PROMAX Premier

PROMAX Premium

DESIGN-RITE XL

**Your Trusted End Mill Partner for over 30 years**

**Specializing in High Performance Solid Carbide End Mills**

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## DESIGN-RITE XL


General Purpose Aluminum

| | | |
|---|---|---|
| D142 | 2 Flute | 96 |
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General Purpose Universal

| | | |
|---|---|---|
| D442 | 2 Flute | 98 |
| D642 | 2 Flute | 99-102 |
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| D842 | 2 Flute Double End | 104 |
| D642CR | 2 Flute Corner Radius | 105-106 |
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| D844 | 4 Flute Double End | 126 |
| D844M | 4 Flute Double End Metric | 127 |
| D644CR | 4 Flute Corner Radius | 128-137 |
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# Pictogram Glossary

| | |
|---|---|
| **Best Used In Material** | UN Universal; TI Titanium; VA Stainless Steel; H Hardened Steel; AL Aluminum; ST Steel |
| **Number Of Flutes** | 2 FL; 3 FL; 4 FL; 5 FL; 6 FL; 7 FL |
| **End Mill Corner / End Style** | S Square; PC Protective Corner; PR Protective Radius; R Corner Radius; R Ball Radius |
| **Application Uses** | Peripheral; Ramping; Helical; Slotting; Plunging; Corner Radius Contouring; Corner Radius Profiling; Ball Contouring; Ball Profiling |
| **Geometry Information** | Shank Flat; C b Chip Breakers; $\lambda_s = 35°/38°$ Helix; $\gamma_s = 9°$ Rake Angle; UE Unequal Index; Balanced; Coarse Pitch; Fine Pitch |

# Policies & Procedures

## CUSTOMER SERVICE

At CERATIZIT Sacramento, we will provide the highest quality cutting tools to best suit your application. In addition, our customers receive both an excellent tool and the knowledge and assistance of our Technical Support and other departments. We believe that customer service is just as important as the product being sold. Our customers receive the answers they seek and the information they need in a more than timely manner. You can feel comfortable knowing that quality products and customer satisfaction are at the center of every decision we make.

**Call our knowledgeable Tech Line at 800-878-0502 for all of your cutting tool needs and questions.**

## LIMITED WARRANTY

CERATIZIT Sacramento warrants each new product manufactured and sold by us or one of our authorized dealers against defects in workmanship and/or materials. Our obligation is limited to the repair or replacement of defective products. At our discretion, we may refund the purchase price of a defective product. This warranty does not cover products that are damaged as a result of negligence or misuse including improper operating conditions and machine set up or any items that have been repaired or altered. This warranty excludes all other warranties, expressed or implied, including any implied warranties of merchant ability or fitness for a particular purpose. In no event will CERATIZIT Sacramento be liable for any incidental, special or consequential damages of any nature.

## RETURN POLICY

Returned products must be accompanied by a CERATIZIT Sacramento authorized Returned Goods Authorization number (RGA). Warranty claims should be made through the distributor from whom the product was purchased. Distributors may call us at 1-800-878-0502 to receive an RGA number. Returned goods may be subject to a restocking fee. Special, modified, non-catalog or altered tools are not acceptable for return.

## TEST TOOL POLICY

Take the our Challenge:  Throw it on the spindle and prove it to yourself. Higher production rates and longer tool life are your goals and ours. CERATIZIT Sacramento will authorize a test tool credit only when the proper procedures of the existing GUARANTEED TEST TOOL ORDER (GTO) are followed. For details on this program, please call our TECH LINE at 1-800-878-0502.

# Safety Precautions

Carbide cutting tools can break or shatter under improper or severe use.  Always wear the proper personal protective equipment when performing metal cutting operations. Carbide cutting tools have sharp edges. Use caution while handling cutting tools to avoid injury.

# High Precision Coating for High Precision Tools

## TiCN
(Titanium Carbonitride)

This multipurpose gradient coating is used for milling in general purpose applications in which interrupted cutting is encountered as it has a higher edge stability than TiCN-grey. It is also ideal where high feed and speed rates are desirable.

## AlTiN
(Aluminum Titanium Nitride)

Our AlTiN is a monoblock and gradient, multilayer coating designed specifically for use on carbide end mills. Use when machining Cast Iron and Steel work pieces as it has excellent oxidation resistance allowing for high speeds in semi-dry or dry machining operations where increased heat is generated.

## ZrN
(Zirconium Nitride)

This monolayer coating effectively reduces built-up edges when machining aluminum and titanium alloys. Recommended when machining medical grade materials and in other high heat resistant applications. Also for use in machining Steels, Alloyed Steels, Superalloys, Aluminium > 12% Si, Aluminium < 12% Si, Copper, Bronze and Brass Plastics.

## nACRo®
(Aluminum-Chromium-Silicon)

The latest generation in tool coatings, nACRo®, has a nanocomposite structure that has increased hardness for scratch and higher heat resistance. Add to these qualities increased tool life and decreased tool changes, this coating will maximize machine time in “tough” difficult to cut materials including Steels, Hardened Steels, Alloyed Steels, and Superalloys. nACRo® coated tools have been proven to reduce production time by up to 30%.

# “Feel The Edge”

PROMAX Premier and PROMAX Premium EDGE PREP is standard on many of our end mills. This process allows you to forgo the tedious and long break-in periods needed on most tools in order receive the most production out of your end mill. Combining our edge prep and superior coatings the results are clear – longer running end mills, with fewer tool changes per run, equals significant cost effectiveness.

# The CERATIZIT Group

For over **95 years**, CERATIZIT has been a **pioneer** developing exceptional hard material products for cutting tools and wear protection.

The privately owned company, based in Mamer, Luxembourg, develops and manufactures highly specialized carbide cutting tools, inserts and rods made of hard materials as well as wear parts.

The CERATIZIT Group is the **global market leader** in a number of cutting tool application areas. We successfully develop new types of cemented carbide, cermet and ceramic grades, which are used for instance in wheel set and turbine machining, in the aerospace and automotive industries, for heavy machining and bar peeling – always with the goal of increased stability, process reliability and performance.

In 2014 CERATIZIT purchased a majority holding in PROMAX Tools L.P. and completed the purchase in 2017 adding PROMAX Tools L.P. to the CERATIZIT Group. The evolution of this step was completed with PROMAX Tools L.P. changing their name to CERATIZIT Sacramento in 2018 while keeping the PROMAX name for their branded products on the US market.

