 FLUTE	437-2500-030-C11
1/4	1/4	3/4	4	-	4 FLUTE	437L2500-C11
1/4	1/4	3/4	4	.010	4 FLUTE	437L2500-010-C11
1/4	1/4	3/4	4	.020	4 FLUTE	437L2500-020-C11
5/16	5/16	13/16	2-1/2	-	4 FLUTE	437-3125-C11
5/16	5/16	13/16	2-1/2	.030	4 FLUTE	437-3125-030-C11
3/8	3/8	1/2	2-1/2	-	4 FLUTE	437S3750-C11
3/8	3/8	1/2	2-1/2	.020	4 FLUTE	437S3750-020-C11
3/8	3/8	1/2	2-1/2	.030	4 FLUTE	437S3750-030-C11
3/8	3/8	1	2-1/2	-	4 FLUTE	437-3750-C11
3/8	3/8	1	2-1/2	.020	4 FLUTE	437-3750-020-C11
3/8	3/8	1	2-1/2	.030	4 FLUTE	437-3750-030-C11
3/8	3/8	1	4	-	4 FLUTE	437L3750-C11
3/8	3/8	1	4	.020	4 FLUTE	437L3750-020-C11
3/8	3/8	1	4	.030	4 FLUTE	437L3750-030-C11
1/2	1/2	5/8	3	-	4 FLUTE	437S5000-C11
1/2	1/2	5/8	3	.020	4 FLUTE	437S5000-020-C11
1/2	1/2	5/8	3	.030	4 FLUTE	437S5000-030-C11
1/2	1/2	1-1/4	3	-	4 FLUTE	437-5000-C11
1/2	1/2	1-1/4	3	.020	4 FLUTE	437-5000-020-C11
1/2	1/2	1-1/4	3	.030	4 FLUTE	437-5000-030-C11
1/2	1/2	1-1/4	4	-	4 FLUTE	437L5000-C11
1/2	1/2	1-1/4	4	.020	4 FLUTE	437L5000-020-C11
1/2	1/2	1-1/4	4	.030	4 FLUTE	437L5000-030-C11
5/8	5/8	3/4	3	-	4 FLUTE	437S6250-C11
5/8	5/8	3/4	3	.030	4 FLUTE	437S6250-030-C11
5/8	5/8	1-5/8	3-1/2	-	4 FLUTE	437-6250-C11
5/8	5/8	1-5/8	3-1/2	.030	4 FLUTE	437-6250-030-C11
3/4	3/4	1	4	-	4 FLUTE	437S7500-C11
3/4	3/4	1	4	.030	4 FLUTE	437S7500-030-C11
3/4	3/4	1-5/8	4	-	4 FLUTE	437-7500-C11
3/4	3/4	1-5/8	4	.030	4 FLUTE	437-7500-030-C11
3/4	3/4	1-5/8	6	-	4 FLUTE	437L7500-C11
3/4	3/4	1-5/8	6	.030	4 FLUTE	437L7500-030-C11
1	1	1-1/4	4	-	4 FLUTE	437S1000-C11
1	1	1-1/4	4	.030	4 FLUTE	437S1000-030-C11
1	1	2	4	-	4 FLUTE	437-1000-C11
1	1	2	4	.030	4 FLUTE	437-1000-030-C11
1	1	2	6	-	4 FLUTE	437L1000-C11
1	1	2	6	.030	4 FLUTE	437L1000-030-C11

437 SERIES - 4 FLUTE BALL NOSE
FOR HARD METALS/EXOTICS [>32RC] SERIES

DIA	SHANK DIA	LOC	OAL	EDP ALTIN (C11)
1/4	1/4	3/8	2-1/2	437S2500BN-C11
1/4	1/4	3/4	2-1/2	437-2500BN-C11
5/16	5/16	7/16	2-1/2	437S3125BN-C11
5/16	5/16	13/16	2-1/2	437-3125BN-C11
3/8	3/8	1/2	2-1/2	437S3750BN-C11
3/8	3/8	1	2-1/2	437-3750BN-C11
1/2	1/2	5/8	3	437S5000BN-C11
1/2	1/2	1-1/4	3	437-5000BN-C11
5/8	5/8	3/4	3	437S6250BN-C11
5/8	5/8	1-5/8	3-1/2	437-6250BN-C11
3/4	3/4	1	4	437S7500BN-C11
3/4	3/4	1-5/8	4	437-7500BN-C11
1	1	1-1/4	4	437S1000BN-C11
1	1	2	4	437-1000BN-C11

537 Titanium Series Speed & Feeds

Type of Cut	Precipitation Hardening Stainless Steel -- 15/5PH, 16-6PH, 17/4PH, AM-3xx Series	Depth of Cut (vs. Dia of tool)	SFM Speed	End Mill Diameter Chip Load Per Tooth 1/4"	3/8"	1/2"	5/8"	3/4"	1"
Shallow Slotting	< 32	< 50% of Dia.	400 - 420	0.0013	0.0020	0.0028	0.0034	0.0042	0.0056
	> 32		260 - 280	0.0011	0.0017	0.0024	0.0029	0.0036	0.0048
	> 42		180 - 220	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Deep Slotting	< 32	75 -100% of Dia.	360 - 380	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 32		220 - 240	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
	> 42		160 - 200	0.0008	0.0012	0.0017	0.0021	0.0025	0.0034
Medium Radial 1.0 X Dia Depth	< 32	30% x Dia. Radial	400 - 420	0.0014	0.0021	0.0030	0.0037	0.0045	0.0060
	> 32		260 - 280	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 42		180 - 220	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Heavy Radial 1.0 X Dia Depth	< 32	50% x Dia. Radial	400 - 420	0.0014	0.0021	0.0030	0.0037	0.0045	0.0060
	> 32		260 - 280	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 42		180 - 220	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Medium Radial 2.0 X Dia Depth	< 32	30% x Dia. Radial	360 - 380	0.0013	0.0020	0.0028	0.0034	0.0042	0.0056
	> 32		220 - 240	0.0011	0.0017	0.0024	0.0029	0.0036	0.0048
	> 42		160 - 200	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Heavy Radial 2.0 X Dia Depth	< 32	50% x Dia. Radial	360 - 380	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 32		220 - 240	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
	> 42		160 - 200	0.0008	0.0012	0.0017	0.0021	0.0025	0.0034
Finishing Medium Radial	< 32	< 25% of Dia.	360 - 380	0.0013	0.0020	0.0028	0.0034	0.0042	0.0056
	> 32		220 - 240	0.0011	0.0017	0.0024	0.0029	0.0036	0.0048
	> 42		160 - 200	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Finishing Light Radial	< 32	< 10% of Dia.	400 - 420	0.0014	0.0021	0.0030	0.0037	0.0045	0.0060
	> 32		260 - 280	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 42		180 - 220	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Finishing	< 32	< .010 Radial Depth	400 - 420	0.0023	0.0036	0.0050	0.0061	0.0074	0.0100
	> 32		260 - 280	0.0020	0.0032	0.0045	0.0055	0.0067	0.0090
	> 42		180 - 220	0.0018	0.0029	0.0040	0.0049	0.0059	0.0080

Formulas

RPM= (SFM x 3.82)/tool diameter

IPM= number of flutes x RPM x chip load per tooth

The chart is a starting point based on a coated tool. Reduce rates up to 50% using an uncoated tool.

Important Disclaimer: The speed and feed rates are suggested as a general guideline. Machine type, horsepower, spindle speed limitations, toolholding & workholding devices all may impact a cutting tools ability to perform properly. As a result BENCHMARK is not responsible for tool failure, part damage or injury that may be caused as a result.

537 Hard Metals / Exotics (>32 RC) Series

- Variably indexed to reduce harmonics and improve surface finish.
- New edge technology to reduce HP and increase metal removal.
- Flats available upon request.
- Offered both square and with radii.
- Extended reach also in stock.

Application:

Cutter: 537-5000-C11 (1/2" 5 flt)
Material: 304 Stainless Steel
Chip Per Tooth: .0025"
Axial DOC: 1.250"
RPM: 2300
Radial Engagement: .010%
Load: 0
Feedrate: 29 IPM/ 301 SFM
Part Count: 50 Pcs.
Doubled competitors tool life.

CUTTER DIA.	SHANK DIA.	LOC	OAL	RAD		EDP
1/8	1/8	1/4	2	-	5 FLUTE	537S1250-C11
1/8	1/8	1/4	2	.010	5 FLUTE	537S1250-010-C11
1/8	1/8	1/4	2	.020	5 FLUTE	537S1250-020-C11
1/8	1/8	1/2	2	-	5 FLUTE	537-1250-C11
1/8	1/8	1/2	2	.010	5 FLUTE	537-1250-010-C11
1/8	1/8	1/2	2	.020	5 FLUTE	537-1250-020-C11
3/16	3/16	5/16	2	-	5 FLUTE	537S1875-C11
3/16	3/16	5/16	2	.010	5 FLUTE	537S1875-010-C11
3/16	3/16	5/16	2	.020	5 FLUTE	537S1875-020-C11
3/16	3/16	9/16	2	-	5 FLUTE	537-1875-C11
3/16	3/16	9/16	2	.010	5 FLUTE	537-1875-010-C11
3/16	3/16	9/16	2	.020	5 FLUTE	537-1875-020-C11
1/4	1/4	3/8	2-1/2	-	5 FLUTE	537S2500-C11
1/4	1/4	3/8	2-1/2	.010	5 FLUTE	537S2500-010-C11
1/4	1/4	3/8	2-1/2	.020	5 FLUTE	537S2500-020-C11
1/4	1/4	3/4	2-1/2	-	5 FLUTE	537-2500-C11
1/4	1/4	3/4	2-1/2	.010	5 FLUTE	537-2500-010-C11
1/4	1/4	3/4	2-1/2	.020	5 FLUTE	537-2500-020-C11
1/4	1/4	3/4	2-1/2	.030	5 FLUTE	537-2500-030-C11
1/4	1/4	3/4	4	-	5 FLUTE	537L2500-C11
1/4	1/4	3/4	4	.010	5 FLUTE	537L2500-010-C11
1/4	1/4	3/4	4	.020	5 FLUTE	537L2500-020-C11

537 Hard Metals / Exotics (>32 RC) Series

CUTTER DIA.	SHANK DIA.	LOC	OAL	RAD		EDP
5/16	5/16	13/16	2-1/2	-	5 FLUTE	537-3125-C11
5/16	5/16	13/16	2-1/2	.030	5 FLUTE	537-3125-030-C11
3/8	3/8	1/2	2-1/2	-	5 FLUTE	537S3750-C11
3/8	3/8	1/2	2-1/2	.020	5 FLUTE	537S3750-020-C11
3/8	3/8	1/2	2-1/2	.030	5 FLUTE	537S3750-030-C11
3/8	3/8	1	2-1/2	-	5 FLUTE	537-3750-C11
3/8	3/8	1	2-1/2	.020	5 FLUTE	537-3750-020-C11
3/8	3/8	1	2-1/2	.030	5 FLUTE	537-3750-030-C11
3/8	3/8	1	4	-	5 FLUTE	537L3750-C11
3/8	3/8	1	4	.020	5 FLUTE	537L3750-020-C11
3/8	3/8	1	4	.030	5 FLUTE	537L3750-030-C11
1/2	1/2	5/8	3	-	5 FLUTE	537S5000-C11
1/2	1/2	5/8	3	.020	5 FLUTE	537S5000-020-C11
1/2	1/2	5/8	3	.030	5 FLUTE	537S5000-030-C11
1/2	1/2	1-1/4	3	-	5 FLUTE	537-5000-C11
1/2	1/2	1-1/4	3	.020	5 FLUTE	537-5000-020-C11
1/2	1/2	1-1/4	3	.030	5 FLUTE	537-5000-030-C11
1/2	1/2	1-1/4	4	-	5 FLUTE	537L5000-C11
1/2	1/2	1-1/4	4	.020	5 FLUTE	537L5000-020-C11
1/2	1/2	1-1/4	4	.030	5 FLUTE	537L5000-030-C11
5/8	5/8	3/4	3	-	5 FLUTE	537S6250-C11
5/8	5/8	3/4	3	.030	5 FLUTE	537S6250-030-C11
5/8	5/8	1-5/8	3-1/2	-	5 FLUTE	537-6250-C11
5/8	5/8	1-5/8	3-1/2	.030	5 FLUTE	537-6250-030-C11
3/4	3/4	1	4	-	5 FLUTE	537S7500-C11
3/4	3/4	1	4	.030	5 FLUTE	537S7500-030-C11
3/4	3/4	1-5/8	4	-	5 FLUTE	537-7500-C11
3/4	3/4	1-5/8	4	.030	5 FLUTE	537-7500-030-C11
3/4	3/4	1-5/8	6	-	5 FLUTE	537L7500-C11
3/4	3/4	1-5/8	6	.030	5 FLUTE	537L7500-030-C11
1	1	1-1/4	4	-	5 FLUTE	537S1000-C11
1	1	1-1/4	4	.030	5 FLUTE	537S1000-030-C11
1	1	2	4	-	5 FLUTE	537-1000-C11
1	1	2	4	.030	5 FLUTE	537-1000-030-C11
1	1	2	6	-	5 FLUTE	537L1000-C11
1	1	2	6	.030	5 FLUTE	537L1000-030-C11

625 Titanium Series Speed & Feeds

Type of Cut	Titanium Alloys Cast and Wrought 6AL-4V ASTM 1/2/3 6Al-25N-4Zr-2Mo-Si	Depth of Cut (vs. Dia of tool)	SFM Speed	End Mill Diameter Chip Load Per Tooth 1/4"	3/8"	1/2"	5/8"	3/4"	1"
Shallow Slotting	< 32	< 50% of Dia.	200 - 250	0.0013	0.0020	0.0028	0.0034	0.0042	0.0056
	> 32		160 - 200	0.0011	0.0017	0.0024	0.0029	0.0036	0.0048
	> 42		120 - 160	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Deep Slotting	< 32	75 -100% of Dia.	180 - 220	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 32		140 - 200	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
	> 42		120 - 160	0.0008	0.0012	0.0017	0.0021	0.0025	0.0034
Medium Radial 1.0 X Dia Depth	< 32	30% x Dia. Radial	200 - 250	0.0014	0.0021	0.0030	0.0037	0.0045	0.0060
	> 32		160 - 200	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 42		120 - 160	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Heavy Radial 1.0 X Dia Depth	< 32	50% x Dia. Radial	180 - 220	0.0013	0.0020	0.0028	0.0034	0.0042	0.0056
	> 32		140 - 200	0.0011	0.0017	0.0024	0.0029	0.0036	0.0048
	> 42		120 - 160	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Medium Radial 2.0 X Dia Depth	< 32	30% x Dia. Radial	200 - 250	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 32		160 - 200	0.0007	0.0011	0.0015	0.0018	0.0022	0.0030
	> 42		120 - 160	0.0008	0.0012	0.0017	0.0021	0.0025	0.0034
Heavy Radial 2.0 X Dia Depth	< 32	50% x Dia. Radial	180 - 220	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
	> 32		140 - 200	0.0007	0.0011	0.0015	0.0018	0.0022	0.0030
	> 42		120 - 160	0.0008	0.0012	0.0017	0.0021	0.0025	0.0034
Finishing Medium Radial	< 32	< 25% of Dia.	200 - 250	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 32		160 - 200	0.0007	0.0011	0.0015	0.0018	0.0022	0.0030
	> 42		120 - 160	0.0008	0.0012	0.0017	0.0021	0.0025	0.0034
Finishing Light Radial	< 32	< 10% of Dia.	220 - 270	0.0014	0.0021	0.0030	0.0037	0.0045	0.0060
	> 32		180 - 220	0.0011	0.0018	0.0025	0.0031	0.0037	0.0050
	> 42		140 - 180	0.0009	0.0014	0.0020	0.0025	0.0030	0.0040
Finishing	< 32	< .010 Radial Depth	250 -300	0.0023	0.0036	0.0050	0.0061	0.0074	0.0100
	> 32		200 - 250	0.0020	0.0032	0.0045	0.0055	0.0067	0.0090
	> 42		160 - 200	0.0018	0.0029	0.0040	0.0049	0.0059	0.0080

Formulas

RPM= (SFM x 3.82)/tool diameter

IPM= number of flutes x RPM x chip load per tooth

The chart is a starting point based on a coated tool. Reduce rates up to 50% using an uncoated tool.

Important Disclaimer: The speed and feed rates are suggested as a general guideline. Machine type, horsepower, spindle speed limitations, toolholding & workholding devices all may impact a cutting tools ability to perform properly. As a result BENCHMARK is not responsible for tool failure, part damage or injury that may be caused as a result.