# Facts and figures

**1 headquarters**
Mamer, Luxembourg

**34**
production sites

**> 70**
sales subsidiaries

**> 9,000**
employees

**> 100,000**
different products

**> 1,000**
patents and
utility models

**> 200**
employees in R&D

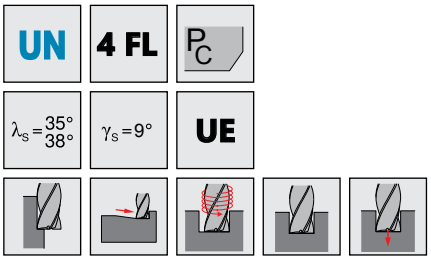
**> 10**
innovation awards

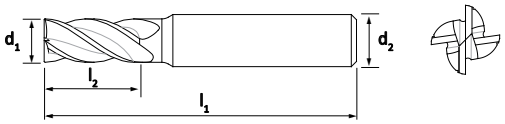
**30%**
of products
developed in the last 5 years

# Changing the Industry
# One Amazing Tool At A Time

# Series US451

## 4 Flute Universal






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Protective Corner: | 1/8” - 1” = +/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN | nACRo® |
|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 3/8 | 1 - 1/2 | 4 | US451002 | US451003 |
| 5/32 | 3/16 | 1/2 | 2 | 4 | US451005 | US451006 |
| 5/32 | 3/16 | 3/8 | 2 | 4 | US451008 | US451009 |
| 3/16 | 3/16 | 5/8 | 2 | 4 | US451011 | US451012 |
| 3/16 | 3/16 | 3/8 | 2 | 4 | US451014 | US451015 |
| 7/32 | 1/4 | 3/4 | 2 - 1/2 | 4 | US451017 | US451018 |
| 7/32 | 1/4 | 3/8 | 2 | 4 | US451020 | US451021 |
| 1/4 | 1/4 | 3/4 | 2 - 1/2 | 4 | US451023 | US451024 |
| 1/4 | 1/4 | 3/8 | 2 | 4 | US451026 | US451027 |
| 1/4 | 1/4 | 1 - 1/4 | 3 | 4 | US451029 | US451030 |
| 5/16 | 5/16 | 3/4 | 2 - 1/2 | 4 | US451032 | US451033 |
| 5/16 | 5/16 | 1/2 | 2 - 1/2 | 4 | US451035 | US451036 |
| 3/8 | 3/8 | 7/8 | 3 | 4 | US451038 | US451039 |
| 3/8 | 3/8 | 5/8 | 2 - 1/2 | 4 | US451041 | US451042 |
| 3/8 | 3/8 | 1 - 1/2 | 4 | 4 | US451044 | US451045 |
| 7/16 | 7/16 | 1 | 2 - 3/4 | 4 | US451047 | US451048 |
| 1/2 | 1/2 | 1 | 3 | 4 | US451079 | US451080 |
| 1/2 | 1/2 | 1 - 1/4 | 3 - 1/2 | 4 | US451050 | US451051 |
| 1/2 | 1/2 | 5/8 | 2 - 1/2 | 4 | US451053 | US451054 |
| 1/2 | 1/2 | 2 | 4 | 4 | US451056 | US451057 |
| 5/8 | 5/8 | 1 - 1/4 | 3 - 1/2 | 4 | US451059 | US451060 |
| 5/8 | 5/8 | 7/8 | 3 | 4 | US451062 | US451063 |
| 5/8 | 5/8 | 2 - 1/2 | 5 | 4 | US451065 | US451066 |
| 3/4 | 3/4 | 1 - 5/8 | 4 | 4 | US451068 | US451069 |
| 3/4 | 3/4 | 2 - 1/2 | 5 | 4 | US451071 | US451072 |
| 1 | 1 | 1 - 1/2 | 4 | 4 | US451074 | US451075 |
| 1 | 1 | 2 - 3/4 | 6 | 4 | US451077 | US451078 |

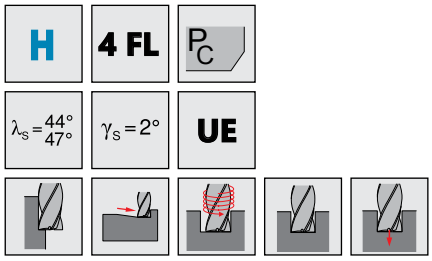
Application Range:

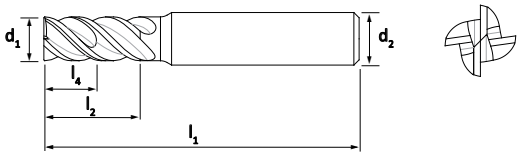
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | ● | |

Feeds & Speeds Available on Page 38

# Series US453

## 4 Flute Hardened Steel






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 3/4” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 3/4” = +.000/-.002 |
| Protective Corner: | 1/8” - 3/4” = +/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_4$ TCL | $l_1$ OAL | Flute | nACRo® |
|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 3/8 | 0.150 | 2 | 4 | US453002 |
| 3/16 | 3/16 | 7/16 | 0.225 | 2 - 1/2 | 4 | US453004 |
| 1/4 | 1/4 | 1/2 | 0.300 | 2 - 1/2 | 4 | US453006 |
| 5/16 | 5/16 | 3/4 | 0.375 | 2 - 1/2 | 4 | US453008 |
| 3/8 | 3/8 | 7/8 | 0.450 | 3 | 4 | US453010 |
| 7/16 | 7/16 | 1 | 0.525 | 2 - 3/4 | 4 | US453012 |
| 1/2 | 1/2 | 1 | 0.600 | 3 | 4 | US453014 |
| 1/2 | 1/2 | 1 - 1/2 | 0.600 | 4 | 4 | US453016 |
| 5/8 | 5/8 | 1 - 1/4 | 0.750 | 3 - 1/2 | 4 | US453018 |
| 5/8 | 5/8 | 1 - 7/8 | 0.750 | 5 | 4 | US453020 |
| 3/4 | 3/4 | 1 - 5/8 | 0.900 | 4 | 4 | US453022 |
| 3/4 | 3/4 | 2 - 3/8 | 0.900 | 5 | 4 | US453024 |

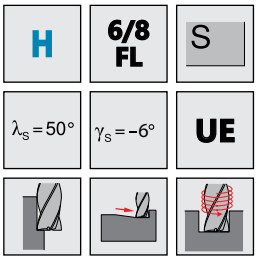
Application Range:

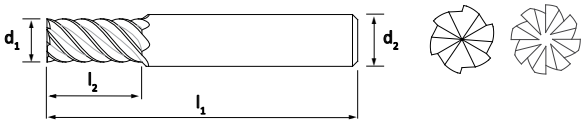
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | | | | | | | | |

Feeds & Speeds Available on Page 39

# Series US367

## 6 & 8 Flute Hardened Steel






**Tolerances**

Shank: 1/8” - 3/4” = -.0001/-.0004
Cutting Dia: 1/8” - 3/4” = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | nACRo® |
|---|---|---|---|---|---|
| 1/8 | 1/8 | 3/8 | 2 | 6 | US367002 |
| 3/16 | 3/16 | 7/16 | 2 | 6 | US367004 |
| 3/16 | 3/16 | 5/8 | 2 - 1/2 | 6 | US367006 |
| 1/4 | 1/4 | 1/2 | 2 | 6 | US367008 |
| 1/4 | 1/4 | 11/16 | 2 - 1/2 | 6 | US367010 |
| 5/16 | 5/16 | 3/4 | 2 - 1/2 | 6 | US367012 |
| 5/16 | 5/16 | 1 | 3 | 6 | US367014 |
| 3/8 | 3/8 | 7/8 | 3 | 6 | US367016 |
| 3/8 | 3/8 | 1 - 1/8 | 3 - 1/2 | 6 | US367018 |
| 1/2 | 1/2 | 1 | 3 | 6 | US367031 |
| 1/2 | 1/2 | 1 - 1/4 | 3 - 1/2 | 6 | US367020 |
| 1/2 | 1/2 | 1 - 1/2 | 4 | 6 | US367022 |
| 5/8 | 5/8 | 1 - 1/4 | 3 - 1/2 | 8 | US367024 |
| 5/8 | 5/8 | 1 - 7/8 | 5 | 8 | US367026 |
| 3/4 | 3/4 | 1 - 1/2 | 4 | 8 | US367028 |
| 3/4 | 3/4 | 2 - 1/4 | 5 | 8 | US367030 |

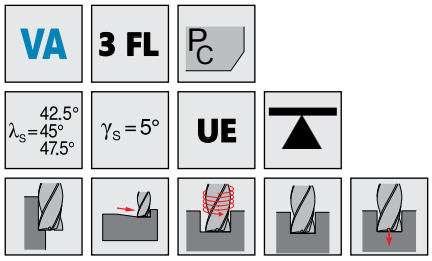
Application Range:

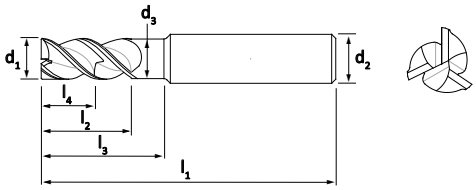
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | | | | | | | | |

Feeds & Speeds Available on Page 39

# Series US340

## 3 Flute Stainless Steel






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 3/4” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 3/4” = +.000/-.002 |
| Protective Corner: | 1/8” - 3/4” = +/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_4$ TCL | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | Flute | AlTiN | nACRo® |
|---|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 3/8 | 0.163 | 2 - 1/4 | 1/2 | 0.120 | 3 | US340002 | US340003 |
| 3/16 | 3/16 | 7/16 | 0.243 | 2 - 1/2 | 11/16 | 0.180 | 3 | US340012 | US340014 |
| 3/16 | 3/16 | 5/8 | 0.243 | 2 - 1/2 | 1 | 0.180 | 3 | US340007 | US340009 |
| 3/16 | 3/16 | 3/8 | 0.206 | 2 - 1/2 | 5/8 | 0.180 | 3 | US340013 | US340015 |
| 3/16 | 3/16 | 5/8 | 0.243 | 2 - 1/2 | | | 3 | US340006 | US340008 |
| 1/4 | 1/4 | 1/2 | 0.325 | 2 - 1/2 | 3/4 | 0.240 | 3 | US340024 | US340026 |
| 1/4 | 1/4 | 3/4 | 0.325 | 2 - 1/2 | 1 | 0.240 | 3 | US340019 | US340021 |
| 1/4 | 1/4 | 3/8 | 0.275 | 2 - 1/2 | 5/8 | 0.240 | 3 | US340025 | US340027 |
| 1/4 | 1/4 | 3/4 | 0.325 | 2 - 1/2 | | | 3 | US340018 | US340020 |
| 5/16 | 5/16 | 3/4 | 0.406 | 2 - 1/2 | 1 | 0.300 | 3 | US340030 | US340032 |
| 5/16 | 5/16 | 1/2 | 0.343 | 2 - 1/2 | 3/4 | 0.300 | 3 | US340035 | US340036 |
| 5/16 | 5/16 | 15/16 | 0.406 | 2 - 1/2 | | | 3 | US340031 | US340033 |
| 3/8 | 3/8 | 7/8 | 0.487 | 2 - 1/2 | 1 - 1/8 | 0.360 | 3 | US340045 | US340047 |
| 3/8 | 3/8 | 1 - 3/16 | 0.487 | 3 | 1 - 1/2 | 0.360 | 3 | US340040 | US340042 |
| 3/8 | 3/8 | 1/2 | 0.412 | 2 - 1/2 | 7/8 | 0.360 | 3 | US340046 | US340048 |
| 3/8 | 3/8 | 1 - 3/16 | 0.487 | 3 | | | 3 | US340039 | US340041 |
| 1/2 | 1/2 | 1 | 0.650 | 3 | 1 - 3/8 | 0.480 | 3 | US340057 | US340059 |
| 1/2 | 1/2 | 1 - 1/2 | 0.650 | 4 | 1 - 7/8 | 0.480 | 3 | US340052 | US340054 |
| 1/2 | 1/2 | 5/8 | 0.550 | 3 | 1 | 0.480 | 3 | US340058 | US340060 |
| 1/2 | 1/2 | 1 - 1/2 | 0.650 | 4 | | | 3 | US340051 | US340053 |
| 5/8 | 5/8 | 1 - 1/4 | 0.812 | 3 - 1/2 | 1 - 5/8 | 0.600 | 3 | US340069 | US340071 |
| 5/8 | 5/8 | 1 - 5/8 | 0.812 | 4 | 2 - 1/4 | 0.600 | 3 | US340064 | US340066 |
| 5/8 | 5/8 | 7/8 | 0.687 | 3 - 1/2 | 1 - 1/4 | 0.600 | 3 | US340070 | US340072 |
| 5/8 | 5/8 | 1 - 5/8 | 0.812 | 4 | | | 3 | US340063 | US340065 |
| 3/4 | 3/4 | 1 - 1/2 | 0.975 | 4 | 1 | 0.720 | 3 | US340081 | US340083 |
| 3/4 | 3/4 | 2 - 3/8 | 0.975 | 6 | 2 - 7/8 | 0.720 | 3 | US340076 | US340078 |
| 3/4 | 3/4 | 1 | 0.825 | 4 | 1 - 1/2 | 0.720 | 3 | US340082 | US340084 |
| 3/4 | 3/4 | 2 - 3/8 | 0.975 | 6 | | | 3 | US340075 | US340077 |

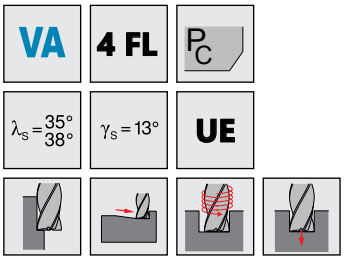
Application Range:

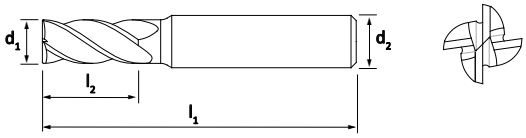
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | ● | ● | ● | ● | | | ● | |

Feeds & Speeds Available on Page 41

# Series US445

## 4 Flute Stainless Steel






**Tolerances**

| | |
|---|---|
| Shank: | 3/16” - 3/4” = -.0001/-.0004 |
| Cutting Dia: | 3/16” - 3/4” = +.000/-.002 |
| Protective Corner: | 3/16” - 3/4” = +/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN | nACRo® |
|---|---|---|---|---|---|---|
| 3/16 | 3/16 | 7/16 | 2 | 4 | US445002 | US445003 |
| 1/4 | 1/4 | 1/2 | 2 - 1/2 | 4 | US445005 | US445006 |
| 5/16 | 5/16 | 3/4 | 2 - 1/2 | 4 | US445008 | US445009 |
| 3/8 | 3/8 | 7/8 | 3 | 4 | US445011 | US445012 |
| 7/16 | 7/16 | 1 | 2 - 3/4 | 4 | US445014 | US445015 |
| 1/2 | 1/2 | 1 | 3 | 4 | US445025 | US445026 |
| 1/2 | 1/2 | 1 - 1/4 | 3 - 1/2 | 4 | US445017 | US445018 |
| 5/8 | 5/8 | 1 - 1/2 | 4 | 4 | US445020 | US445021 |
| 3/4 | 3/4 | 1 - 5/8 | 4 | 4 | US445023 | US445024 |

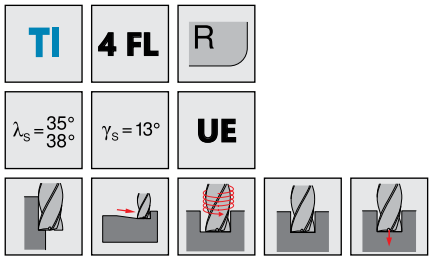
Application Range:

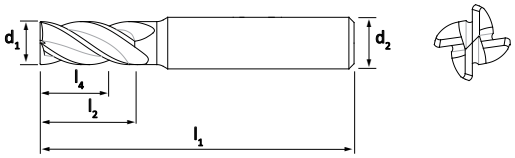
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | | | ● | | | | |

Feeds & Speeds Available on Page 40

# Series US456

## 4 Flute Titanium






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Protective Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_4$ TCL | $l_1$ OAL | R Radius | Flute | nACRo® | ZrN |
|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 3/8 | 0.300 | 1 - 1/2 | 0.004 | 4 | US456002 | US456003 |
| 3/16 | 3/16 | 5/8 | 0.512 | 2 | 0.004 | 4 | US456005 | US456006 |
| 1/4 | 1/4 | 3/4 | 0.600 | 2 - 1/2 | 0.008 | 4 | US456008 | US456009 |
| 1/4 | 1/4 | 3/8 | 0.275 | 2 | 0.008 | 4 | US456011 | US456012 |
| 1/4 | 1/4 | 1 - 1/4 | 1.100 | 3 | 0.008 | 4 | US456014 | US456015 |
| 5/16 | 5/16 | 3/4 | 0.562 | 2 - 1/2 | 0.008 | 4 | US456017 | US456018 |
| 3/8 | 3/8 | 7/8 | 0.650 | 3 | 0.008 | 4 | US456020 | US456021 |
| 3/8 | 3/8 | 5/8 | 0.412 | 2 - 1/2 | 0.008 | 4 | US456023 | US456024 |
| 3/8 | 3/8 | 1 - 1/2 | 1.275 | 4 | 0.008 | 4 | US456026 | US456027 |
| 7/16 | 7/16 | 1 | 0.737 | 2 - 3/4 | 0.008 | 4 | US456029 | US456030 |
| 1/2 | 1/2 | 1 | 0.550 | 3 | 0.012 | 4 | US456055 | US456056 |
| 1/2 | 1/2 | 1 - 1/4 | 0.950 | 3 - 1/2 | 0.012 | 4 | US456032 | US456033 |
| 1/2 | 1/2 | 5/8 | 0.550 | 2 - 1/2 | 0.012 | 4 | US456035 | US456036 |
| 1/2 | 1/2 | 2 | 1.700 | 4 | 0.012 | 4 | US456038 | US456039 |
| 5/8 | 5/8 | 1 - 1/4 | 0.687 | 3 - 1/2 | 0.012 | 4 | US456041 | US456042 |
| 5/8 | 5/8 | 2 - 1/2 | 2.125 | 5 | 0.012 | 4 | US456044 | US456045 |
| 3/4 | 3/4 | 1 - 5/8 | 0.825 | 4 | 0.012 | 4 | US456047 | US456048 |
| 3/4 | 3/4 | 2 - 1/2 | 2.050 | 5 | 0.012 | 4 | US456050 | US456051 |
| 1 | 1 | 1 - 1/2 | 1.100 | 4 | 0.012 | 4 | US456053 | US456054 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ● | ● | | | | | |

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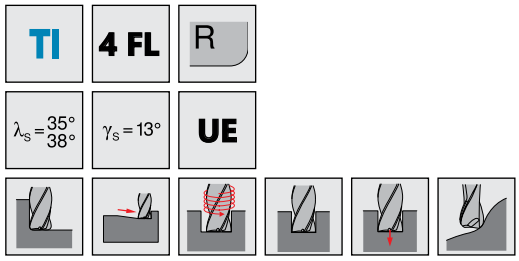
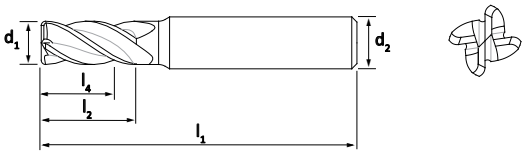
# Series US457