625 Hard Metals / Titanium Series

- Variably Indexed for harmonic balance
- Improved cutting edge technology
- Superior life in high speed machining
- Excellent for trochoidal milling and helical interpolation
- New C11 coating

Introducing the 625 Series from Benchmark Carbide developed for high speed machining and exotics. We have combined the best micro grade substrate with a new proven geometry and a superior coating for maximum metal removal. (MMR)

Titanium Application: Finishing

Cutter: 625-2500-020-C11
(1/4" 6 Flute)
Material: Titanium 6AL4V
Chip Per Tooth: .0071" .0009"
Axial DOC: .300"
RPM: 6500
Radial Engagement: .020" Tro
Load: 5%
Feedrate: 36 IPM/ 425 SFM
Part Count: 300
Increased Part Count By: 50%

Titanium Application: Roughing

Cutter: 625-3750-020-C11
(3/8" 6 Flute)
Material: Cobalt Chrome
Chip per/ tooth: .0013"
Axial DOC: .150"
RPM: 4000
Radial Engagement: .025"
Load: 10%
Feedrate: 30 IPM/ 393 SFM
Part Count By: 15 test pcs.

CUTTER DIA.	SHANK DIA.	LOC	OAL	RAD		EDP
1/8	1/8	1/4	2	-	6 FLUTE	625S1250-C11
1/8	1/8	1/4	2	.010	6 FLUTE	625S1250-010-C11
1/8	1/8	1/4	2	.020	6 FLUTE	625S1250-020-C11
1/8	1/8	1/2	2	-	6 FLUTE	625-1250-C11
1/8	1/8	1/2	2	.010	6 FLUTE	625-1250-010-C11
1/8	1/8	1/2	2	.020	6 FLUTE	625-1250-020-C11
3/16	3/16	5/16	2	-	6 FLUTE	625S1875-C11
3/16	3/16	5/16	2	.010	6 FLUTE	625S1875-010-C11
3/16	3/16	5/16	2	.020	6 FLUTE	625S1875-020-C11
3/16	3/16	9/16	2	-	6 FLUTE	625-1875-C11
3/16	3/16	9/16	2	.010	6 FLUTE	625-1875-010-C11
3/16	3/16	9/16	2	.020	6 FLUTE	625-1875-020-C11
1/4	1/4	3/8	2-1/2	-	6 FLUTE	625S2500-C11
1/4	1/4	3/8	2-1/2	.010	6 FLUTE	625S2500-010-C11
1/4	1/4	3/8	2-1/2	.020	6 FLUTE	625S2500-020-C11
1/4	1/4	3/4	2-1/2	-	6 FLUTE	625-2500-C11
1/4	1/4	3/4	2-1/2	.010	6 FLUTE	625-2500-010-C11
1/4	1/4	3/4	2-1/2	.020	6 FLUTE	625-2500-020-C11
1/4	1/4	3/4	2-1/2	.030	6 FLUTE	625-2500-030-C11
1/4	1/4	3/4	4	-	6 FLUTE	625L2500-C11
1/4	1/4	3/4	4	.010	6 FLUTE	625L2500-010-C11
1/4	1/4	3/4	4	.020	6 FLUTE	625L2500-020-C11

625 Hard Metals / Titanium Series

CUTTER DIA.	SHANK DIA.	LOC	OAL	RAD		EDP
5/16	5/16	13/16	2-1/2	-	6 FLUTE	625-3125-C11
5/16	5/16	13/16	2-1/2	.030	6 FLUTE	625-3125-030-C11
3/8	3/8	1/2	2-1/2	-	6 FLUTE	625S3750-C11
3/8	3/8	1/2	2-1/2	.020	6 FLUTE	625S3750-020-C11
3/8	3/8	1/2	2-1/2	.030	6 FLUTE	625S3750-030-C11
3/8	3/8	1	2-1/2	-	6 FLUTE	625-3750-C11
3/8	3/8	1	2-1/2	.020	6 FLUTE	625-3750-020-C11
3/8	3/8	1	2-1/2	.030	6 FLUTE	625-3750-030-C11
3/8	3/8	1	4	-	6 FLUTE	625L3750-C11
3/8	3/8	1	4	.020	6 FLUTE	625L3750-020-C11
3/8	3/8	1	4	.030	6 FLUTE	625L3750-030-C11
1/2	1/2	5/8	3	-	6 FLUTE	625S5000-C11
1/2	1/2	5/8	3	.020	6 FLUTE	625S5000-020-C11
1/2	1/2	5/8	3	.030	6 FLUTE	625S5000-030-C11
1/2	1/2	1-1/4	3	-	6 FLUTE	625-5000-C11
1/2	1/2	1-1/4	3	.020	6 FLUTE	625-5000-020-C11
1/2	1/2	1-1/4	3	.030	6 FLUTE	625-5000-030-C11
1/2	1/2	1-1/4	4	-	6 FLUTE	625L5000-C11
1/2	1/2	1-1/4	4	.020	6 FLUTE	625L5000-020-C11
1/2	1/2	1-1/4	4	.030	6 FLUTE	625L5000-030-C11
5/8	5/8	3/4	3	-	8 FLUTE	825S6250-C11
5/8	5/8	3/4	3	.030	8 FLUTE	825S6250-030-C11
5/8	5/8	1-5/8	3-1/2	-	8 FLUTE	825-6250-C11
5/8	5/8	1-5/8	3-1/2	.030	8 FLUTE	825-6250-030-C11
3/4	3/4	1	4	-	8 FLUTE	825S7500-C11
3/4	3/4	1	4	.030	8 FLUTE	825S7500-030-C11
3/4	3/4	1-5/8	4	-	8 FLUTE	825-7500-C11
3/4	3/4	1-5/8	4	.030	8 FLUTE	825-7500-030-C11
3/4	3/4	1-5/8	6	-	8 FLUTE	825L7500-C11
3/4	3/4	1-5/8	6	.030	8 FLUTE	825L7500-030-C11
1	1	1-1/4	4	-	10 FLUTE	625S1000-C11
1	1	1-1/4	4	.030	10 FLUTE	625S1000-030-C11
1	1	2	4	-	10 FLUTE	625-1000-C11
1	1	2	4	.030	10 FLUTE	625-1000-030-C11
1	1	2	6	-	10 FLUTE	625L1000-C11
1	1	2	6	.030	10 FLUTE	625L1000-030-C11

335 STUB, STANDARD, AND REG LENGTH SPEEDS AND FEEDS

MATERIALS		Carbon Steels	Alloy Steels	Stainless Steels 300 Series	Stainless Steels 400 Series	Precipitation Stainless Steels	Gray Cast Iron	Ductile Cast Iron	High Temp Alloys	Titanium Pure	Titanium Cast / Wrought
Description		10XX, 11XX 13XX, 15XX	40XX, 41XX, 42XX, 43XX,	304, 304L, 316, 316L, 312,	420, 420F, 416, 440C	15-5PH, 16-6PH, 17-4PH, AM-xx Series	Gray	Ductile	Inconel 625/718, A286, Haynes	Pure	Cast/Wrought 6AL4V, ASTM 1,2,3 Alpha-Beta
SFM < 32 RC		200-450-200-	150-300	150-350	200-450	80-250	250-450	120-350	70-120	140-220	140-200
SFM > 32 RC		100-250	80-200	80-200	100-250	90-125	130-300	80-140	40-90	90-160	90-160
1/8	S	0.0007	0.0006	0.0007	0.0007	0.0006	0.0006	0.0006	0.0005	0.0007	0.0006
	HP	0.0008	0.0007	0.0008	0.0008	0.0007	0.0007	0.0007	0.0006	0.0008	0.0007
	LP	0.0010	0.0008	0.0009	0.0009	0.0008	0.0008	0.0008	0.0007	0.0009	0.0008
1/4	S	0.0014	0.0012	0.0013	0.0013	0.0012	0.0012	0.0012	0.0010	0.0013	0.0012
	HP	0.0017	0.0014	0.0017	0.0017	0.0014	0.0014	0.0014	0.0012	0.0017	0.0014
	LP	0.0019	0.0017	0.0018	0.0018	0.0017	0.0017	0.0017	0.0014	0.0018	0.0017
5/16	S	0.0018	0.0015	0.0017	0.0017	0.0015	0.0015	0.0015	0.0012	0.0017	0.0015
	HP	0.0021	0.0018	0.0021	0.0021	0.0018	0.0018	0.0018	0.0015	0.0021	0.0018
	LP	0.0024	0.0021	0.0023	0.0023	0.0021	0.0021	0.0021	0.0018	0.0023	0.0021
3/8	S	0.0021	0.0018	0.0020	0.0020	0.0018	0.0018	0.0018	0.0014	0.0020	0.0018
	HP	0.0025	0.0021	0.0025	0.0025	0.0021	0.0021	0.0021	0.0018	0.0025	0.0021
	LP	0.0029	0.0025	0.0027	0.0027	0.0025	0.0025	0.0025	0.0021	0.0027	0.0025
1/2	S	0.0030	0.0025	0.0028	0.0028	0.0025	0.0025	0.0025	0.0020	0.0028	0.0025
	HP	0.0035	0.0030	0.0035	0.0035	0.0030	0.0030	0.0030	0.0025	0.0035	0.0030
	LP	0.0040	0.0035	0.0038	0.0038	0.0035	0.0035	0.0035	0.0030	0.0038	0.0031
5/8	S	0.0038	0.0031	0.0035	0.0035	.0031	0.0031	0.0031	0.0025	0.0035	0.0031
	HP	0.0044	0.0038	1.0044	0.0044	0.0038	0.0038	0.0038	0.0031	0.0044	0.0044
	LP	0.0050	0.0044	0.0049	0.0048	0.0044	0.0044	0.0044	0.0038	0.0048	0.0044
3/4	S	0.0045	0.0038	0.0042	0.0042	0.0038	0.0038	0.0038	0.0030	0.0042	0.0038
	HP	0.0053	0.0045	0.0053	0.0053	0.0045	0.0045	0.0045	0.0038	0.0053	0.0045
	LP	0.0060	0.0053	0.0057	0.0057	0.0053	0.0053	0.0053	0.0045	0.0057	0.0053
1	S	0.0060	0.0050	0.0056	0.0056	0.0050	0.0050	0.0050	0.0040	0.0556	0.0050
	HP	0.0070	0.0070	0.0070	0.0070	0.0060	0.0060	0.0060	0.0050	0.0070	0.0060
	LP	0.0080	0.0070	0.0076	0.0076	0.0076	0.0070	0.0070	0.0060	0.0076	0.0070

S=SLOTTING
Axial Depth
up to .5 x Diameter

HP: HEAVY PERIPHERAL
Axial Depth up to Effective Length of Cut
Radial width .5 x Diameter

LP=LIGHT PERIPHERAL
Axial Dept up to Effective Length of Cut
Radial width .15 x Diameter

335S SERIES - 3 FLUTE STUB, 35 DEGREE HELIX WITH CORNER RADIUS

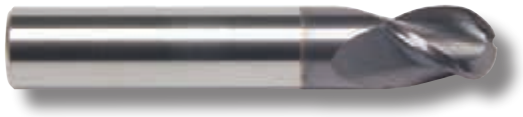
DIA	SHANK DIA	LOC	OAL	CORNER RADIUS	EDP
1/8	1/8	1/4	1-1/2	.008-.010	335S1250
5/32	3/16	5/16	2	.008-.010	335S1562
3/16	3/16	5/16	2	.008-.010	335S1875
7/32	1/4	3/8	2	.015-.020	335S2188
1/4	1/4	3/8	2	.015-.020	335S2500
9/32	5/16	7/16	2	.015-.020	335S2812
5/16	5/16	7/16	2	.015-.020	335S3125
11/32	3/8	1/2	2	.015-.020	335S3438
3/8	3/8	1/2	2	.015-.020	335S3750
7/16	7/16	9/16	2-1/2	.015-.020	335S4375
1/2	1/2	5/8	2-1/2	.030-.035	335S5000
5/8	5/8	3/4	3	.030-.035	335S6250
3/4	3/4	1	3	.030-.035	335S7500
1	1	1-1/4	3	.030-.035	335S1000

335 SERIES - 3 FLUTE, 35 DEGREE HELIX WITH CORNER RADIUS

DIA	SHANK DIA	LOC	OAL	CORNER RADIUS	EDP
1/8	1/8	1/2	1-1/2	.008-.010	335-1250
5/32	3/16	9/16	2	.008-.010	335-1562
3/16	3/16	9/16	2	.008-.010	335-1875
7/32	1/4	3/4	2-1/2	.015-.020	335-2188
1/4	1/4	3/4	2-1/2	.015-.020	335-2500
9/32	5/16	13/16	2-1/2	.015-.020	335-2812
5/16	5/16	13/16	2-1/2	.015-.020	335-3125
11/32	3/8	1	2-1/2	.015-.020	335-3438
3/8	3/8	1	2-1/2	.015-.020	335-3750
7/16	7/16	1	2-3/4	.015-.020	335-4375
1/2	1/2	1-1/4	3	.030-.035	335-5000
5/8	5/8	1-5/8	3-1/2	.030-.035	335-6250
3/4	3/4	1-5/8	4	.030-.035	335-7500
1	1	2	4	.030-.035	335-1000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

335S SERIES - 3 FLUTE, STUB BALL NOSE
35 DEGREE HELIX



DIA	SHANK DIA	LOC	OAL	BALL RADIUS	EDP
1/8	1/8	1/4	1-1/2	.0625	335S1250BN
5/32	3/16	5/16	2	.0781	335S1562BN
3/16	3/16	5/16	2	.0938	335S1875BN
7/32	1/4	3/8	2	.1094	335S2188BN
1/4	1/4	3/8	2	.1250	335S2500BN
9/32	5/16	7/16	2	.1406	335S2812BN
5/16	5/16	7/16	2	.1563	335S3125BN
11/32	3/8	1/2	2	.1719	335S3438BN
3/8	3/8	1/2	2	.1875	335S3750BN
7/16	7/16	9/16	2-1/2	.2188	335S4375BN
1/2	1/2	5/8	2-1/2	.2500	335S5000BN
5/8	5/8	3/4	3	.3125	335S6250BN
3/4	3/4	1	3	.3750	335S7500BN
1	1	1-1/4	3	.5000	335S1000BN

335 SERIES - 3 FLUTE, BALL NOSE
35 DEGREE HELIX

DIA	SHANK DIA	LOC	OAL	BALL RADIUS	EDP
1/8	1/8	1/2	1-1/2	.0625	335-1250BN
5/32	3/16	9/16	2	.0781	335-1562BN
3/16	3/16	9/16	2	.0938	335-1875BN
7/32	1/4	3/4	2-1/2	.1094	335-2188BN
1/4	1/4	3/4	2-1/2	.1250	335-2500BN
9/32	5/16	13/16	2-1/2	.1406	335-2812BN
5/16	5/16	13/16	2-1/2	.1563	335-3125BN
11/32	3/8	1	2-1/2	.1719	335-3438BN
3/8	3/8	1	2-1/2	.1875	335-3750BN
7/16	7/16	1	2-3/4	.2188	335-4375BN
1/2	1/2	1-1/4	3	.2500	335-5000BN
5/8	5/8	1-5/8	3-1/2	.3125	335-6250BN
3/4	3/4	1-5/8	4	.3750	335-7500BN
1	1	2	4	.5000	335-1000BN

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

545 SPEEDS AND FEEDS (SFM) CHIP LOAD PER/TOOTH CHART

MATERIALS	Carbon Steels	Alloy Steel	Stainless Steels 300 Series	Stainless Steels 400 Series	Precipitation Stainless Steels	Gray Cast Iron	Ductile Cast Iron	High Temp Alloys	Titanium Pure	Titanium Cast/Wrought
DESCRIPTION	10XX, 11XX, 13XX, 15XX,	40XX, 41XX, 42XX, 43XX, 44XX, 46XX, 86XX, Series	304, 304L, 316, 316L, 312	420, 420F, 416, 440C	15-PH, 16-6PH, 17-4PH, AM-xx Series	Gray	Ductile	Inconel 625/718, A286,Haynes	Pure	Cast/Wrought 6AL4V, ASTM 1,2,3 Alpha-Beta
SFM < 32 Rc	200 - 450	150 - 300	150 - 350	200 - 450	80 - 250	250 - 450	120 - 350	70 - 120	140 - 220	140 - 200
SFM > 32 Rc	100 - 250	80 - 200	80 - 200	100 - 250	90 - 125	130 - 300	80 - 140	40 - 90	90 -160	90 - 160
1/8 HP	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0005	0.0007	0.0007
LP	0.0011	0.001	0.001	0.001	0.001	0.001	0.001	0.0007	0.001	0.001
FINISH	0.0014	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.001	0.0013	0.0013
1/4 HP	0.0017	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.001	0.0014	0.0014
LP	0.0021	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0014	0.0019	0.0019
FINISH	0.0028	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.002	0.0025	0.0025
5/16 HP	0.0021	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0012	0.0018	0.0018
LP	0.0034	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031	0.0025	0.0031	0.0031
FINISH	0.0034	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031	0.0025	0.0031	0.0031
3/8 HP	0.0025	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0014	0.0021	0.0021
LP	0.0032	0.0029	0.0029	0.0029	0.0029	0.0029	0.0029	0.0021	0.0029	0.0029
FINISH	0.0041	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.003	0.0038	0.0038
1/2 HP	0.0035	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.003	0.003
LP	0.0045	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.004	0.004
FINISH	0.0055	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.005
5/8 HP	0.0042	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0024	0.0036	0.0036
LP	0.0053	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048	0.0036	0.0048	0.0048
FINISH	0.0065	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0048	0.0059	0.0059
3/4 HP	0.005	0.0043	0.0043	0.0043	0.0043	0.0043	0.0043	0.0029	0.0043	0.0043
LP	0.0064	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0043	0.0057	0.0057
FINISH	0.0078	0.0071	0.0071	0.0071	0.0071	0.0071	0.0071	0.0057	0.0071	0.0071
1" HP	0.009	0.008	0.008	0.008	0.008	0.008	0.008	0.006	0.008	0.008
LP	0.009	0.008	0.008	0.008	0.008	0.008	0.008	0.006	0.008	0.008
FINISH	0.011	0.01	0.01	0.01	0.01	0.01	0.01	0.008	0.01	0.01
1-1/4 HP	0.0079	0.0068	0.0068	0.0068	0.0068	0.0068	0.0068	0.0045	0.0068	0.0068
LP	0.0101	0.009	0.009	0.009	0.009	0.009	0.009	0.0068	0.009	0.009
FINISH	0.0124	0.0113	0.0113	0.0113	0.0113	0.0113	0.0113	0.009	0.0113	0.0113

HP=HEAVY PERIPHERAL
Axial Depth up to 1 x Diameter,
Radial width .2 x Diameter

LP=LIGHT PERIPHERAL
Axial Depth up to Effective Length
Radial width .05 x Diameter

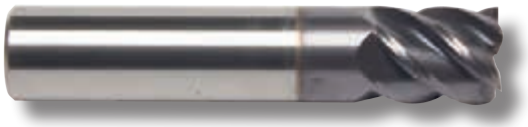
FINISH=FINISH OPERATION
Axial Depth up to Effective Length of Cut
Radial width .02 x Diameter

For additional support and for maximum optimization of your Benchmark tools, call us toll free at 800-523-8570 and ask to speak to our Technical Support Dept.

545 SERIES - 5 FLUTE STUB WITH 3/8 SHANK

DIA	SHANK DIA	LOC	OAL	EDP
1/8	3/8	1/4	2-1/2	545-1250S
3/16	3/8	5/16	2-1/2	545-1875S
1/4	3/8	3/8	2-1/2	545-2500S

545S SERIES - 5 FLT STUB, 45 DEGREE HELIX



DIA	SHANK DIA	LOC	OAL	EDP
1/8	1/8	1/4	1-1/2	545S1250
5/32	3/16	5/16	2	545S1562
3/16	3/16	5/16	2	545S1875
7/32	1/4	3/8	2	545S2188
1/4	1/4	3/8	2	545S2500
9/32	5/16	7/16	2	545S2812
5/16	5/16	7/16	2	545S3125
11/32	3/8	1/2	2	545S3438
3/8	3/8	1/2	2	545S3750
13/32	7/16	9/16	2-1/2	545S4062
7/16	7/16	9/16	2-1/2	545S4375
15/32	1/2	5/8	2-1/2	545S4688
1/2	1/2	5/8	2-1/2	545S5000
5/8	5/8	3/4	3	545S6250
3/4	3/4	1	3	545S7500
1	1	1-1/4	3	545S1000

545 SERIES - 5 FLUTE REGULAR LENGTH 45 DEGREE HELIX

DIA	SHANK DIA	LOC	OAL	EDP
1/8	1/8	1/2	1-1/2	545-1250
5/32	3/16	9/16	2	545-1562
3/16	3/16	9/16	2	545-1875
7/32	1/4	3/4	2-1/2	545-2188
1/4	1/4	3/4	2-1/2	545-2500
9/32	5/16	13/16	2-1/2	545-2812
5/16	5/16	13/16	2-1/2	545-3125
11/32	3/8	1	2-1/2	545-3438
3/8	3/8	1	2-1/2	545-3750
13/32	7/16	1	2-3/4	545-4062
7/16	7/16	1	2-3/4	545-4375
15/32	1/2	1-1/4	3	545-4688
1/2	1/2	1-1/4	3	545-5000
9/16	9/16	1-1/8	3-1/2	545-5625
5/8	5/8	1-1/2	3-1/2	545-6250
3/4	3/4	1-5/8	4	545-7500
7/8	7/8	2	4	545-8750
1	1	2	4	545-1000
1-1/4	1-1/4	2	4-1/2	545-1.250

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

545 SERIES - 5 FLUTE LONG LENGTH 45 DEGREE HELIX

DIA	SHANK DIA	LOC	OAL	EDP
1/4	1/4	1-1/4	4	545L2500
5/16	5/16	1-1/4	4	545L3125
3/8	3/8	1-1/2	4	545L3750
7/16	7/16	2	4	545L4375
1/2	1/2	2	4	545L5000
5/8	5/8	2-1/2	5	545L6250
3/4	3/4	3-1/4	6	545L7500
1	1	3-1/4	6	545L1000
1-1/4	1-1/4	3-1/4	6	545L1.250

545 SERIES - 5 FLUTE DOUBLE END 45 DEGREE HELIX

DIA	SHANK DIA	LOC	OAL	EDP
1/8	1/8	1/4	1-1/2	545DE1250
3/16	3/16	5/16	2	545DE1875
1/4	1/4	3/8	2-1/2	545DE2500
5/16	5/16	7/16	2-1/2	545DE3125
3/8	3/8	1/2	2-1/2	545DE3750
7/16	7/16	9/16	2-3/4	545DE4375
1/2	1/2	5/8	3	545DE5000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

545 SERIES - 5 FLUTE 45 DEGREE HELIX WITH RADIUS

RADIUS SIZE

DIA	SHANK DIA	LOC	OAL	EDP ALTIN (C11)
1/4	1/4	3/8	2	545S2500-030-C11
1/4	1/4	3/4	2-1/2	545-2500-030-C11
1/4	1/4	1-1/4	4	545L2500-030-C11
3/8	3/8	1/2	2	545S3750-030-C11
3/8	3/8	1/2	2	545S3750-060-C11
3/8	3/8	1	2-1/2	545-3750-030-C11
3/8	3/8	1	2-1/2	545-3750-060-C11
3/8	3/8	1-1/2	4	545L3750-030-C11
3/8	3/8	1-1/2	4	545L3750-060-C11
1/2	1/2	5/8	2-1/2	545S5000-030-C11
1/2	1/2	5/8	2-1/2	545S5000-060-C11
1/2	1/2	5/8	2-1/2	545S5000-090-C11
1/2	1/2	1-1/4	3	545-5000-030-C11
1/2	1/2	1-1/4	3	545-5000-060-C11
1/2	1/2	1-1/4	3	545-5000-090-C11
1/2	1/2	2	4	545L5000-030-C11
1/2	1/2	2	4	545L5000-060-C11
1/2	1/2	2	4	545L5000-090-C11
5/8	5/8	3/4	3	545S6250-030-C11
5/8	5/8	3/4	3	545S6250-060-C11
5/8	5/8	3/4	3	545S6250-090-C11
5/8	5/8	1-5/8	3-1/2	545-6250-030-C11
5/8	5/8	1-5/8	3-1/2	545-6250-060-C11
5/8	5/8	1-5/8	3-1/2	545-6250-090-C11
5/8	5/8	2-1/2	5	545L6250-030-C11
5/8	5/8	2-1/2	5	545L6250-060-C11
5/8	5/8	2-1/2	2	545L6250-090-C11
3/4	3/4	1	3	545S7500-030-C11
3/4	3/4	1	3	545S7500-060-C11
3/4	3/4	1	3	545S7500-090-C11
3/4	3/4	1-5/8	4	545-7500-030-C11
3/4	3/4	1-5/8	4	545-7500-060-C11
3/4	3/4	1-5/8	4	545-7500-090-C11
3/4	3/4	3-1/4	6	545L7500-060-C11
3/4	3/4	3-1/4	6	545L7500-060-C11
3/4	3/4	3-1/4	6	545L7500-090-C11
1	1	1-1/4	3	545S1000-030-C11
1	1	1-1/4	3	545S1000-060-C11
1	1	1-1/4	3	545S1000-090-C11
1	1	2	4	545-1000-030-C11
1	1	2	4	545-1000-060-C11
1	1	2	4	545-1000-090-C11
1	1	3-1/4	6	545L1000-030-C11
1	1	3-1/4	6	545L1000-060-C11
1	1	3-1/4	6	545L1000-090-C11

360 INITIAL SPEEDS (SFM) AND FEEDS (CHIP LOAD PER/TOOTH) CHART

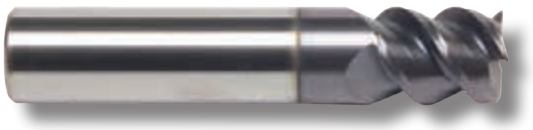
MATERIALS	Carbon Steels	Alloy Steels	Stainless Steels 300 Series	Stainless Steels 400 Series	Precipitation Stainless Steels	Gray Cast Iron	Ductile Cast Iron	High Temp Alloys	Titanium Pure	Titanium Cast/Wrought
Description	10XX, 11XX, 13XX, 15XX	40XX, 41XX, 42XX, 43XX, 44XX, 46XX 86XX, SERIES	304, 304L, 316, 316L, 312	420, 420F, 416, 440C	15-5PH, 16-6PH, 17-4PH, AM-XX Series	Gray	Ductile	Inconel 625/718, A286, Haynes	Pure	Cast/Wrought 6ALV, AST, 1,2,3, Alpha - Beta
SFM <32 RC	200-450	150-300	150-350	200-450	80-250	250-450	120-350	70-120	140-220	140-200
SFM>32 RC	100-250	80-200	80-200	100-250	90-125	130-300	80-140	40-90	90-160	90-160
1/8 HP	0.0008	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0005	0.0007	0.0007
LP	0.0011	0.001	0.001	0.001	0.001	0.001	0.001	0.0007	0.001	0.001
FINISH	0.0014	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.001	0.0013	0.0013
1/4 HP	0.0017	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014	0.001	0.0014	0.0014
LP	0.0021	0.0019	0.0019	0.0019	0.0019	0.0019	0.0019	0.0014	0.0019	0.0019
FINISH	0.0028	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.002	0.0025	0.0025
5/16 HP	0.0021	0.0018	0.0018	0.0018	0.0018	0.0018	0.0018	0.0012	0.0018	0.0018
LP	0.0034	0.0031	0.31	0.0031	0.0031	0.0031	0.0031	0.0025	0.0031	0.0019
FINISH	0.0034	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031	0.0025	0.0031	0.0025
3/8 HP	0.0025	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0014	0.0021	0.0021
LP	0.0032	0.0029	0.029	0.0029	0.0029	0.0029	0.0029	0.0021	0.0029	0.0029
FINISH	0.0041	0.0038	0.0038	0.0038	0.0038	0.0038	0.0038	0.003	0.0038	0.0038
1/2 HP	0.0035	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.003	0.003
LP	0.0045	0.004	0.004	0.004	0.004	0.004	0.004	0.003	0.004	0.004
FINISH	0.0055	0.005	0.005	0.005	0.005	0.005	0.005	0.004	0.005	0.005
5/8 HP	0.0042	0.0036	0.0036	0.0036	0.0036	0.0036	0.0036	0.0024	0.0036	0.0036
LP	0.0053	0.0048	0.0048	0.0048	0.0048	0.0048	0.0048	0.0036	0.0048	0.0048
FINISH	0.0065	0.0059	0.0059	0.0059	0.0059	0.0059	0.0059	0.0048	0.0059	0.0059
3/4 HP	0.005	0.0043	0.0004	0.0043	0.0043	0.0043	0.0043	0.0029	0.0043	0.0043
LP	0.0064	0.0057	0.0057	0.0057	0.0057	0.0057	0.0057	0.0043	0.0057	0.0057
FINISH	0.0078	0.0071	0.0071	0.0071	0.0071	0.0071	0.0071	0.0057	0.0071	0.0071
1" HP	0.009	0.008	0.008	0.008	0.008	0.008	0.008	0.006	0.008	0.008
LP	0.009	0.008	0.008	0.008	0.008	0.008	0.008	0.006	0.008	0.008
FINISH	0.011	0.01	0.01	0.01	0.01	0.01	0.01	0.008	0.01	0.01

HP = HEAVY PERIPHERAL
Axial Depth up to 1 x Diameter
Radial width .2 x Diameter

LP = LIGHT PERIPHERAL
Axial Depth up to Effective Length of Cut
Radial witdth .05 x Diameter

FINISH = FINISH OPERATION .
Axial Depth up to Effective Length of Cut
Radial width .02 x Diameter

360S SERIES - 3 FLUTE STUB, 60 DEGREE HELIX



DIA	SHANK DIA	LOC	OAL	EDP
1/8	1/8	1/4	1-1/2	360S1250
5/32	3/16	5/16	2	360S1562
3/16	3/16	5/16	2	360S1875
7/32	1/4	3/8	2	360S2188
1/4	1/4	3/8	2	360S2500
9/32	5/16	7/16	2	360S2812
5/16	5/16	7/16	2	360S3125
11/32	3/8	1/2	2	360S3438
3/8	3/8	1/2	2	360S3750
13/32	7/16	9/16	2-1/2	360S4062
7/16	7/16	9/16	2-1/2	360S4375
15/32	1/2	5/8	2-1/2	360S4688
1/2	1/2	5/8	2-1/2	360S5000
5/8	5/8	3/4	3	360S6250
3/4	3/4	1	3	360S7500
1	1	1-1/4	3	360S1000

360 SERIES - 3 FLUTE REGULAR, 60 DEGREE HELIX

DIA	SHANK DIA	LOC	OAL	EDP
1/8	1/8	1/2	1-1/2	360-1250
5/32	3/16	9/16	2	360-1562
3/16	3/16	9/16	2	360-1875
7/32	1/4	3/4	2-1/2	360-2188
1/4	1/4	3/4	2-1/2	360-2500
9/32	5/16	13/16	2-1/2	360-2812
5/16	5/16	13/16	2-1/2	360-3125
11/32	3/8	1	2-1/2	360-3438
3/8	3/8	1	2-1/2	360-3750
13/32	7/16	1	2-3/4	360-4062
7/16	7/16	1	2-3/4	360-4375
15/32	1/2	1-1/4	3	360-4688
1/2	1/2	1-1/4	3	360-5000
5/8	5/8	1-5/8	3-1/2	360-6250
3/4	3/4	1-5/8	4	360-7500
1	1	2	4	360-1000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

360 SERIES - 3 FLUTE LONG, 60 DEGREE HELIX

DIA	SHANK DIA	LOC	OAL	EDP
1/4	1/4	1-1/4	4	360L2500
5/16	5/16	1-1/4	4	360L3125
3/8	3/8	1-1/2	4	360L3750
7/16	7/16	2	4	360L4375
1/2	1/2	2	4	360L5000
5/8	5/8	2-1/2	5	360L6250
3/4	3/4	3-1/4	6	360L7500
1	1	3-1/4	6	360L1000

360 SERIES - 3 FLUTE DOUBLE END, 60 DEGREE HELIX

DIA	SHANK DIA	LOC	OAL	EDP
1/8	1/8	1/4	1-1/2	360DE1250
3/16	3/16	5/16	2	360DE1875
1/4	1/4	3/8	2-1/2	360DE2500
5/16	5/16	7/16	2-1/2	360DE3125
3/8	3/8	1/2	2-1/2	360DE3750
7/16	7/16	9/16	2-3/4	360DE4375
1/2	1/2	5/8	3	360DE5000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