## 4 Flute Titanium Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8" - 1" = -.0001/-.0004 |
| Cutting Dia: | 1/8" - 1" = +.000/-.002 |
| Radius: | Radius < 0.060 = +/-.001 |
| | Radius > 0.060 = +/-.0015 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_4$ TCL | $l_1$ OAL | R Radius | Flute | nACRo® | ZrN |
|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 3/8 | 0.300 | 1 - 1/2 | 0.010 | 4 | US457002 | US457003 |
| 1/8 | 1/8 | 3/8 | 0.300 | 1 - 1/2 | 0.015 | 4 | US457035 | US457036 |
| 1/8 | 1/8 | 3/8 | 0.300 | 1 - 1/2 | 0.020 | 4 | US457071 | US457072 |
| 3/16 | 3/16 | 3/8 | 0.206 | 2 | 0.010 | 4 | US457008 | US457009 |
| 3/16 | 3/16 | 3/8 | 0.206 | 2 | 0.015 | 4 | US457041 | US457042 |
| 3/16 | 3/16 | 3/8 | 0.206 | 2 | 0.020 | 4 | US457077 | US457078 |
| 3/16 | 3/16 | 5/8 | 0.512 | 2 | 0.010 | 4 | US457005 | US457006 |
| 3/16 | 3/16 | 5/8 | 0.512 | 2 | 0.015 | 4 | US457038 | US457039 |
| 3/16 | 3/16 | 5/8 | 0.512 | 2 | 0.020 | 4 | US457074 | US457075 |
| 1/4 | 1/4 | 3/8 | 0.275 | 2 | 0.010 | 4 | US457014 | US457015 |
| 1/4 | 1/4 | 3/8 | 0.275 | 2 | 0.015 | 4 | US457047 | US457048 |
| 1/4 | 1/4 | 3/8 | 0.275 | 2 | 0.020 | 4 | US457083 | US457084 |
| 1/4 | 1/4 | 3/8 | 0.275 | 2 | 0.030 | 4 | US457113 | US457114 |
| 1/4 | 1/4 | 3/4 | 0.600 | 2 - 1/2 | 0.010 | 4 | US457011 | US457012 |
| 1/4 | 1/4 | 3/4 | 0.600 | 2 - 1/2 | 0.015 | 4 | US457044 | US457045 |
| 1/4 | 1/4 | 3/4 | 0.600 | 2 - 1/2 | 0.020 | 4 | US457080 | US457081 |
| 1/4 | 1/4 | 3/4 | 0.600 | 2 - 1/2 | 0.030 | 4 | US457110 | US457111 |
| 1/4 | 1/4 | 1 - 1/4 | 1.100 | 3 | 0.010 | 4 | US457017 | US457018 |
| 1/4 | 1/4 | 1 - 1/4 | 1.100 | 3 | 0.015 | 4 | US457050 | US457051 |
| 1/4 | 1/4 | 1 - 1/4 | 1.100 | 3 | 0.020 | 4 | US457086 | US457087 |
| 1/4 | 1/4 | 1 - 1/4 | 1.100 | 3 | 0.030 | 4 | US457116 | US457117 |
| 5/16 | 5/16 | 3/4 | 0.562 | 2 - 1/2 | 0.015 | 4 | US457053 | US457054 |
| 5/16 | 5/16 | 3/4 | 0.562 | 2 - 1/2 | 0.020 | 4 | US457089 | US457090 |
| 5/16 | 5/16 | 3/4 | 0.562 | 2 - 1/2 | 0.030 | 4 | US457119 | US457120 |
| 3/8 | 3/8 | 5/8 | 0.412 | 2 - 1/2 | 0.010 | 4 | US457023 | US457024 |
| 3/8 | 3/8 | 5/8 | 0.412 | 2 - 1/2 | 0.015 | 4 | US457059 | US457060 |
| 3/8 | 3/8 | 5/8 | 0.412 | 2 - 1/2 | 0.020 | 4 | US457095 | US457096 |
| 3/8 | 3/8 | 5/8 | 0.412 | 2 - 1/2 | 0.030 | 4 | US457125 | US457126 |
| 3/8 | 3/8 | 7/8 | 0.650 | 3 | 0.010 | 4 | US457020 | US457021 |
| 3/8 | 3/8 | 7/8 | 0.650 | 3 | 0.015 | 4 | US457056 | US457057 |
| 3/8 | 3/8 | 7/8 | 0.650 | 3 | 0.020 | 4 | US457092 | US457093 |
| 3/8 | 3/8 | 7/8 | 0.650 | 3 | 0.030 | 4 | US457122 | US457123 |
| 3/8 | 3/8 | 1 - 1/2 | 1.275 | 4 | 0.010 | 4 | US457026 | US457027 |
| 3/8 | 3/8 | 1 - 1/2 | 1.275 | 4 | 0.015 | 4 | US457062 | US457063 |

**Additional Sizes On Page 17**

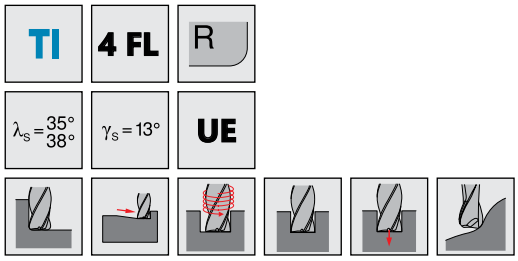
Application Range:

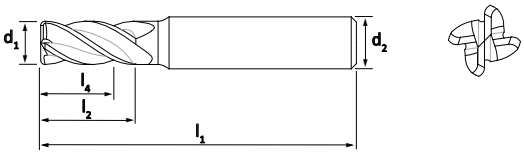
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ● | ● | | | | | |