ROUGHERS STUB AND STANDARD LENGTH INITIAL SPEEDS (SFM) AND SPEEEDS (CHIP LOAD CHIP PER/TOOTH) CHART

MATERIALS		Carbon Steels	Alloy Steels	Stainless Steels 300 Series	Stainless Steels 400 Series	Precipitation Stainless Steels	Gray Cast Iron	Ductile Cast Iron	High Temp Alloys	Titanium Pure	Titanium Cast / Wrought
Description		10XX, 11XX 13XX, 15XX	40XX, 41XX, 42XX, 43XX, 44XX, 46XX, 86XX Series	304, 304L, 316, 316L, 312,	420, 420F, 416, 440C	15-5PH, 16-6PH, 17-4PH, AM-xx Series	Gray	Ductile	Inconel 625/718, A286, Haynes	Pure	Cast/Wrought 6AL4V, ASTM 1,2,3 Alpha-Beta
SFM < 32 RC		200 - 450	150 - 300	150 - 350	200 - 450	80 - 250	250 - 450	120 - 350	70 - 120	140 - 220	140 - 200
SFM > 32 RC		100 - 250	80 - 200	80 - 200	100 - 250	90 - 250	130 - 300	80 - 140	40 - 90	90 - 160	90 - 160
3/8	S	0.0021	0.0018	0.002	0.002	0.0018	0.0018	0.0018	0.0014	0.002	0.0018
	HP	0.0025	0.0021	0.0025	0.0025	0.0021	0.0021	0.0021	0.0018	0.0025	0.0025
	LP	0.0029	0.0025	0.0027	0.0027	0.0025	0.0025	0.0025	0.0021	0.0027	0.0025
			.								
1/2	S	0.003	0.0025	0.0028	0.0028	0.0025	0.0025	0.0025	0.002	0.0028	0.0025
	HP	0.0035	0.003	0.0035	0.0035	0.003	0.003	0.003	0.0025	0.0035	0.0035
	LP	0.004	0.0035	0.0038	0.0038	0.0035	0.0035	0.0035	0.003	0.0038	0.0035
5/8	S	0.0038	0.0031	0.0035	0.0035	0.0031	0.0031	0.0031	0.0025	0.0035	0.0031
	HP	0.0044	0.0038	0.0044	0.0044	0.0038	0.0038	0.0038	0.0031	0.0044	0.0038
	LP	0.005	0.0044	0.0048	0.0048	0.0044	0.0044	0.0044	0.0038	0.0048	0.0044
3/4	S	0.0045	0.0038	0.0042	0.0042	0.0038	0.0038	0.0038	0.003	0.0042	0.0038
	HP	0.0053	0.0045	0.0053	0.0053	0.0045	0.0045	0.0045	0.0038	0.0053	0.0045
	LP	0.006	0.0053	0.0057	0.0057	0.0053	0.0053	0.0053	0.0045	0.0057	0.005
1"	S	0.006	0.005	0.0056	0.0056	0.005	0.005	0.005	0.004	0.0056	0.006
	HP	0.007	0.006	0.007	0.007	0.006	0.006	0.006	0.005	0.007	0.006
	LP	0.008	0.007	0.0076	0.0076	0.007	0.007	0.007	0.006	0.0076	0.007

S = SLOTTING
Axial Depth up to .5 x Diameter
Radial width .5 x Diameter

HP = HEAVY PERIPHERAL
Axial Depth up to 1 x Diameter
Radial width .5 x Diameter

LP=LIGHT PERIPHERAL
Axial Depth up to Effective Length
Radial width .15 x Diameter

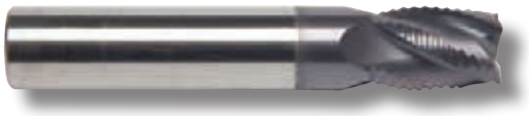
FINISHING ROUGHERS
C430 SERIES - 4 FLUTE WITH CHIPBREAKERS

DIA	SHANK DIA	LOC	OAL	EDP
1/8	1/8	1/4	1-1/2	C430S1250
1/8	1/8	1/2	1-1/2	C430-1250
1/8	1/8	3/4	2-1/4	C430L250
3/16	3/16	3/8	2	C430S1875
3/16	3/16	5/8	2	C430-1875
3/16	3/16	3/4	2-1/4	C430L1875
1/4	1/4	1/2	2	C430S2500
1/4	1/4	3/4	2-1/2	C430-2500
1/4	1/4	1-1/8	3	C430L2500
5/16	5/16	1/2	2	C430S3125
5/16	5/16	13/16	2-1/2	C430-3125
5/16	5/16	1-1/8	3	C430L3125
3/8	3/8	5/8	2	C430S3750
3/8	3/8	7/8	2-1/2	C430-3750
3/8	3/8	1-1/8	3	C430L3750
1/2	1/2	5/8	2-1/2	C430S5000
1/2	1/2	1	3	C430-5000
1/2	1/2	2	4	C430L5000
5/8	5/8	3/4	3	C430S6250
5/8	5/8	1-1/4	3-1/2	C430-6250
5/8	5/8	2-1/4	5	C430L6250
3/4	3/4	1	3	C430S7500
3/4	3/4	1-1/2	4	C430-7500
3/4	3/4	2-1/4	5	C430L7500
1	1	1	3	C430S1000
1	1	1-1/2	4	C430-1000
1	1	2-1/4	5	C430L1000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

4 FLUTE ROUGHER SERIES

SR430 SERIES - 4 FLUTE STUB - ROUGHERS
SQUARE END, FINE PITCH



DIA	SHANK DIA	LOC	OAL	EDP
1/4	1/4	3/8	2	SR430-2500
5/16	5/16	7/16	2	SR430-3125
3/8	3/8	1/2	2	SR430-3750
7/16	7/16	9/16	2-1/2	SR430-4375
1/2	1/2	5/8	2-1/2	SR430-5000
5/8	5/8	3/4	3	SR430-6250
3/4	3/4	1	3	SR430-7500
1	1	1-1/4	3	SR430-1000

R430 SERIES - 4 FLUTE REGULAR - ROUGHERS
SQUARE END, FINE PITCH

DIA	SHANK DIA	LOC	OAL	EDP
1/4	1/4	3/4	2-1/2	R430-2500
5/16	5/16	7/8	2-1/2	R430-3125
3/8	3/8	1	2-1/2	R430-3750
7/16	7/16	1	2-3/4	R430-4375
1/2	1/2	1-1/4	3	R430-5000
5/8	5/8	1-1/2	3-1/2	R430-6250
3/4	3/4	1-5/8	4	R430-7500
1	1	2	4	R430-1000

LR430 SERIES - 4 FLUTE LONG - ROUGHERS
SQUARE END, FINE PITCH

DIA	SHANK DIA	LOC	OAL	EDP
1/4	1/4	1-1/8	3	LR430-2500
5/16	5/16	1-1/8	3	LR430-3125
3/8	3/8	1-1/8	3	LR430-3750
7/16	7/16	2	4	LR430-4375
1/2	1/2	2	4	LR430-5000
5/8	5/8	2-1/4	5	LR430-6250
3/4	3/4	2-1/4	5	LR430-7500
1	1	3-1/4	6	LR430-1000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

5 FLUTE ROUGHER SERIES

SR530 SERIES - 5 FLUTE STUB - ROUGHERS
SQUARE END, FINE PITCH

DIA	SHANK DIA	LOC	OAL	EDP
3/8	3/8	1/2	2	SR530-3750
7/16	7/16	9/16	2-1/2	SR530-4375
1/2	1/2	5/8	2-1/2	SR530-5000
5/8	5/8	3/4	3	SR530-6250
3/4	3/4	1	3	SR530-7500
1	1	1-1/4	3	SR530-1000

R530 SERIES - 5 FLUTE REGULAR - ROUGHERS
SQUARE END, FINE PITCH

DIA	SHANK DIA	LOC	OAL	EDP
3/8	3/8	1	2-1/2	R530-3750
7/16	7/16	1	2-3/4	R530-4375
1/2	1/2	1-1/4	3	R530-5000
5/8	5/8	1-1/2	3-1/2	R530-6250
3/4	3/4	1-5/8	4	R530-7500
1	1	2	4	R530-1000

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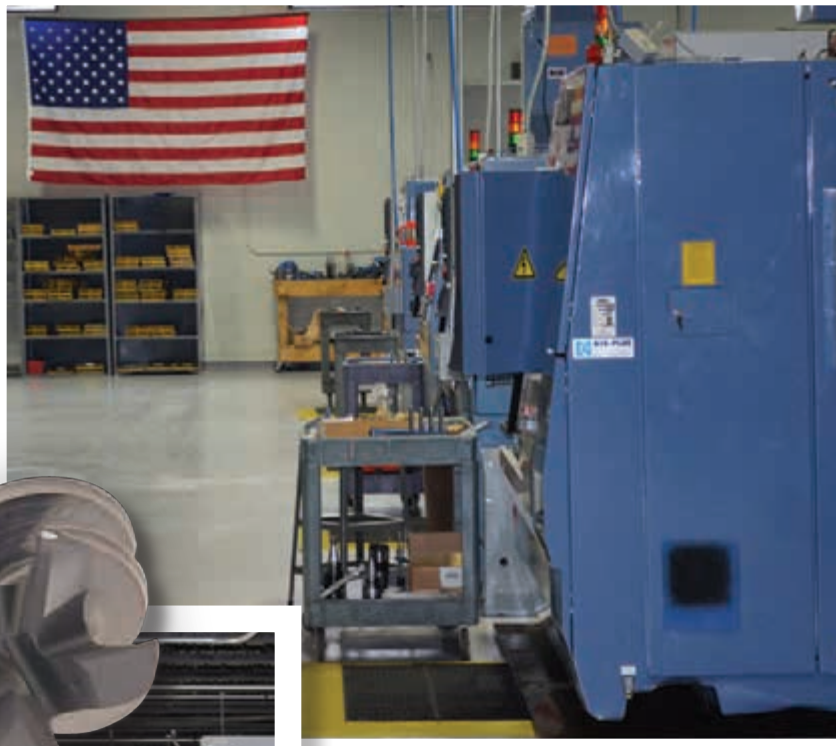
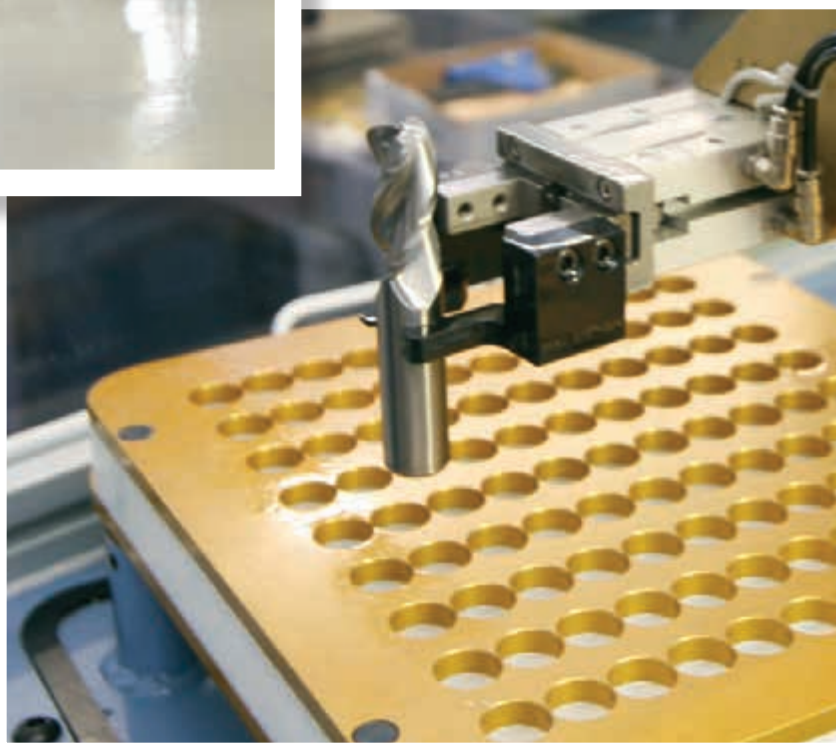




BENCHMARK™
CARBIDE

Main TOC Tech Info

RECOMMENDED SPEED AND FEED INFORMATION

General Purpose End Mills

Materials	SFM	End Mill Diameter Chip Load Per Tooth							
Soft Grades (<32 HRC)	Speed	1/8"	3/16"	1/4"	3/8"	1/2"	5/8"	3/4"	1"
Non Ferrous									
Aluminum Alloys--2024-T4/T6, 2014, 6061-T6/T651, 7075-T6	2000	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.007
Copper--Yellow Brass, High Lead Brass, Red Brass	1500	0.001	0.001	0.002	0.0025	0.003	0.004	0.004	0.005
Copper Alloys--Alum/Bronze, Low Silicon Bronze	1000	0.001	0.001	0.002	0.0025	0.003	0.004	0.004	0.005
Magnesium--De-CAt, Extruded	1300	0.001	0.002	0.002	0.003	0.004	0.006	0.008	0.009
Plastics,Acrylics, Phenolics--Polysulfone	200-600	0.001	0.002	0.003	0.004	0.006	0.008	0.001	0.015
Carbon, Graphites	200-400	0.040	0.040	0.060	0.080	0.010	0.001	0.015	0.020
Stainless Steel									
Precipitation--13/8, 15/5, AM-350/355	80-250	0.0005	.0005	0.001	0.001	0.002	0.002	0.004	0.006
Austenic--200 Series, 302, 303, 304L, 316L	100-350	0.0001	0.0002	0.0005	0.001	0.0015	0.002	0.003	0.004
Martensitic--403, 410, 416	100-250	0.0001	0.0002	0.0005	0.0005	0.001	0.001	0.003	0.004
High Temp Alloys									
Cobalt Base--Stellite, HS-21, HAYNES25/188, x-40, L-605	60-100	0.0004	.0005	0.001	0.001	0.001	0.001	0.0015	0.002
Iron Base--Incoly 600-802, Multimet N-155, Timkin 16-25-6	80-130	0.0005	0.0005	0.001	0.0015	0.002	0.0025	0.003	0.004
Titanium Alloys--6AL-4V, Astm 1/2/3, 6 AL-25N-4Zr-2Mo-Si	50-250	0.0005	0.0005	0.0005	0.001	0.001	0.0015	0.002	0.004
Steel									
High Strength Steels--4340, 6150, 52100, H-11, H-13	50-250	0.0005	.0005	0.001	0.001	0.001	0.0015	0.002	0.004
High Alloy Steels--A-2/6/10, P-3/10, 01, 02, 06	100-300	0.0005	0.0005	0.001	0.001	0.001	0.0015	0.002	0.004
Medium Alloy Steels--200, 250, 300	150-350	0.0005	0.0005	0.001	0.002	0.0025	0.0035	0.004	0.005
Low Alloy Steels Maraging--10XX, 11XX, 13XX	100-400	0.0005	0.001	0.0015	0.002	0.003	0.004	0.005	0.006
Cast Iron									
Ductile Iron--Ductile Cast Iron	100-400	0.0005	0.001	0.0015	0.002	0.002	0.003	0.004	0.005
Cast Iron--Gray Cast Iron	100-400	0.0005	0.001	0.002	0.003	0.004	0.005	0.006	0.008

Formulas

RPM= (SFM x 3.82)/tool diameter

IPM= number of flutes x RPM x chip load per tooth

The chart is a starting point based on a coated tool. Reduce rates up to 50% using an uncoated tool.

Important Disclaimer: The speed and feed rates are suggested as a general guideline. Machine type, horsepower, spindle speed limitations, toolholding & workholding devices all may impact a cutting tool's ability to perform properly. As a result BENCHMARK is not responsible for tool failure, part damage or injury that may be caused as a result.

RECOMMENDED SPEED AND FEED INFORMATION

General Purpose End Mills

Materials	SFM	End Mill Diameter Chip Load Per Tooth							
Hard Grades (>32 HRC)	Speed	1/8"	3/16"	1/4"	3/8"	1/2"	5/8"	3/4"	1"
Non Ferrous									
Aluminum+Aluminum Alloys--440, 356, 380, C61300	1000	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.007
Copper--Navel Brass, High Silicon Bronze, A-17, C-17200	1000	0.001	0.001	0.002	0.0025	0.003	0.004	0.004	0.005
Copper Alloys--Nickel Silver, Beryllium Copper, Oxygen-Free Copper	1000	0.001	0.001	0.002	0.0025	0.003	0.004	0.004	0.005
Plastics,Acrylics, Phenolics--Polycarbonate	200-500	0.001	0.002	0.003	0.004	0.006	0.008	0.001	0.015
Stainless Steel									
Precipitation--17/4, 17/7, AF-71, Custom 450/636, 15/7 Mo, 21-6-9	90-150	0.0005	.0005	0.001	0.001	0.002	0.002	0.004	0.006
Austenic--304, 310, 314, 316, 321, 330, 347, 348, 21-6-9	100-150	0.0001	0.0002	0.0005	0.001	0.0015	0.002	0.003	0.004
Martensitic--420, 430F, 440C, 446	100-175	0.0001	0.0002	0.0005	0.0005	0.001	0.001	0.003	0.004
High Temp Alloys									
Cobalt Base--Air-Resist 13/213/215, Haynes 21/36, NASA CO-W-RE	40-80	0.0004	.0005	0.001	0.001	0.001	0.001	0.0015	0.002
Nickel Base--Hastalloy, Inconel 718/X/W, Waspalloy, Rene 41-95	50-90	0.0005	0.0005	0.001	0.001	0.002	0.0025	0.003	0.004
Iron Base--A-286, Haynes 556, Discoly, V57	60-120	0.0005	0.0005	0.001	0.0015	0.002	0.0025	0.003	0.004
Titanium Alloys--5AL-2.5Sn-Eli, 8Al-1 Mo-1V	90-160	0.0005	0.0005	0.0005	0.001	0.001	0.0015	0.002	0.004
Steel									
High Steel Strength--4340M, EDT-150, HP9-430, 300M, D6-Ac, 11-10	80-180	0.0005	.0005	0.001	0.001	0.001	0.0015	0.002	0.004
High Alloy Steels--Stressproof, AmorPlate	80-180	0.0005	0.0005	0.001	0.001	0.001	0.0015	0.002	0.004
Low Alloy Steels Maraging--23XX, 31XX	100-200	0.0005	0.001	0.0015	0.002	0.003	0.004	0.005	0.006
Cast Iron									
Ductile Iron	80-140	0.0005	0.001	0.0015	0.002	0.002	0.003	0.004	0.005
Cast Iron--Malleable, Chilled	90-160	0.0005	0.001	0.002	0.003	0.004	0.005	0.006	0.008

Formulas

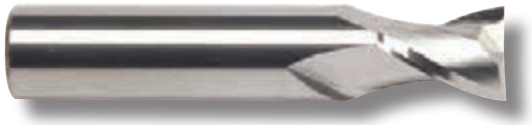
RPM= (SFM x 3.82)/tool diameter

IPM= number of flutes x RPM x chip load per tooth

The chart is a starting point based on a coated tool. Reduce rates up to 50% using an uncoated tool.

Important Disclaimer: The speed and feed rates are suggested as a general guideline. Machine type, horsepower, spindle speed limitations, toolholding & workholding devices all may impact a cutting tool's ability to perform properly. As a result BENCHMARK is not responsible for tool failure, part damage or injury that may be caused as a result.

502S SERIES - 2 FLUTE STUB STANDARD



DIA	SHANK DIA	LOC	OAL	EDP SQUARE END
3/64	1/8	3/32	1-1/2	502S0469
1/16	1/8	1/8	1-1/2	502S0625
3/32	1/8	3/16	1-1/2	502S0938
1/8	1/8	1/4	1-1/2	502S1250
5/32	3/16	5/16	2	502S1562
3/16	3/16	5/16	2	502S1875
7/32	1/4	7/16	2	502S2188
1/4	1/4	1/2	2	502S2500
5/16	5/16	1/2	2	502S3125
3/8	3/8	5/8	2	502S3750
1/2	1/2	5/8	2-1/2	502S5000
5/8	5/8	3/4	3	502S6250
3/4	3/4	1	3	502S7500

502 SERIES - 2 FLUTE REGULAR STANDARD

DIA	SHANK DIA	LOC	OAL	EDP SQUARE END
3/64	1/8	9/64	1-1/2	502-0469
1/16	1/8	3/16	1-1/2	502-0625
5/64	1/8	1/4	1-1/2	502-0781
3/32	1/8	3/8	1-1/2	502-0938
7/64	1/8	3/8	1-1/2	502-1094
1/8	1/8	1/2	1-1/2	502-1250
9/64	3/16	9/16	2	502-1406
5/32	3/16	9/16	2	502-1562
11/64	3/16	5/8	2	502-1719
3/16	3/16	5/8	2	502-1875
13/64	1/4	5/8	2-1/2	502-2031
7/32	1/4	5/8	2-1/2	502-2188
1/4	1/4	3/4	2-1/2	502-2500
9/32	5/16	3/4	2-1/2	502-2812
19/64	5/16	13/16	2-1/2	502-2969
5/16	5/16	13/16	2-1/2	502-3125
21/64	3/8	7/8	2-1/2	502-3281
11/32	3/8	7/8	2-1/2	502-3438
3/8	3/8	7/8	2-1/2	502-3750
13/32	7/16	1	2-3/4	502-4062
7/16	7/16	1	2-3/4	502-4375
1/2	1/2	1	3	502-5000
9/16	9/16	1-1/8	3-1/2	502-5625
5/8	5/8	1-1/4	3-1/2	502-6250
3/4	3/4	1-1/2	4	502-7500
7/8	7/8	1-1/2	4	502-8750
1	1	1-1/2	4	502-1000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

562 SERIES - 2 FLUTE LONG LENGTH

DIA	SHANK DIA	LOC	OAL	EDP SQUARE END
1/8	1/8	3/4	2-1/4	562-1250
3/16	3/16	3/4	2-1/4	562-1875
1/4	1/4	1-1/8	3	562-2500
1/4	1/4	1	4	562L2500
5/16	5/16	1-1/8	3	562-3125
3/8	3/8	1-1/8	3	562-3750
3/8	3/8	1	4	562L3750
7/16	7/16	2	4	562-4375
1/2	1/2	2	4	562-5000
1/2	1/2	1	4	562L5000
5/8	5/8	2-1/4	5	562-6250
3/4	3/4	2-1/4	5	562-7500
1	1	2-1/4	5	562-1000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

582 SERIES - 2 FLUTE EXTRA LONG LENGTH

DIA	SHANK DIA	LOC	OAL	EDP SQUARE END
1/8	1/8	1	3	582-1250
3/16	3/16	1-1/8	3	582-1875
1/4	1/4	1-1/2	4	582-2500
1/4	1/4	1-1/2	6	582L2500
5/16	5/16	1-5/8	4	582-3125
3/8	3/8	1-3/4	4	582-3750
3/8	3/8	1-1/2	6	582L3750
7/16	7/16	3	6	582-4375
1/2	1/2	3	6	582-5000
1/2	1/2	1-1/2	6	582L5000
5/8	5/8	3	6	582-6250
3/4	3/4	3	6	582-7500
1	1	3	6	582-1000

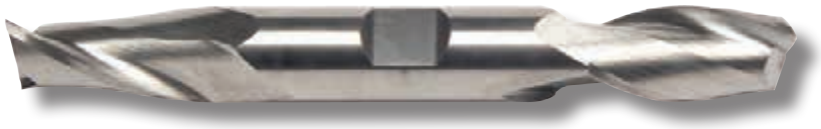
FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

522 SERIES - 2 FLUTE DOUBLE END STUB

DIA	SHANK DIA	LOC	OAL	EDP SQUARE END
1/16	1/8	1/8	1-1/2	522-0625
3/32	1/8	3/16	1-1/2	522-0938
1/8	1/8	1/4	1-1/2	522-1250
5/32	3/16	5/16	2	522-1562
3/16	3/16	3/8	2	522-1875
7/32	1/4	1/2	2-1/2	522-2188
1/4	1/4	1/2	2-1/2	522-2500
5/16	5/16	1/2	2-1/2	522-3125
3/8	3/8	9/16	2-1/2	522-3750
1/2	1/2	5/8	3	522-5000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

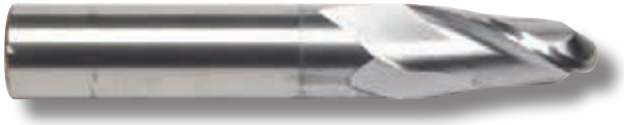
542 SERIES - 2 FLUTE DOUBLE END REGULAR



DIA	SHANK DIA	LOC	OAL	EDP SQUARE END
1/8	3/8	3/8	3-1/2	542-1250
5/32	3/8	7/16	3-1/2	542-1562
3/16	3/8	1/2	3-1/2	542-1875
7/32	3/8	9/16	3-1/2	542-2188
1/4	3/8	5/8	3-1/2	542-2500
9/32	3/8	11/16	3-1/2	542-2812
5/16	3/8	3/4	3-1/2	542-3125
11/32	3/8	3/4	3-1/2	542-3438
3/8	3/8	3/4	3-1/2	542-3750
7/16	1/2	7/8	4	542-4375
1/2	1/2	1	4	542-5000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

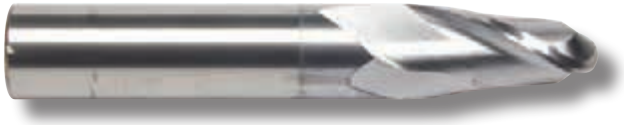
502 SERIES - 2 FLUTE STUB BALL NOSE



DIA	SHANK DIA	LOC	OAL	EDP BALL NOSE
3/64	1/8	3/32	1-1/2	502S0469BN
1/16	1/8	1/8	1-1/2	502S0625BN
3/32	1/8	1/4	1-1/2	502S0938BN
1/8	1/8	1/4	1-1/2	502S1250BN
5/32	3/16	5/16	2	502S1562BN
3/16	3/16	5/16	2	502S1875BN
7/32	1/4	7/16	2	502S2188BN
1/4	1/4	1/2	2	502S2500BN
5/16	5/16	1/2	2	502S3125BN
3/8	3/8	5/8	2	502S3750BN
1/2	1/2	5/8	2-1/2	502S5000BN
5/8	5/8	3/4	3	502S6250BN
3/4	3/4	1	3	502S7500BN

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

502 SERIES - 2 FLUTE REGULAR BALL NOSE



DIA	SHANK DIA	LOC	OAL	EDP BALL NOSE
3/64	1/8	9/64	1-1/2	502-0469BN
1/16	1/8	3/16	1-1/2	502-0625BN
5/64	1/8	1/4	1-1/2	502-0781BN
3/32	1/8	3/8	1-1/2	502-0938BN
7/64	1/8	3/8	1-1/2	502-1094BN
1/8	1/8	1/2	1-1/2	502-1250BN
9/64	3/16	1/2	2	502-1406BN
5/32	3/16	9/16	2	502-1562BN
11/64	3/16	9/16	2	502-1719BN
3/16	3/16	5/8	2	502-1875BN
13/64	1/4	5/8	2-1/2	502-2031BN
7/32	1/4	5/8	2-1/2	502-2188BN
1/4	1/4	3/4	2-1/2	502-2500BN
9/32	5/16	3/4	2-1/2	502-2812BN
19/64	5/16	13/16	2-1/2	502-2969BN
5/16	5/16	13/16	2-1/2	502-3125BN
21/64	3/8	7/8	2-1/2	502-3281BN
11/32	3/8	7/8	2-1/2	502-3438BN
3/8	3/8	7/8	2-1/2	502-3750BN
13/32	7/16	1	2-3/4	502-4062BN
7/16	7/16	1	2-3/4	502-4375BN
1/2	1/2	1	3	502-5000BN
9/16	9/16	1-1/8	3-1/2	502-5625BN
5/8	5/8	1-1/4	3-1/2	502-6250BN
3/4	3/4	1-1/2	4	502-7500BN
7/8	7/8	1-1/2	4	502-8750BN
1	1	1-1/2	4	502-1000BN

562 SERIES - 2 FLUTE LONG BALL NOSE

DIA	SHANK DIA	LOC	OAL	EDP BALL NOSE
1/8	1/8	3/4	2-1/4	562-1250BN
3/16	3/16	3/4	2-1/4	562-1875BN
1/4	1/4	1-1/8	3	562-2500BN
1/4	1/4	1	4	562L2500BN
5/16	5/16	1-1/8	3	562-3125BN
3/8	3/8	1-1/8	3	562-3750BN
3/8	3/8	1	4	562L3750BN
7/16	7/16	2	4	562-4375BN
1/2	1/2	2	4	562-5000BN
1/2	1/2	1	4	562L5000BN
5/8	5/8	2-1/4	5	562-6250BN
3/4	3/4	2-1/4	5	562-7500BN
1	1	2-1/4	5	562-1000BN

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

582 SERIES - 2 FLUTE EXTRA LONG BALL NOSE

DIA	SHANK DIA	LOC	OAL	EDP BALL NOSE
1/8	1/8	1	3	582-1250BN
3/16	3/16	1-1/8	3	582-1875BN
1/4	1/4	1-1/2	4	582-2500BN
1/4	1/4	1-1/2	6	582L2500BN
5/16	5/16	1-5/8	4	582-3125BN
3/8	3/8	1-3/4	4	582-3750BN
3/8	3/8	1-1/2	6	582L3750BN
7/16	7/16	3	6	582-4375BN
1/2	1/2	3	6	582-5000BN
1/2	1/2	1-1/2	6	582L5000BN
5/8	5/8	3	6	582-6250BN
3/4	3/4	3	6	582-7500BN
1	1	3	6	582-1000BN

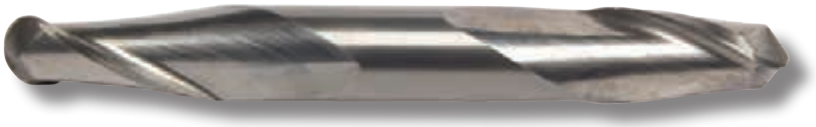
FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

522 SERIES - 2 FLUTE STUB LENGTH DOUBLE END BALL NOSE

DIA	SHANK DIA	LOC	OAL	EDP BALL NOSE
1/16	1/8	1/8	1-1/2	522-0625BN
3/32	1/8	3/16	1-1/2	522-0938BN
1/8	1/8	1/4	1-1/2	522-1250BN
5/32	3/16	5/16	2	522-1562BN
3/16	3/16	3/8	2	522-1875BN
7/32	1/4	1/2	2-1/2	522-2188BN
1/4	1/4	1/2	2-1/2	522-2500BN
5/16	5/16	1/2	2-1/2	522-3125BN
3/8	3/8	9/16	2-1/2	522-3750BN
1/2	1/2	5/8	3	522-5000BN

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

542 SERIES - 2 FLUTE REGULAR LENGTH DOUBLE END BALL NOSE



DIA	SHANK DIA	LOC	OAL	EDP BALL NOSE
1/8	3/8	3/8	3-1/2	542-1250BN
5/32	3/8	7/16	3-1/2	542-1562BN
3/16	3/8	1/2	3-1/2	542-1875BN
7/32	3/8	5/8	3-1/2	542-2188BN
1/4	3/8	5/8	3-1/2	542-2500BN
9/32	3/8	11/16	3-1/2	542-2812BN
5/16	3/8	3/4	3-1/2	542-3125BN
11/32	3/8	3/4	3-1/2	542-3438BN
3/8	3/8	3/4	3-1/2	542-3750BN
7/16	1/2	7/8	4	542-4375BN
1/2	1/2	1	4	542-5000BN

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

504S SERIES - 4 FLUTE SE STUB STANDARD

DIA	SHANK DIA	LOC	OAL	EDP SQUARE END
3/64	1/8	3/32	1-1/2	504S0469
1/16	1/8	1/8	1-1/2	504S0625
3/32	1/8	3/16	1-1/2	504S0938
1/8	1/8	1/4	1-1/2	504S1250
5/32	3/16	5/16	2	504S1562
3/16	3/16	5/16	2	504S1875
7/32	1/4	7/16	2	504S2188
1/4	1/4	1/2	2	504S2500
5/16	5/16	1/2	2	504S3125
3/8	3/8	5/8	2	504S3750
1/2	1/2	5/8	2-1/2	504S5000
5/8	5/8	3/4	3	504S6250
3/4	3/4	1	3	504S7500

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

504 SERIES - 4 FLUTE STANDARD

DIA	SHANK DIA	LOC	OAL	EDP SQUARE END
3/64	1/8	9/64	1-1/2	504-0469
1/16	1/8	3/16	1-1/2	504-0625
5/64	1/8	1/4	1-1/2	504-0781
3/32	1/8	3/8	1-1/2	504-0938
7/64	1/8	3/8	1-1/2	504-1094
1/8	1/8	1/2	1-1/2	504-1250
9/64	3/16	9/16	2	504-1406
5/32	3/16	9/16	2	504-1562
11/64	3/16	5/8	2	504-1719
3/16	3/16	5/8	2	504-1875
13/64	1/4	5/8	2-1/2	504-2031
7/32	1/4	5/8	2-1/2	504-2188
1/4	1/4	3/4	2-1/2	504-2500
9/32	5/16	3/4	2-1/2	504-2812
19/64	5/16	13/16	2-1/2	504-2969
5/16	5/16	13/16	2-1/2	504-3125
21/64	3/8	7/8	2-1/2	504-3281
11/32	3/8	7/8	2-1/2	504-3438
3/8	3/8	7/8	2-1/2	504-3750
13/32	7/16	1	2-3/4	504-4062
7/16	7/16	1	2-3/4	504-4375
1/2	1/2	1	3	504-5000
9/16	9/16	1-1/8	3-1/2	504-5625
5/8	5/8	1-1/4	3-1/2	504-6250
3/4	3/4	1-1/2	4	504-7500
7/8	7/8	1-1/2	4	504-8750
1	1	1-1/2	4	504-1000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

564 SERIES - 4 FLUTE LONG LENGTH

DIA	SHANK DIA	LOC	OAL	EDP SQUARE END
1/8	1/8	3/4	2-1/4	564-1250
3/16	3/16	3/4	2-1/4	564-1875
1/4	1/4	1-1/8	3	564-2500
1/4	1/4	1	4	564L2500
5/16	5/16	1-1/8	3	564-3125
3/8	3/8	1-1/8	3	564-3750
3/8	3/8	1	4	564L3750
7/16	7/16	2	4	564-4375
1/2	1/2	2	4	564-5000
1/2	1/2	1	4	564L5000
5/8	5/8	2-1/4	5	564-6250
3/4	3/4	2-1/4	5	564-7500
1	1	2-1/4	5	564-1000