Feeds & Speeds Available on Page 42

# Series US457

## 4 Flute Titanium Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | Radius < 0.060 = +/-.001 |
| | Radius > 0.060 = +/-.0015 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_4$ TCL | $l_1$ OAL | R Radius | Flute | nACRo® | ZrN |
|---|---|---|---|---|---|---|---|---|
| 3/8 | 3/8 | 1 - 1/2 | 1.275 | 4 | 0.020 | 4 | US457098 | US457099 |
| 3/8 | 3/8 | 1 - 1/2 | 1.275 | 4 | 0.030 | 4 | US457128 | US457129 |
| 7/16 | 7/16 | 1 | 0.737 | 2 - 3/4 | 0.020 | 4 | US457101 | US457102 |
| 1/2 | 1/2 | 5/8 | 0.550 | 2 - 1/2 | 0.010 | 4 | US457032 | US457033 |
| 1/2 | 1/2 | 5/8 | 0.550 | 2 - 1/2 | 0.015 | 4 | US457068 | US457069 |
| 1/2 | 1/2 | 5/8 | 0.550 | 2 - 1/2 | 0.020 | 4 | US457107 | US457108 |
| 1/2 | 1/2 | 5/8 | 0.550 | 2 - 1/2 | 0.030 | 4 | US457134 | US457135 |
| 1/2 | 1/2 | 5/8 | 0.550 | 2 - 1/2 | 0.060 | 4 | US457161 | US457162 |
| 1/2 | 1/2 | 1 | 0.550 | 3 | 0.010 | 4 | US457193 | US457194 |
| 1/2 | 1/2 | 1 | 0.550 | 3 | 0.015 | 4 | US457195 | US457196 |
| 1/2 | 1/2 | 1 | 0.550 | 3 | 0.020 | 4 | US457197 | US457198 |
| 1/2 | 1/2 | 1 | 0.550 | 3 | 0.030 | 4 | US457199 | US457200 |
| 1/2 | 1/2 | 1 | 0.550 | 3 | 0.060 | 4 | US457201 | US457202 |
| 1/2 | 1/2 | 1 - 1/4 | 0.950 | 3 - 1/2 | 0.010 | 4 | US457029 | US457030 |
| 1/2 | 1/2 | 1 - 1/4 | 0.950 | 3 - 1/2 | 0.015 | 4 | US457065 | US457066 |
| 1/2 | 1/2 | 1 - 1/4 | 0.950 | 3 - 1/2 | 0.020 | 4 | US457104 | US457105 |
| 1/2 | 1/2 | 1 - 1/4 | 0.950 | 3 - 1/2 | 0.030 | 4 | US457131 | US457132 |
| 1/2 | 1/2 | 1 - 1/4 | 0.950 | 3 - 1/2 | 0.060 | 4 | US457158 | US457159 |
| 5/8 | 5/8 | 7/8 | 0.687 | 3 | 0.030 | 4 | US457140 | US457141 |
| 5/8 | 5/8 | 7/8 | 0.687 | 3 | 0.060 | 4 | US457167 | US457168 |
| 5/8 | 5/8 | 1 - 1/4 | 0.687 | 3 - 1/2 | 0.030 | 4 | US457137 | US457138 |
| 5/8 | 5/8 | 1 - 1/4 | 0.687 | 3 - 1/2 | 0.060 | 4 | US457164 | US457165 |
| 5/8 | 5/8 | 2 - 1/2 | 2.125 | 5 | 0.030 | 4 | US457143 | US457144 |
| 5/8 | 5/8 | 2 - 1/2 | 2.125 | 5 | 0.060 | 4 | US457170 | US457171 |
| 3/4 | 3/4 | 1 - 5/8 | 0.825 | 4 | 0.030 | 4 | US457146 | US457147 |
| 3/4 | 3/4 | 1 - 5/8 | 0.825 | 4 | 0.060 | 4 | US457173 | US457174 |
| 3/4 | 3/4 | 1 - 5/8 | 0.825 | 4 | 0.125 | 4 | US457185 | US457186 |
| 3/4 | 3/4 | 2 - 1/2 | 2.050 | 5 | 0.030 | 4 | US457149 | US457150 |
| 3/4 | 3/4 | 2 - 1/2 | 2.050 | 5 | 0.060 | 4 | US457176 | US457177 |
| 1 | 1 | 1 - 1/2 | 1.100 | 4 | 0.030 | 4 | US457152 | US457153 |
| 1 | 1 | 1 - 1/2 | 1.100 | 4 | 0.060 | 4 | US457179 | US457180 |
| 1 | 1 | 1 - 1/2 | 1.100 | 4 | 0.125 | 4 | US457188 | US457189 |
| 1 | 1 | 2 - 3/4 | 2.150 | 6 | 0.030 | 4 | US457155 | US457156 |
| 1 | 1 | 2 - 3/4 | 2.150 | 6 | 0.060 | 4 | US457182 | US457183 |
| 1 | 1 | 2 - 3/4 | 2.150 | 6 | 0.125 | 4 | US457191 | US457192 |

**Additional Sizes On Page 16**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ● | ● | | | | | |

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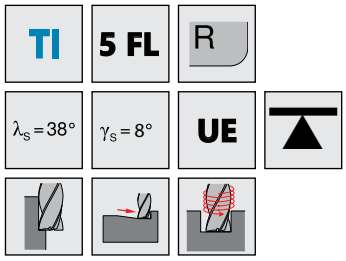
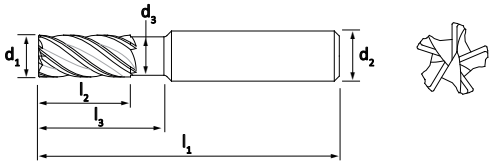
# Series US556

## 5 Flute Titanium






**Tolerances**

Shank: 1/8” - 3/4” = -.0001/-.0004
Cutting Dia: 1/8” - 3/4” = +.000/-.002
Protective Radius: 1/8” - 3/4” = +/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | R Radius | Flute | nACRo® |
|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 3/8 | 2 | 1/2 | 0.120 | 0.004 | 5 | US556002 |
| 3/16 | 3/16 | 7/16 | 2 | 5/8 | 0.180 | 0.004 | 5 | US556004 |
| 1/4 | 1/4 | 1/2 | 2 - 1/2 | 3/4 | 0.240 | 0.008 | 5 | US556006 |
| 5/16 | 5/16 | 3/4 | 2 - 1/2 | 1 | 0.300 | 0.008 | 5 | US556008 |
| 3/8 | 3/8 | 7/8 | 3 | 1 - 1/8 | 0.360 | 0.008 | 5 | US556010 |
| 7/16 | 7/16 | 1 | 2 - 3/4 | 1 - 3/8 | 0.420 | 0.008 | 5 | US556012 |
| 1/2 | 1/2 | 1 | 3 | 1 - 1/4 | 0.480 | 0.012 | 5 | US556019 |
| 1/2 | 1/2 | 1 - 1/4 | 3 - 1/2 | 1 - 1/2 | 0.480 | 0.012 | 5 | US556014 |
| 5/8 | 5/8 | 1 - 1/4 | 3 - 1/2 | 1 - 5/8 | 0.600 | 0.012 | 5 | US556016 |
| 3/4 | 3/4 | 1 - 5/8 | 4 | 2 | 0.720 | 0.012 | 5 | US556018 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | ● | ● | ● | | | | | |

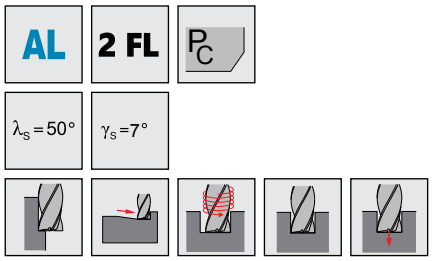
Feeds & Speeds Available on Page 42

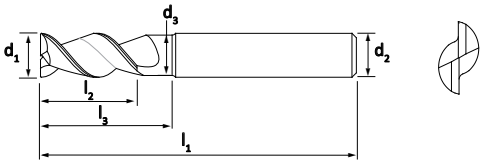


PROMAX Premier

# Series US220

## 2 Flute Aluminum






**Tolerances**

Shank: 1/8” - 3/4” = -.0001/-.0004
Cutting Dia: 1/8” - 3/4” = +.000/-.002
Protective Corner: 1/8” - 3/4” = +/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | Flute | Uncoated |
|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 3/8 | 2 | 3/4 | 0.120 | 2 | US220001 |
| 3/16 | 3/16 | 7/16 | 2 | 3/4 | 0.180 | 2 | US220002 |
| 1/4 | 1/4 | 1/2 | 2 - 1/2 | 13/16 | 0.240 | 2 | US220003 |
| 5/16 | 5/16 | 3/4 | 3 | 1 | 0.300 | 2 | US220004 |
| 3/8 | 3/8 | 7/8 | 3 | 1 - 1/8 | 0.360 | 2 | US220005 |
| 1/2 | 1/2 | 1 | 3 | 1 - 3/8 | 0.480 | 2 | US220009 |
| 1/2 | 1/2 | 1 - 1/4 | 3 - 1/2 | 1 - 5/8 | 0.480 | 2 | US220006 |
| 5/8 | 5/8 | 1 - 1/4 | 4 | 1 - 7/8 | 0.600 | 2 | US220007 |
| 3/4 | 3/4 | 1 - 1/2 | 5 | 2 - 1/4 | 0.720 | 2 | US220008 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ● | ● | ● | |