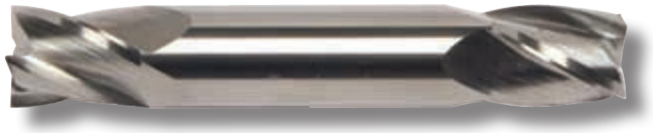
FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

584 SERIES - 4 FLUTE EXTRA LONG LENGTH

DIA	SHANK DIA	LOC	OAL	EDP SQUARE END
1/8	1/8	1	3	584-1250
3/16	3/16	1-1/8	3	584-1875
1/4	1/4	1-1/2	4	584-2500
1/4	1/4	1-1/2	6	584L2500
5/16	5/16	1-5/8	4	584-3125
3/8	3/8	1-3/4	4	584-3750
3/8	3/8	1-1/2	6	584L3750
7/16	7/16	3	6	584-4375
1/2	1/2	3	6	584-5000
1/2	1/2	1-1/2	6	584L5000
5/8	5/8	3	6	584-6250
3/4	3/4	3	6	584-7500
3/4	3/4	4	7	584L7500
1	1	3	6	584-1000
1	1	4	7	584L1000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

524 SERIES - 4 FLUTE STUB LENGTH DOUBLE END



DIA	SHANK DIA	LOC	OAL	EDP SQUARE END
1/16	1/8	1/8	1 1/2	524-0625
3/32	1/8	3/16	1 1/2	524-0938
1/8	1/8	1/4	1 1/2	524-1250
5/32	3/16	5/16	2	524-1562
3/16	3/16	3/8	2	524-1875
7/32	1/4	1/2	2 1/2	524-2188
1/4	1/4	1/2	2 1/2	524-2500
5/16	5/16	1/2	2 1/2	524-3125
3/8	3/8	9/16	2 1/2	524-3750
1/2	1/2	5/8	3	524-5000

544 SERIES - 4 FLUTE REGULAR LENGTH DOUBLE END

DIA	SHANK DIA	LOC	OAL	EDP SQUARE END
1/8	3/8	3/8	3-1/2	544-1250
5/32	3/8	7/16	3-1/2	544-1562
3/16	3/8	1/2	3-1/2	544-1875
7/32	3/8	9/16	3-1/2	544-2188
1/4	3/8	5/8	3-1/2	544-2500
9/32	3/8	11/16	3-1/2	544-2812
5/16	3/8	3/4	3-1/2	544-3125
11/32	3/8	3/4	3-1/2	544-3438
3/8	3/8	3/4	3-1/2	544-3750
7/16	1/2	7/8	4	544-4375
1/2	1/2	1	4	544-5000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

504 SERIES - 4 FLUTE WITH RADIUS REGULAR LENGTH 30 DEGREE HELIX

RADIUS SIZE

DIA	SHANK DIA	LOC	OAL	RADIUS	EDP WITH RADIUS
1/8	1/8	1/2	1-1/2	015	504-1250-015-C11
1/8	1/8	1/2	1-1/2	020	504-1250-020-C11
1/8	1/8	1/2	1-1/2	030	504-1250-030-C11
3/16	3/16	5/8	2	015	504-1875-015-C11
3/16	3/16	5/8	2	020	504-1875-020-C11
3/16	3/16	5/8	2	030	504-1875-030-C11
1/4	1/4	3/4	2-1/2	015	504-2500-015-C11
1/4	1/4	3/4	2-1/2	020	504-2500-020-C11
1/4	1/4	3/4	2-1/2	030	504-2500-030-C11
1/4	1/4	3/4	2-1/2	045	504-2500-045-C11
1/4	1/4	3/4	2-1/2	060	504-2500-060-C11
5/16	5/16	13/16	2-1/2	015	504-3125-015-C11
5/16	5/16	13/16	2-1/2	020	504-3125-020-C11
5/16	5/16	13/16	2-1/2	030	504-3125-030-C11
5/16	5/16	13/16	2-1/2	045	504-3125-045-C11
5/16	5/16	13/16	2-1/2	060	504-3125-060-C11
3/8	3/8	1	2-1/2	015	504-3750-015-C11
3/8	3/8	1	2-1/2	020	504-3750-020-C11
3/8	3/8	1	2-1/2	030	504-3750-030-C11
3/8	3/8	1	2-1/2	045	504-3750-045-C11
3/8	3/8	1	2-1/2	060	504-3750-060-C11
1/2	1/2	1	3	015	504-5000-015-C11
1/2	1/2	1	3	020	504-5000-020-C11
1/2	1/2	1	3	030	504-5000-030-C11
1/2	1/2	1	3	045	504-5000-045-C11
1/2	1/2	1	3	060	504-5000-060-C11
1/2	1/2	1	3	090	504-5000-090-C11
1/2	1/2	1	3	125	504-5000-125-C11
5/8	5/8	1 1/4	3-1/2	015	504-6250-015-C11
5/8	5/8	1 1/4	3-1/2	020	504-6250-020-C11
5/8	5/8	1 1/4	3-1/2	030	504-6250-030-C11
5/8	5/8	1 1/4	3-1/2	045	504-6250-045-C11
5/8	5/8	1 1/4	3-1/2	060	504-6250-060-C11
5/8	5/8	1 1/4	3-1/2	090	504-6250-090-C11
3/4	3/4	1 1/2	4	015	504-7500-015-C11
3/4	3/4	1 1/2	4	020	504-7500-020-C11
3/4	3/4	1 1/2	4	030	504-7500-030-C11
3/4	3/4	1 1/2	4	045	504-7500-045-C11
3/4	3/4	1 1/2	4	060	504-7500-060-C11
3/4	3/4	1 1/2	4	090	504-7500-090-C11
3/4	3/4	1 1/2	4	125	504-7500-125-C11
1	1	1 1/2	4	015	504-1000-015-C11
1	1	1 1/2	4	020	504-1000-020-C11
1	1	1 1/2	4	030	504-1000-030-C11
1	1	1 1/2	4	045	504-1000-045-C11
1	1	1 1/2	4	060	504-1000-060-C11
1	1	1 1/2	4	090	504-1000-090-C11
1	1	1 1/2	4	125	504-1000-125-C11

504S SERIES - 4 FLUTE STUB BALL NOSE

DIA	SHANK DIA	LOC	OAL	EDP BALL NOSE
3/64	1/8	3/32	1-1/2	504S0469BN
1/16	1/8	1/8	1-1/2	504S0625BN
3/32	1/8	3/16	1-1/2	504S0938BN
1/8	1/8	1/4	1-1/2	504S1250BN
5/32	3/16	5/16	2	504S1562BN
3/16	3/16	5/16	2	504S1875BN
7/32	1/4	7/16	2	504S2188BN
1/4	1/4	1/2	2	504S2500BN
5/16	5/16	1/2	2	504S3125BN
3/8	3/8	5/8	2	504S3750BN
1/2	1/2	5/8	2-1/2	504S5000BN
5/8	5/8	3/4	3	504S6250BN
3/4	3/4	1	3	504S7500BN

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

504 SERIES - 4 FLUTE REGULAR BALL NOSE

DIA	SHANK DIA	LOC	OAL	EDP BALL NOSE
3/64	1/8	9/64	1-1/2	504-0469BN
1/16	1/8	3/16	1-1/2	504-0625BN
5/64	1/8	1/4	1-1/2	504-0781BN
3/32	1/8	3/8	1-1/2	504-0938BN
7/64	1/8	3/8	1-1/2	504-1094BN
1/8	1/8	1/2	1-1/2	504-1250BN
9/64	3/16	9/16	2	504-1406BN
5/32	3/16	9/16	2	504-1562BN
11/64	3/16	5/8	2	504-1719BN
3/16	3/16	5/8	2	504-1875BN
13/64	1/4	5/8	2-1/2	504-2031BN
7/32	1/4	5/8	2-1/2	504-2188BN
1/4	1/4	3/4	2-1/2	504-2500BN
9/32	5/16	3/4	2-1/2	504-2812BN
19/64	5/16	13/16	2-1/2	504-2969BN
5/16	5/16	13/16	2-1/2	504-3125BN
21/64	3/8	7/8	2-1/2	504-3281BN
11/32	3/8	7/8	2-1/2	504-3438BN
3/8	3/8	7/8	2-1/2	504-3750BN
13/32	7/16	1	2-3/4	504-4062BN
7/16	7/16	1	2-3/4	504-4375BN
1/2	1/2	1	3	504-5000BN
9/16	9/16	1-1/8	3-1/2	504-5625BN
5/8	5/8	1-1/4	3-1/2	504-6250BN
3/4	3/4	1-1/2	4	504-7500BN
7/8	7/8	1-1/2	4	504-8750BN
1	1	1-1/2	4	504-1000BN

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

564 SERIES - 4 FLUTE LONG LENGTH BALL NOSE

DIA	SHANK DIA	LOC	OAL	EDP BALL NOSE
1/8	1/8	3/4	2-1/4	564-1250BN
3/16	3/16	3/4	2-1/4	564-1875BN
1/4	1/4	1-1/8	3	564-2500BN
1/4	1/4	1	4	564L2500BN
5/16	5/16	1-1/8	3	564-3125BN
3/8	3/8	1-1/8	3	564-3750BN
3/8	3/8	1	4	564L3750BN
7/16	7/16	2	4	564-4375BN
1/2	1/2	2	4	564-5000BN
1/2	1/2	1	4	564L5000BN
5/8	5/8	2-1/4	5	564-6250BN
3/4	3/4	2-1/4	5	564-7500BN
1	1	2-1/4	5	564-1000BN

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

584 SERIES - 4 FLUTE EXTRA LONG BALL NOSE

DIA	SHANK DIA	LOC	OAL	EDP BALL NOSE
1/8	1/8	1	3	584-1250BN
3/16	3/16	1-1/8	3	584-1875BN
1/4	1/4	1-1/2	4	584-2500BN
1/4	1/4	1-1/2	6	584L2500BN
5/16	5/16	1-5/8	4	584-3125BN
3/8	3/8	1-3/4	4	584-3750BN
3/8	3/8	1-1/2	6	584L3750BN
7/16	7/16	3	6	584-4375BN
1/2	1/2	3	6	584-5000BN
1/2	1/2	1-1/2	6	584L5000BN
5/8	5/8	3	6	584-6250BN
3/4	3/4	3	6	584-7500BN
3/4	3/4	4	7	584L7500BN
1	1	3	6	584-1000BN
1	1	4	7	584L1000BN

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

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524 SERIES - 4 FLUTE STUB DOUBLE END BALL NOSE

DIA	SHANK DIA	LOC	OAL	EDP BALL NOSE
1/16	1/8	1/8	1-1/2	524S0625BN
3/32	1/8	3/16	1-1/2	524S0938BN
1/8	1/8	1/4	1-1/2	524S1250BN
5/32	3/16	5/16	2	524S1562BN
3/16	3/16	3/8	2	524S1875BN
7/32	1/4	1/2	2-1/2	524S2188BN
1/4	1/4	1/2	2-1/2	524S2500BN
5/16	5/16	1/2	2-1/2	524S3125BN
3/8	3/8	9/16	2-1/2	524S3750BN
1/2	1/2	5/8	3	524S5000BN

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

544 SERIES - 4 FLUTE REGULAR LENGTH DOUBLE END BALL NOSE

DIA	SHANK DIA	LOC	OAL	4 FLUTE BALL NOSE
1/8	3/8	3/8	3 1/2	544-1250BN
5/32	3/8	7/16	3 1/2	544-1562BN
3/16	3/8	1/2	3 1/2	544-1875BN
7/32	3/8	9/16	3 1/2	544-2188BN
1/4	3/8	5/8	3 1/2	544-2500BN
9/32	3/8	11/16	3 1/2	544-2812BN
5/16	3/8	3/4	3 1/2	544-3125BN
11/32	3/8	3/4	3 1/2	544-3438BN
3/8	3/8	3/4	3 1/2	544-3750BN
7/16	1/2	7/8	4	544-4375BN
1/2	1/2	1.00	4	544-5000BN

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

630 SERIES - 6 FLUTE, 30 DEGREE HELIX

DIA	SHANK DIA	LOC	OAL	EDP
3/32	1/8	5/16	1-1/2	630-0938
1/8	1/8	7/16	1-1/2	630-1250
5/32	3/16	9/16	2	630-1562
3/16	3/16	5/8	2	630-1875
1/4	1/4	3/4	2-1/2	630-2500
9/32	5/16	3/4	2-1/2	630-2812
5/16	5/16	13/16	2-1/2	630-3125
3/8	3/8	7/8	2-1/2	630-3750
7/16	7/16	1	2-3/4	630-4375

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

830 SERIES - 8 FLUTE, 30 DEGREE HELIX

DIA	SHANK DIA	LOC	OAL	EDP
1/2	1/2	1	3	830-5000
9/16	9/16	1-1/8	3-1/2	830-5625
5/8	5/8	1-1/4	3-1/2	830-6250
11/16	3/4	1-3/8	4	830-6875
3/4	3/4	1-1/2	4	830-7500
1	1	1-1/2	4	830-1000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

345 SERIES - 3 FLUTE, 45 DEGREE HELIX

DIA	SHANK DIA	LOC	OAL	EDP
1/8	1/8	3/8	1-1/2	345-1250
3/16	3/16	9/16	2	345-1875
7/32	1/4	3/8	2-1/2	345-2188
1/4	1/4	5/8	2-1/2	345-2500
5/16	5/16	13/16	2-1/2	345-3125
3/8	3/8	3/4	2-1/2	345-3750
1/2	1/2	1	3	345-5000
5/8	5/8	1-1/4	3-1/2	345-6250
3/4	3/4	1-1/2	4	345-7500
1	1	1-1/2	4	345-1000

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

BRT SERIES - 2 FLUTE 10 DEG RUNNER CUTTER
20 DEGREE INCLUDED ANGLE

SHANK DIA	LOC	OAL	RADIUS	EDP
3/16	.308	2	1/32	BRT-187-031
3/16	.308	2	3/64	BRT-187-046
1/4	.414	2-1/2	1/16	BRT-250-062
1/4	.338	2-1/2	5/64	BRT-250-078
5/16	.437	2-1/2	3/32	BRT-312-093
5/16	.366	2-1/2	7/64	BRT-312-109
3/8	.468	2-1/2	1/8	BRT-375-125
1/2	.675	3	5/32	BRT-500-156

BRF SERIES - 2 FLUTE 15 DEGREE RUNNER CUTTER
30 DEGREE INCLUDED ANGLE

SHANK DIA	LOC	OAL	RADIUS	EDP
3/16	.262	2	1/32	BRF-187-031
3/16	.216	2	3/64	BRF-187-046
1/4	.287	2-1/2	1/16	BRF-250-062
1/4	.243	2-1/2	5/64	BRF-250-078
5/16	.313	2-1/2	3/32	BRF-312-093
5/16	.270	2-1/2	7/64	BRF-312-109
3/8	.341	2-1/2	1/8	BRF-375-125
1/2	.545	3	5/32	BRF-500-156

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

Chamfer Mills

Materials	SFM	End Mill Diameter Chip Load Per Tooth							
Soft Grades (<32 HRC)	**Speed**	**1/8"**	**3/16"**	**1/4"**	**3/8"**	**1/2"**	**5/8"**	**3/4"**	**1"**
Non Ferrous									
Aluminum Alloys--2024-T4/T6, 2014, 6061-T6/T651, 7075-T6	800-2000	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.007
Copper--Yellow Brass, High Lead Brass, Red Brass	800-1500	0.001	0.001	0.002	0.0025	0.003	0.004	0.004	0.005
Copper Alloys--Alum/Bronze, Low Silicon Bronze	800-1000	0.001	0.001	0.002	0.0025	0.003	0.004	0.004	0.005
Magnesium--De-CAt, Extruded	900-1300	0.001	0.002	0.002	0.003	0.004	0.006	0.008	0.009
Plastics, Acrylics, Phenolics-- Polysulfone	200-600	0.001	0.002	0.003	0.004	0.006	0.008	0.001	0.015
Carbon, Graphites	200-400	0.040	0.040	0.060	0.080	0.010	0.001	0.015	0.020
Stainless Steel									
Precipitation--13/8, 15/5, AM-350/355	80-250	0.0005	.0005	0.001	0.001	0.002	0.002	0.004	0.006
Austenic--200 Series, 302, 303, 304L, 316L	100-350	0.0001	0.0002	0.0005	0.001	0.0015	0.002	0.003	0.004
Martensitic--403, 410, 416	100-250	0.0001	0.0002	0.0005	0.0005	0.001	0.001	0.003	0.004
High Temp Alloys									
Cobalt Base--Stellite, HS-21, HAYNES25/188, x-40, L-605	60-100	0.0004	.0005	0.001	0.001	0.001	0.001	0.0015	0.002
Iron Base--Incoly 600-802, Multimet N-155, Timkin 16-25-6	80-130	0.0005	0.0005	0.001	0.0015	0.002	0.0025	0.003	0.004
Titanium Alloys--6AL-4V, Astm 1/2/3, 6 AL-25N-4Zr-2Mo-Si	50-250	0.0005	0.0005	0.0005	0.001	0.001	0.0015	0.002	0.004
Steel									
High Strength Steels--4340, 6150, 52100, H-11, H-13	50-250	0.0005	.0005	0.001	0.001	0.001	0.0015	0.002	0.004
High Alloy Steels--A-2/6/10, P-3/10, 01, 02, 06	100-300	0.0005	0.0005	0.001	0.001	0.001	0.0015	0.002	0.004
Medium Alloy Steels--200, 250, 300	150-350	0.0005	0.0005	0.001	0.002	0.0025	0.0035	0.004	0.005
Low Alloy Steels Maraging--10XX, 11XX, 13XX	100-400	0.0005	0.001	0.0015	0.002	0.003	0.004	0.005	0.006
Cast Iron									
Ductile Iron--Ductile Cast Iron	100-400	0.0005	0.001	0.0015	0.002	0.002	0.003	0.004	0.005
Cast Iron--Gray Cast Iron	100-400	0.0005	0.001	0.002	0.003	0.004	0.005	0.006	0.008

Formulas

RPM= (SFM x 3.82)/tool diameter

IPM= number of flutes x RPM x chip load per tooth

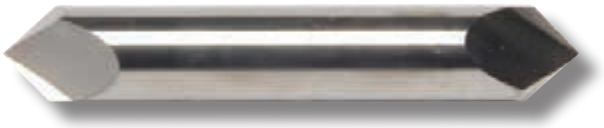
The chart is a starting point based on a coated tool. Reduce rates up to 50% using an uncoated tool.

Important Disclaimer: The speed and feed rates are suggested as a general guideline. Machine type, horsepower, spindle speed limitations,

92 SERIES - 2 FLUTE SINGLE END, CHAMFER MILL

DIA	OAL	ANGLE	EDP
1/8	1-1/2	60°	921250060
1/8	1-1/2	82°	921250082
1/8	1-1/2	90°	921250090
1/8	1-1/2	120°	921250120
3/16	2	60°	921875060
3/16	2	82°	921875082
3/16	2	90°	921875090
3/16	2	120°	921875120
1/4	2-1/2	60°	922500060
1/4	2-1/2	82°	922500082
1/4	2-1/2	90°	922500090
1/4	2-1/2	120°	922500120
3/8	2-1/2	60°	923750060
3/8	2-1/2	82°	923750082
3/8	2-1/2	90°	923750090
3/8	2-1/2	120°	923750120
1/2	3	60°	925000060
1/2	3	82°	925000082
1/2	3	90°	925000090
1/2	3	120°	925000120
3/4	4	60°	927500060
3/4	4	82°	927500082
3/4	4	90°	927500090
3/4	4	120°	927500120

92 SERIES - 2 FLUTE DOUBLE END, CHAMFER MILL



DIA	OAL	ANGLE	EDP
1/4	2-1/2	90°	922500090DE
3/8	2-1/2	90°	923750090DE
1/2	3	90°	925000090DE
3/4	4	90°	927500090DE

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

94 SERIES - 4 FLUTE SINGLE END, CHAMFER MILL

DIA	OAL	ANGLE	EDP
1/4	2-1/2	60°	942500060
1/4	2-1/2	82°	942500082
1/4	2-1/2	90°	942500090
1/4	2-1/2	120°	942500120
3/8	2-1/2	60°	943750060
3/8	2-1/2	82°	943750082
3/8	2-1/2	90°	943750090
3/8	2-1/2	120°	943750120
1/2	3	60°	945000060
1/2	3	82°	945000082
1/2	3	90°	945000090
1/2	3	120°	945000120
3/4	4	60°	947500060
3/4	4	82°	947500082
3/4	4	90°	947500090
3/4	4	120°	947500120

94 SERIES - 4 FLUTE DOUBLE END, CHAMFER MILL

DIA	OAL	ANGLE	EDP
1/4	2-1/2	90°	942500090DE
3/8	2-1/2	90°	943750090DE
1/2	3	90°	945000090DE
3/4	4	90°	947500090DE

FOR COATED TOOLS: ADD -C11 (ALTIN) OR -C4 (TICN) TO THE END OF EDP NUMBER

CHAMFER DRILL SPOT DRILLING CHART

Chamfer Drills Spot Drilling		
Materials	**SFM**	**Feed Per Rev**
Non Ferrous		
Aluminum Alloys--2024-T4/T6, 2014, 6061-T6/T651, 7075-T6	650-1500	0.004
Copper--Yellow Brass, High Lead Brass, Red Brass	600-1500	0.004
Copper Alloys--Alum/Bronze, Low Silicon Bronze	600-1000	0.003
Magnesium--De-CAt, Extruded	900-1300	0.004
Plastics, Acrylics, Phenolics- Polysulfone	200-600	0.006
Carbon, Graphites	200-400	0.01
Stainless Steel		
Precipitation--13/8, 15/5, AM-350/355	80-250	0.0008
Austenic--200 Series, 302, 303, 304L, 316L	100-350	0.001
Martensitic--403, 410, 416	100-250	0.001
Steel		
High Strength Steels--4340, 6150, 52100, H-11, H-13	250 - 400	0.001
High Alloy Steels--A-2/6/10, P-3/10, 01, 02, 06	250-500	0.001
Medium Alloy Steels--200, 250, 300	250-450	0.0015
Low Alloy Steels Maraging--10XX, 11XX, 13XX	100-400	0.0015
Cast Iron		
Ductile Iron--Ductile Cast Iron	100-400	0.002
Cast Iron--Gray Cast Iron	100-400	0.004
Formulas		
RPM= (SFM x 3.82)/tool diameter		
IPM= number of flutes x RPM x chip load per tooth		
For Chamfering Feed and Speeds refer to the charts for our General Purpose End MIlls		
The chart is a starting point based on a coated tool. Reduce rates up to 50% using an uncoated tool.		
Important Disclaimer: The speed and feed rates are suggested as a general guideline. Machine type, horsepower, spindle speed limitations, toolholding & workholding devices all may impact a cutting tool's ability to perform properly. As a result BENCHMARK is not responsible for tool failure, part damage or injury that may be caused as a result.		

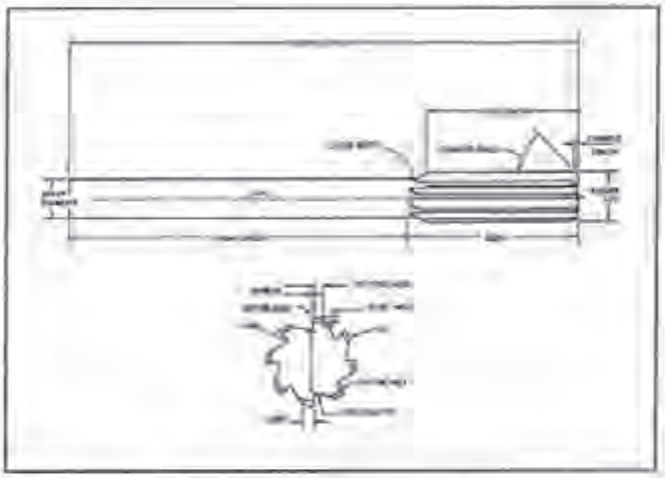
CD2 SERIES - 2 FLUTE SINGLE END SPOTTING AND CHAMFER MILL

DIA	OAL	ANGLE	EDP
1/4	2-1/2	60	CD22500060
1/4	2-1/2	90	CD22500090
1/4	2-1/2	120	CD22500120
3/8	2-1/2	60	CD23750060
3/8	2-1/2	90	CD23750090
3/8	2-1/2	120	CD23750120
1/2	3	60	CD25000060
1/2	3	90	CD25000090
1/2	3	120	CD25000120
3/4	4	90	CD27500090

CD4 SERIES - 4 FLUTE SINGLE END SPOTTING AND CHAMFER MILL

DIA	OAL	ANGLE	EDP
1/4	2-1/2	60	CD42500060
1/4	2-1/2	90	CD42500090
1/4	2-1/2	120	CD42500120
3/8	2-1/2	60	CD43750060
3/8	2-1/2	90	CD43750090
3/8	2-1/2	120	CD43750120
1/2	3	60	CD45000060
1/2	3	90	CD45000090
1/2	3	120	CD45000120
3/4	4	90	CD47500090

REAMERS



STOCK REMOVAL

REAMER DIAMETER

Up to 1/16	1/4 to 3/8
1/16 to1/8	3/8 to 1/2
1/8 to 1/4	1/2 to 5/8

SUGGESTED STOCK REMOVAL

.003 - .005	.008 - .014
.004 - .008	.010 - .015
.006 - .012	.012 - .018

REAMER FORMULAS

$$RPM = \frac{SFM}{TD} \times 3.82$$

IPM = IPR x RPM

SYMBOLS

IMP = Feed rate in inches per minute
IPR = Inches per revolution
RPM = Revolutions per minute
SFM = Surface feet per minute
TD = Tool diameter in inches

MATERIAL OPERATING PARAMETERS SPEEDS AND FEEDS FOR REAMERS

MATERIAL	SPEED (SFM)	Reamer Diameter	FEED PER REVOLUTION 1/16"	1/8"	1/4"	1/2"	3/4"
Aluminum/Aluminum Alloys	100-1000		.0030	.0040	.0080	.0100	.0140
Brass/Bronze, Soft	60-450		.0020	.0040	.0050	.0080	.0120
Bronze/High Tensile	40-400		.0020	.0040	.0050	.0080	.0120
Copper/Copper Alloys	50-450		.0020	.0040	.0070	.0100	.0140
Iron, Hard Cast	45-110		.0020	.0040	.0050	.0090	.0130
Iron, Soft Cast	90-200		.0030	.0060	.0080	.0120	.0150
Iron, Malleable	45-145		.0020	.0040	.0060	.0080	.0130
Monel/Nickel Base Alloys	45-100		.0030	.0060	.0080	.0100	.0120
Molybdenum	40-120		.0010	.0030	.0060	.0100	.0130
Plastic and Related Materials	130-165		.0010	.0020	.0020	.0040	.0050
Steel, Hardened up to Rc 35	35-85		.0020	.0040	.0060	.0080	.0130
Steel, Hardened up to Rc 50	25-35		.0020	.0030	.0040	.0060	.0070
Steel, Hardened up to Rc 60	15-25		.0010	.0020	.0020	.0030	.0040
Steel, Low Carbon	50-120		.0020	.0040	.0070	.0100	.0150
Steel, Tool	15-75		.0010	.0020	.0020	.0030	.0050
Stainless Steel, Free Machining	60-150		.0020	.0040	.0060	.0080	.0100
Stainless Steel, Work Hardening	50-85		.0020	.0040	.0050	.0070	.0090
Titanium Alloys	65-375		.0020	.0040	.0060	.0100	.0130

NOTE: The material operating parameters provided above are suggested starting points under ideal conditions. Adjustments to speeds and feeds may be required to meet individual job requirements.

Main TOC

MADE TO-ORDER REAMERS STR FTL,RHS,LHS

RANGE SIZE	LOC	SHK DIA	OAL	No. of Flutes
0420-0535	3/8	.041	1-1/2	4
0536-0650	3/8	.52	1-1/2	4
0651-0790	1/2	.062	1-3/4	4
0791-0950	1/2	.078	2	4
0951-1145	5/8	.094	2-1/4	4
1146-1290	5/8	.109	2-1/4	4
1291-1455	3/4	.125	2-1/2	4
1456-1590	3/4	.140	2-1/2	4
1591-1750	7/8	.156	2-3/4	4
1751-1900	7/8	.172	2-3/4	4
1901-2240	1	.188	3	4
2241-2540	1	.219	3	4
2541-2850	1-1/8	.250	3-1/4	6
2851-3150	1-1/8	.281	3-1/4	6
3151-3650	1-1/4	.313	3-1/2	6
3651-3860	1-1/4	.360	3-1/2	6
3861-4150	1-1/4	.375	4	6
4151-4450	1-3/8	.375	4	6
4451-4750	1-3/8	.438	4	6
4751-5150	1-1/2	.438	4	6
5151-5400	1-1/2	.500	4	6
5401-5700	1-1/2	.535	4	6
5701-6000	1-3/4	.565	4	6
6001-6350	1-3/4	.595	4	6

24 HOUR DELIvERY

Diameter Tolerance = +.0000 / +.0003

300 SERIES STRAIGHT FLUTE STANDARD REAMERS

SIZE	LOC	OAL	EDP#
#65	1/4	1-1/2	300-0350
#64	1/4	1-1/2	300-0360
#63	1/4	1-1/2	300-0370
#62	1/4	1-1/2	300-0380
#61	1/4	1-1/2	300-0390
1.0 mm	1/4	1-1/2	300-0394
#60	1/4	1-1/2	300-0400
#59	3/8	1-1/2	300-0410
#58	3/8	1-1/2	300-0420
#57	3/8	1-1/2	300-0430
#56	3/8	1-1/2	300-0465
3/64	3/8	1-1/2	300-0469
#55	3/8	1-1/2	300-0520
#54	3/8	1-1/2	300-0550
1.5 mm	3/8	1-1/2	300-0591
#53	3/8	1-1/2	300-0595
1/16	3/8	1-1/2	300-0625
#52	3/8	1-1/2	300-0635
#51	1/2	1-1/2	300-0670
#50	1/2	1-3/4	300-0700
#49	1/2	1-3/4	300-0730
#48	1/2	1-3/4	300-0760
5/64	1/2	1-3/4	300-0781
#47	1/2	1-3/4	300-0785
2.0 mm	1/2	2	300-0787
#46	1/2	2	300-0810
#45	1/2	2	300-0820
#44	1/2	2	300-0860
#43	1/2	2	300-0890
.0918 O-U	1/2	2	300-0918
.0933 O-U	1/2	2	300-0933
#42	1/2	2	300-0935
3/32	1/2	2	300-0938
#41	5/8	2-1/4	300-0960
#40	5/8	2-1/4	300-0980
2.5 mm	5/8	2-1/4	300-0984
#39	5/8	2-1/4	300-0995
#38	5/8	2-1/4	300-1015
#37	5/8	2-1/4	300-1040
#36	5/8	2-1/4	300-1065
7/64	5/8	2-1/4	300-1094
#35	5/8	2-1/4	300-1100
#34	5/8	2-1/4	300-1110
#33	5/8	2-1/4	300-1130
#32	5/8	2-1/4	300-1160
3.0 mm	5/8	2-1/4	300-1181
#31	5/8	2-1/4	300-1200
.1230 O-U	5/8	2-1/4	300-1230
.1240 O-U	5/8	2-1/4	300-1240
.1247 D-P	5/8	2-1/4	300-1247
1/8	5/8	2-1/4	300-1250

300 SERIES STRAIGHT FLUTE STANDARD REAMERS

SIZE	LOC	OAL	EDP#
.1260 O-U	3/4	2-1/2	300-1260
#30	3/4	2-1/2	300-1285
#29	3/4	2-1/2	300-1360
3.5 mm	3/4	2-1/2	300-1378
#28	3/4	2-1/2	300-1405
9/64	3/4	2-1/2	300-1406
#27	3/4	2-1/2	300-1440
#26	3/4	2-1/2	300-1470
#25	3/4	2-1/2	300-1495
#24	3/4	2-1/2	300-1520
#23	3/4	2-1/2	300-1540
5/32	3/4	2-1/2	300-1562
#22	3/4	2-1/2	300-1570
4.0 mm	3/4	2-1/2	300-1575
#21	3/4	2-1/2	300-1590
#20	7/8	2-3/4	300-1610
#19	7/8	2-3/4	300-1660
#18	7/8	2-3/4	300-1695
11/64	7/8	2-3/4	300-1719
#17	7/8	2-3/4	300-1730
#16	7/8	2-3/4	300-1770
4.5 mm	7/8	2-3/4	300-1772
#15	7/8	2-3/4	300-1800
#14	7/8	2-3/4	300-1820
#13	7/8	2-3/4	300-1850
.1865 O-U	7/8	2-3/4	300-1865
.1870 D-P	7/8	2-3/4	300-1870
3/16	7/8	2-3/4	300-1875
.1885 O-U	7/8	2-3/4	300-1885
#12	7/8	2-3/4	300-1890
#11	1	3	300-1910
#10	1	3	300-1935
#9	1	3	300-1960
5.0 mm	1	3	300-1969
#8	1	3	300-1990
#7	1	3	300-2010
13/64	1	3	300-2031
#6	1	3	300-2040
#5	1	3	300-2055
#4	1	3	300-2090
#3	1	3	300-2130
5.5 mm	1	3	300-2165
7/32	1	3	300-2188
#2	1	3	300-2210
#1	1	3	300-2280
A	1	3	300-2340
15/64	1	3	300-2344
6.0 mm	1	3	300-2362
B	1	3	300-2380
C	1	3	300-2420
D	1	3	300-2460
.2480 D-P	1	3	300-2480
.2490 O-U	1	3	300-2490
.2495 D-P	1	3	300-2495
E & 1/4	1	3	300-2500
.2510 O-U	1	3	300-2510
6.5 mm	1	3	300-2559