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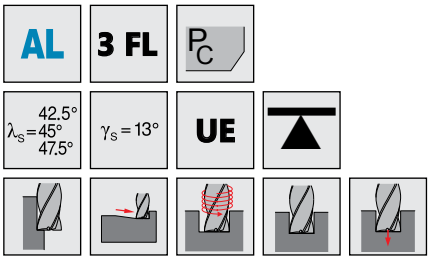
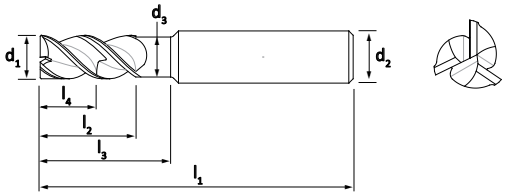
# Series US360

## 3 Flute Aluminum






**Tolerances**

| | |
|---|---|
| Shank: | 1/8" - 3/4" = -.0001/-.0004 |
| Cutting Dia: | 1/8" - 3/4" = +.000/-.002 |
| Protective Corner: | 1/8" - 3/4" = +/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_4$ TCL | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | Flute | Uncoated | ZrN |
|---|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 5/16 | 0.2030 | 2 - 1/4 | 1/2 | 0.120 | 3 | US360001 | US360002 |
| 1/8 | 1/8 | 1/4 | | 3 | 3/4 | 0.120 | 3 | US360003 | US360004 |
| 5/32 | 3/16 | 7/16 | 0.2430 | 2 - 1/2 | 3/4 | 0.150 | 3 | US360005 | US360006 |
| 5/32 | 3/16 | 1/4 | | 3 | 1 | 0.150 | 3 | US360007 | US360008 |
| 3/16 | 3/16 | 1/2 | 0.2480 | 2 - 1/2 | 3/4 | 0.180 | 3 | US360009 | US360010 |
| 3/16 | 3/16 | 5/16 | | 3 | 1 - 1/4 | 0.180 | 3 | US360011 | US360012 |
| 1/4 | 1/4 | 1/2 | 0.3850 | 2 - 1/2 | 3/4 | 0.240 | 3 | US360013 | US360014 |
| 1/4 | 1/4 | 1/2 | 0.3850 | 3 | 1 - 5/8 | 0.240 | 3 | US360017 | US360018 |
| 1/4 | 1/4 | 3/8 | | 3 | 1 - 5/8 | 0.240 | 3 | US360015 | US360016 |
| 5/16 | 5/16 | 3/4 | 0.4660 | 2 - 1/2 | 1 | 0.300 | 3 | US360019 | US360020 |
| 5/16 | 5/16 | 3/4 | 0.4660 | 4 | 2 -1/2 | 0.300 | 3 | US360023 | US360024 |
| 5/16 | 5/16 | 1/2 | | 4 | 2 - 1/2 | 0.300 | 3 | US360021 | US360022 |
| 3/8 | 3/8 | 7/8 | 0.5480 | 3 | 1 - 1/8 | 0.360 | 3 | US360025 | US360026 |
| 3/8 | 3/8 | 7/8 | 0.5480 | 4 | 2 - 1/4 | 0.360 | 3 | US360029 | US360030 |
| 3/8 | 3/8 | 5/8 | | 4 | 2 - 1/4 | 0.360 | 3 | US360027 | US360028 |
| 7/16 | 7/16 | 1 | 0.6290 | 2 - 3/4 | 1 - 1/4 | 0.420 | 3 | US360031 | US360032 |
| 1/2 | 1/2 | 1 | 0.7100 | 3 | 1 - 3/8 | 0.480 | 3 | US360049 | US360050 |
| 1/2 | 1/2 | 1 | 0.7100 | 3 - 1/2 | 1 - 3/8 | 0.480 | 3 | US360033 | US360034 |
| 1/2 | 1/2 | 1 | 0.7100 | 5 | 2 - 7/8 | 0.480 | 3 | US360037 | US360038 |
| 1/2 | 1/2 | 3/4 | | 5 | 2 - 7/8 | 0.480 | 3 | US360035 | US360036 |
| 5/8 | 5/8 | 1 - 1/4 | 0.8730 | 3 - 1/2 | 1 - 5/8 | 0.600 | 3 | US360039 | US360040 |
| 5/8 | 5/8 | 1 - 1/4 | 0.8730 | 6 | 4 | 0.600 | 3 | US360043 | US360044 |
| 5/8 | 5/8 | 1 | | 6 | 4 | 0.600 | 3 | US360041 | US360042 |
| 3/4 | 3/4 | 1 - 5/8 | 1.0350 | 4 | 2-1/8 | 0.720 | 3 | US360045 | US360046 |
| 3/4 | 3/4 | 1 - 1/4 | | 6 | 4 | 0.720 | 3 | US360047 | US360048 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ● | ● | ● | |

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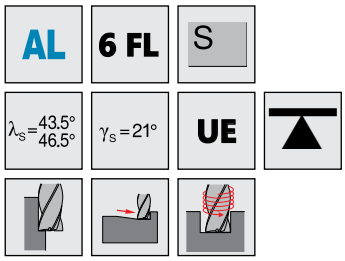
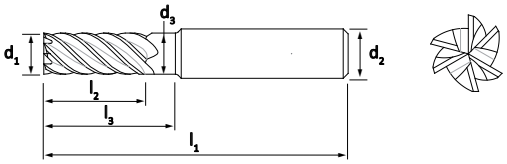
# Series US376