300 SERIES STRAIGHT FLUTE STANDARD REAMERS

SIZE	LOC	OAL	EDP#
F	1-1/8	3-1/4	300-2570
G	1-1/8	3-1/4	300-2610
17/64	1-1/8	3-1/4	300-2656
H	1-1/8	3-1/4	300-2660
I	1-1/8	3-1/4	300-2720
7.0 mm	1-1/8	3-1/4	300-2756
J	1-1/8	3-1/4	300-2770
K	1-1/8	3-1/4	300-2810
9/32	1-1/8	3-1/4	300-2812
L	1-1/8	3-1/4	300-2900
M	1-1/8	3-1/4	300-2950
7.5 mm	1-1/8	3-1/4	300-2953
19/64	1-1/8	3-1/4	300-2969
N	1-1/8	3-1/4	300-3020
.3105 D-P	1-1/8	3-1/4	300-3105
.3115 O-U	1-1/8	3-1/4	300-3115
.3120 D-P	1-1/8	3-1/4	300-3120
5/16	1-1/8	3-1/4	300-3125
.3135 O-U	1-1/8	3-1/4	300-3135
8.0 mm	1-1/8	3-1/4	300-3150
O	1-1/4	3-1/2	300-3160
P	1-1/4	3-1/2	300-3230
21/64	1-1/4	3-1/2	300-3281
Q	1-1/4	3-1/2	300-3320
8.5 mm	1-1/4	3-1/2	300-3346
R	1-1/4	3-1/2	300-3390
11/32	1-1/4	3-1/2	300-3438
S	1-1/4	3-1/2	300-3480
9.0 mm	1-1/4	3-1/2	300-3543
T	1-1/4	3-1/2	300-3580
23/64	1-1/4	3-1/2	300-3594
U	1-1/4	3-1/2	300-3680
.3730 D-P	1-1/4	3-1/2	300-3730
.3740 D-P	1-1/4	3-1/2	300-3740
.3745 D-P	1-1/4	3-1/2	300-3745
3/8	1-1/4	3-1/2	300-3750
.3760 O-U	1-1/4	3-1/2	300-3760
V	1-1/4	3-1/2	300-3770
W	1-1/4	3-1/2	300-3860
25/64	1-1/4	3-1/2	300-3906
10.0 mm	1-1/4	3-1/2	300-3937
X	1-1/4	3-1/2	300-3970
Y	1-1/4	3-1/2	300-4040
13/32	1-1/4	3-1/2	300-4062
Z	1-1/4	3-1/2	300-4130
10.5 mm	1-1/4	3-1/2	300-4134
27/64	1-3/8	4	300-4219
11.0 mm	1-3/8	4	300-4331
.4355 D-P	1-3/8	4	300-4355
.4365 O-U	1-3/8	4	300-4365
.4370 D-P	1-3/8	4	300-4370
7/16	1-3/8	4	300-4375
.4385 O-U	1-3/8	4	300-4385
11.5 mm	1-3/8	4	300-4528
29/64	1-3/8	4	300-4531
15/32	1-3/8	4	300-4688
12.0 mm	1-1/2	4	300-4724
31/64	1-1/2	4	300-4844
12.5 mm	1-1/2	4	300-4921
.4980 D-P	1-1/2	4	300-4980
.4990 O-U	1-1/2	4	300-4990
.4995 D-P	1-1/2	4	300-4995
1/2	1-1/2	4	300-5000
.5010 O-U	1-1/2	4	300-5010

301 SERIES RHS/RHC STANDARD REAMERS

SIZE	LOC	OAL	EDP#
3/64	3/8	1-1/2	301-0469
1/16	3/8	1-1/2	301-0625
5/64	1/2	1-3/4	301-0781
3/32	1/2	2	301-0938
7/64	5/8	2-1/4	301-1094
1/8	5/8	2-1/4	301-1250
9/64	3/4	2-1/2	301-1406
5/32	3/4	2-1/2	301-1562
11/64	7/8	2-3/4	301-1719
3/16	7/8	2-3/4	301-1875
13/64	1	3	301-2031
7/32	1	3	301-2188
15/64	1	3	301-2344
1/4 & (E)	1	3	301-2500
17/64	1-1/8	3-1/4	301-2656
9/32	1-1/8	3-1/4	301-2812
19/64	1-1/8	3-1/4	301-2969
5/16	1-1/8	3-1/4	301-3125
21/64	1-1/4	3-1/2	301-3281
11/32	1-1/4	3-1/2	301-3438
23/64	1-1/4	3-1/2	301-3594
3/8	1-1/4	3-1/2	301-3750
25/64	1-1/4	3-1/2	301-3906
13/32	1-1/4	3-1/2	301-4062
27/64	1-3/8	4	301-4219
7/16	1-3/8	4	301-4375
29/64	1-3/8	4	301-4531
15/32	1-3/8	4	301-4688
31/64	1-1/2	4	301-4844
1/2	1-1/2	4	301-5000

Tool Quote Form

Customer's Name: _____Contact: _____

Phone: _____Fax: _____E-mail: _____

Is this a repeat inquiry / order: Yes: _____ No: _____

If yes, please identify by customer part #: _____ Benchmark part #: _____

Single End or Double End? _____

Number of Flutes? _____

Cutting Diameter & Tolerance: _____

Length of cut: _____

Length below shank, LBS (if applicable): _____

Overall Length: _____

Shank diameter and Type: _____

Hand of Cut and Helix Angle: _____

Type of End-Square, or Ball: _____

Type and Hardness of Material to be Machined: _____

Coating required: _____

Quantity required: _____

Style of Special End Mill: Conventional, Tapered, or Rougher: _____

Comments: _____
_____

NOTE: To avoid delays in the manufacturing or inquiry of our tools, it is important that all information be provided. All orders or inquiries for special end mills must show the customer's name. This important procedure makes for much faster reference should it be necessary. If you want an immediate quote on specials, fax your specifications to:

Fax: 1-413-732-7831 or Call: 1-800-523-8570 or 413-732-7470 or E-mail ppoulin@benchmarkcarbide.com

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Tool Performance Report

Account Name: _____ **Date**_____
Street: _____
City: _____ State: _____Zip Code: _____
Phone: _____Fax:_____E-mail: _____
Contact: _____Title:_____
Application: _____

End Mill Brand: _____**Part No:**_____
Technical Data: _____
Machine Type: _____HP:_____#Spindles: _____
RMS Req.:_____Coolant:_____
Speed: _____RPM:_____SFM:_____
Feed: _____IPM:_____
Material: _____Hardness:_____

Chip Load per Tooth: _____ Majority of Cuts: _____
Depth per Cut: _____ _____Shallow Slotting _____Deep Slotting < 1 xd.
Axial _____ _____ Med. Radial <.25 x d.
Radial _____ _____Med. Radial >.300 x d.

Tool Specification:
Dia: _____Shank Dia.: _____LOC: _____
OAL: _____No. Flts: _____Hand of Cut: _____
End Style: _____Mat'l.: _____Helix: _____
Coating: _____Neck reach Relieved (LBS): _____

Benchmark Tools Distributor_____**Contact**:_____

Benchmark Tool Representative_____

Comments: _____
_____
_____
Results: _____
_____
_____

Note: All requests for Credit will require this form, and a sample tool for evaluation

Benchmark Carbide
572 St James Avenue – Springfield, MA 01109
Toll Free 800-523-8570 – F: 413-732-7831
www.benchmarkcarbide.com

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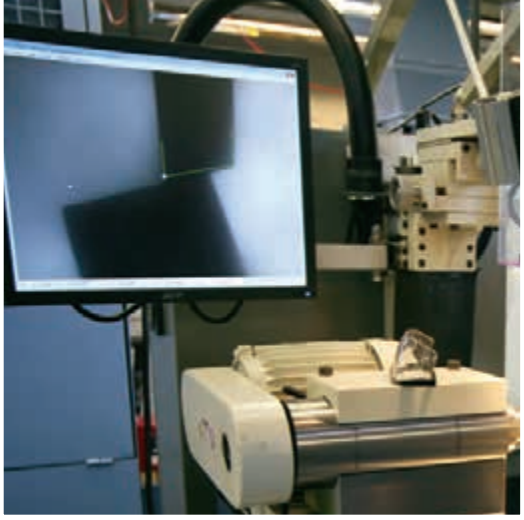

BENCHMARK™
CARBIDE

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DECIMAL EQUIVALENT CHART

CATALOG DIA	Decimal Equiv.	CATALOG DIA	Decimal Equiv.	CATALOG DIA	Decimal Equiv.	CATALOG DIA	Decimal Equiv.	CATALOG DIA	Decimal Equiv.
No. 80	.0135	No. 49	.0730	4.10mm	.1614	6.80mm	.2677	27/64	.4219
.35mm	.0138	1.90mm	.0748	4.20mm	.1654	6.90mm	.2717	11.0mm	.4331
No. 79	.0145	No. 48	.0760	No. 19	.1660	I	.2720	7/16	.4375
1/64	.0156	1.95mm	.0768	4.25mm	.1673	7.00mm	.2756	11.5mm	.4528
.40mm	.0158	5/64	.0781	4.30mm	.1693	J	.2770	29/64	.4531
No. 78	.0160	No. 47	.0785	No. 18	.1695	7.10mm	.2795	15/32	.4688
.45mm	.0177	2.00mm	.0787	11/64	.1719	K	.2810	12.0mm	.4724
No. 77	.0180	2.05mm	.0807	No. 17	.1730	9/32	.2812	31/64	.4844
.50mm	.0197	No. 46	.0810	4.40mm	.1732	7.20mm	.2835	12.5mm	.4921
No. 76	.0200	No. 45	.0820	No. 16	.1770	7.25mm	.2854	1/2	.5000
No. 75	.0210	2.10mm	.0827	4.50mm	.1772	7.30mm	.2874	13.0mm	.5118
.55mm	.0217	2.15mm	.0846	No. 15	.1800	L	.2900	33/64	.5156
No. 74	.0225	No. 44	.0860	4.60mm	.1811	7.40mm	.2913	17/32	.5312
.60mm	.0236	2.20mm	.0866	No. 14	.1820	M	.2950	13.5mm	.5315
No. 73	.0240	2.25mm	.0886	No. 13	.1850	7.50mm	2953	35/64	.5469
No. 72	.0250	No. 43	.0890	4.70mm	.1850	19/64	.2969	14.0mm	.5512
.65mm	.0256	2.30mm	.0906	4.75mm	.1870	7.60mm	.2992	9/16	.5625
No. 71	.0260	2.35mm	.0925	3/16	.1875	N	.3020	14.5mm	.5709
.70mm	.0276	No. 42	.0935	4.80mm	.1890	7.70mm	.3031	37/64	.5781
No. 70	.0280	3/32	.0938	No.12	.1890	7.75mm	.3051	15.0mm	.5906
No. 69	.0292	2.40mm	.0945	No.11	.1910	7.80mm	.3071	19/32	.5938
.75mm	.0295	No. 41	.0960	4.90mm	.1929	7.90mm	.3110	36/64	.6094
No. 68	.0310	2.45mm	.0965	No. 10	.1935	5/16	.3125	15.5mm	.6102
1/32	.0312	No. 40	.0980	No. 9	.1960	8.00mm	.3150	5/8	.6250
.80mm	.0315	2.50mm	.0984	5.00mm	.1969	O	.3160	16.0mm	.6299
No. 67	.0320	No. 39	.0995	No. 8	0.199	8.10mm	.3189	41/64	.6406
No. 66	.0330	No. 38	.1015	5.10mm	.2008	8.20mm	.3228	16.5mm	.6496
.85mm	.0335	2.60mm	.1024	No. 7	.2010	P	.3230	21/32	.6562
No. 65	.0350	No. 37	.1040	13/64	.2031	8.25mm	.3248	17.0mm	.6693
.90mm	.0354	2.70mm	.1063	No. 6	.2040	8.30mm	.3268	43/64	.6719
No. 64	.0360	No. 36	.1065	5.20mm	.2047	21/64	.3281	11/16	.6875
No. 63	.0370	2.75mm	.1083	No. 5	.2055	8.40mm	.3307	17.5mm	.6890
.95mm	.0374	7/64	.1094	5.25mm	.2067	Q	.3320	45/64	.7031
No. 62	.0380	No. 35	.1100	5.30mm	.2087	8.50mm	.3346	18.0mm	.7087
No. 61	.0390	2.80mm	.1102	No. 4	.2090	8.60mm	.3386	23/32	.7188
1.00mm	.0394	No. 34	.1110	5.40mm	.2126	R	'.3390	18.5mm	.7283
No. 60	.0400	No. 33	.1130	No. 3	.2130	8.70mm	.3425	47/64	.7344
No. 59	.0410	2.90mm	.1142	5.50mm	.2165	11/32	.3438	19.0mm	.7480
1.05mm	.0413	No. 32	.1160	7/32	.2188	8.75mm	.3445	3/4	.7500
No. 58	.0420	3.00mm	.1181	5.60mm	.2205	8.80mm	.3465	49/64	.7656
No. 57	.0430	No. 31	.1200	No. 2	.2210	S	.3480	19.5mm	.7677
1.10mm	.0433	3.10mm	.1220	5.70mm	.2244	8.90mm	.3504	25/32	.7812
1.15mm	.0453	1/8	.1250	5.75mm	.2264	9.00mm	.3543	20.0mm	.7874
No. 56	.0465	3.20mm	.1260	No. 1	.2280	T	.3580	51/64	.7969
3/64	.0469	3.25mm	.1280	5.80mm	.2283	9.10mm	.3583	20.5mm	.8071
1.20mm	.0472	No. 30	.1285	5.90mm	.2323	23/64	.3594	13/16	.8125
1.25mm	.0492	3.30mm	.1299	A	.2340	9.20mm	.3622	21.0mm	.8268
1.30mm	.0512	3.40mm	.1339	15/64	.2344	9.25mm	3642	53/64	.8281
No. 55	.0520	No. 29	.1360	6.00mm	.2362	9.30mm	.3661	27/32	.8438
1.35mm	.0531	3.50mm	.1378	B	.2380	U	.3680	21.5mm	.8465
No. 54	.0550	No. 28	.1405	6.10mm	.2402	9.40mm	.3701	55/64	.8594
1.40mm	.0551	9/64	.1406	C	.2420	9.50mm	.3740	22.0mm	.8661
1.45mm	.0571	3.60mm	.1417	6.20mm	.2441	3/8	.3750	7/8	.8750
1.50mm	.0591	No. 27	.1440	D	.2460	V	.3770	22.5mm	.8858
No. 53	.0595	3.70mm	.1457	6.25mm	.2461	9.60mm	.3780	57/64	.8906
1.55mm	.0610	No. 26	.1470	6.30mm	.2480	9.70mm	.3819	23.0mm	.9055
1/16	.0625	3.75mm	.1476	1/4	.2500	9.75mm	.3839	29/32	.9062
1.60mm	.0630	No. 25	.1495	E	.2500	9.80mm	.3858	59/64	.9219
No. 52	.0635	3.80mm	.1496	6.40mm	.2520	W	.3860	23.5mm	.9252
1.65mm	.0650	No. 24	.1520	6.50mm	.2559	9.90mm	.3898	15/16	.9375
1.70mm	.0669	3.90mm	.1535	F	.2570	25/64	.3906	24.0mm	.9449
No. 51	.0670	No. 23	.1540	6.60mm	.2598	10.0mm	.3937	61/64	.9531
1.75mm	.0689	5/32	.1562	G	.2610	X	.3970	24.5mm	.9646
No. 50	.0700	No. 22	.1570	6.70mm	.2638	Y	.4040	31/32	9688
1.80mm	.0709	4.00mm	.1575	17/64	.2656	13/32	.4062	25.0mm	.9843
1.85mm	.0728	No. 21	.1590	6.75mm	.2657	Z	.4130	63/64	.9844
		No. 20	.1610	H	.2660	10.5mm	4134	1	1.0000

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Thank You for your interest and support of our product. Below we have highlighted a few points of interest associated with the new Benchmark catalog.

- All Benchmark products are **made in USA**.
- New Exotic Series for “Hard to machine” applications.
- New “State of the Art” manufacturing facility.
- New equipment as part of continual improvement.
- Benchmark has the largest non-ferrous offering in the industry including necked, ball nose, and huge radius program.
- Patented helix designs.
- Available with wiper flats for improved floor finishing.
- Variety of roughing tools in stock.
- A variety of coatings available.

We are eager to assist you with your tooling requirements and look forward to hearing from you. Please do not hesitate to contact customer service with any questions you may have.
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