## 6 Flute Aluminum






**Tolerances**

Shank: 1/4" - 1" = -.0001/-.0004

Cutting Dia: 1/4" - 1" = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | Flute | Uncoated | ZrN |
|---|---|---|---|---|---|---|---|---|
| 1/4 | 1/4 | 5/8 | 2 - 1/2 | 7/8 | 0.240 | 6 | US376001 | US376002 |
| 1/4 | 1/4 | 5/8 | 3 | 1 - 5/8 | 0.240 | 6 | US376003 | US376004 |
| 5/16 | 5/16 | 3/4 | 2 - 1/2 | 1 | 0.300 | 6 | US376005 | US376006 |
| 5/16 | 5/16 | 3/4 | 4 | 2 - 3/8 | 0.300 | 6 | US376007 | US376008 |
| 3/8 | 3/8 | 1 | 3 | 1 - 1/4 | 0.360 | 6 | US376009 | US376010 |
| 3/8 | 3/8 | 1 | 4 | 2 - 1/4 | 0.360 | 6 | US376011 | US376012 |
| 1/2 | 1/2 | 1 | 3 | 1 - 1/4 | 0.480 | 6 | US376031 | US376032 |
| 1/2 | 1/2 | 1 - 1/4 | 3 - 1/2 | 1 - 1/2 | 0.480 | 6 | US376013 | US376014 |
| 1/2 | 1/2 | 1 - 1/4 | 5 | 3 | 0.480 | 6 | US376015 | US376016 |
| 1/2 | 1/2 | 1 - 7/8 | 5 | | | 6 | US376017 | US376018 |
| 5/8 | 5/8 | 1 - 1/4 | 3 - 1/2 | 1 - 1/2 | 0.600 | 6 | US376019 | US376020 |
| 5/8 | 5/8 | 1 - 1/4 | 6 | 3 - 5/8 | 0.600 | 6 | US376021 | US376022 |
| 5/8 | 5/8 | 2 - 1/2 | 6 | | | 6 | US376023 | US376024 |
| 3/4 | 3/4 | 1 - 5/8 | 4 | 2 | 0.720 | 6 | US376025 | US376026 |
| 3/4 | 3/4 | 1 - 5/8 | 6 | 3 - 5/8 | 0.720 | 6 | US376027 | US376028 |
| 1 | 1 | 2 | 6 | 3 - 7/8 | 0.960 | 6 | US376029 | US376030 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ● | ● | ● | |

Feeds & Speeds Available on Page 43

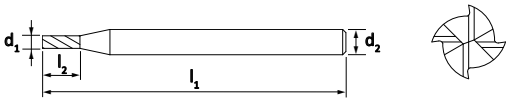
PROMAX Premier

# Series US501

## 4 Flute Micro

UN | 4 FL | S

$\lambda_S = 30°$ | $\gamma_S = 13°$




**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.005 | 1/8 | 0.015 | 1-1/2 | 4 | US501001 |
| 0.006 | 1/8 | 0.018 | 1-1/2 | 4 | US501002 |
| 0.007 | 1/8 | 0.021 | 1-1/2 | 4 | US501003 |
| 0.008 | 1/8 | 0.024 | 1-1/2 | 4 | US501004 |
| 0.009 | 1/8 | 0.027 | 1-1/2 | 4 | US501005 |
| 0.010 | 1/8 | 0.030 | 1-1/2 | 4 | US501006 |
| 0.011 | 1/8 | 0.033 | 1-1/2 | 4 | US501007 |
| 0.012 | 1/8 | 0.036 | 1-1/2 | 4 | US501008 |
| 0.013 | 1/8 | 0.039 | 1-1/2 | 4 | US501009 |
| 0.014 | 1/8 | 0.042 | 1-1/2 | 4 | US501010 |
| 0.015 | 1/8 | 0.045 | 1-1/2 | 4 | US501011 |
| 0.016 | 1/8 | 0.048 | 1-1/2 | 4 | US501012 |
| 0.017 | 1/8 | 0.051 | 1-1/2 | 4 | US501013 |
| 0.018 | 1/8 | 0.054 | 1-1/2 | 4 | US501014 |
| 0.019 | 1/8 | 0.057 | 1-1/2 | 4 | US501015 |
| 0.020 | 1/8 | 0.060 | 1-1/2 | 4 | US501016 |
| 0.021 | 1/8 | 0.063 | 1-1/2 | 4 | US501017 |
| 0.022 | 1/8 | 0.066 | 1-1/2 | 4 | US501018 |
| 0.023 | 1/8 | 0.069 | 1-1/2 | 4 | US501019 |
| 0.024 | 1/8 | 0.072 | 1-1/2 | 4 | US501020 |
| 0.025 | 1/8 | 0.075 | 1-1/2 | 4 | US501021 |
| 0.026 | 1/8 | 0.078 | 1-1/2 | 4 | US501022 |
| 0.027 | 1/8 | 0.081 | 1-1/2 | 4 | US501023 |
| 0.028 | 1/8 | 0.084 | 1-1/2 | 4 | US501024 |
| 0.029 | 1/8 | 0.087 | 1-1/2 | 4 | US501025 |
| 0.030 | 1/8 | 0.090 | 1-1/2 | 4 | US501026 |
| 0.031 | 1/8 | 0.093 | 1-1/2 | 4 | US501027 |
| 0.032 | 1/8 | 0.096 | 1-1/2 | 4 | US501028 |
| 0.033 | 1/8 | 0.099 | 1-1/2 | 4 | US501029 |
| 0.034 | 1/8 | 0.102 | 1-1/2 | 4 | US501030 |
| 0.035 | 1/8 | 0.105 | 1-1/2 | 4 | US501031 |
| 0.036 | 1/8 | 0.108 | 1-1/2 | 4 | US501032 |

**Additional Sizes On Pages 23, 24 & 25**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 44



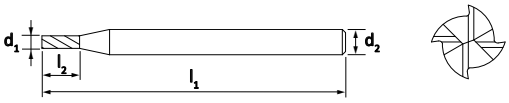
PROMAX Premier

# Series US501

## 4 Flute Micro

UN | 4 FL | S

$\lambda_S = 30°$ | $\gamma_S = 13°$




**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.037 | 1/8 | 0.111 | 1-1/2 | 4 | US501033 |
| 0.038 | 1/8 | 0.114 | 1-1/2 | 4 | US501034 |
| 0.039 | 1/8 | 0.117 | 1-1/2 | 4 | US501035 |
| 0.040 | 1/8 | 0.120 | 1-1/2 | 4 | US501036 |
| 0.041 | 1/8 | 0.123 | 1-1/2 | 4 | US501037 |
| 0.042 | 1/8 | 0.126 | 1-1/2 | 4 | US501038 |
| 0.043 | 1/8 | 0.129 | 1-1/2 | 4 | US501039 |
| 0.044 | 1/8 | 0.132 | 1-1/2 | 4 | US501040 |
| 0.045 | 1/8 | 0.135 | 1-1/2 | 4 | US501041 |
| 0.046 | 1/8 | 0.138 | 1-1/2 | 4 | US501042 |
| 0.047 | 1/8 | 0.141 | 1-1/2 | 4 | US501043 |
| 0.048 | 1/8 | 0.144 | 1-1/2 | 4 | US501044 |
| 0.049 | 1/8 | 0.147 | 1-1/2 | 4 | US501045 |
| 0.050 | 1/8 | 0.150 | 1-1/2 | 4 | US501046 |
| 0.051 | 1/8 | 0.153 | 1-1/2 | 4 | US501047 |
| 0.052 | 1/8 | 0.156 | 1-1/2 | 4 | US501048 |
| 0.053 | 1/8 | 0.159 | 1-1/2 | 4 | US501049 |
| 0.054 | 1/8 | 0.162 | 1-1/2 | 4 | US501050 |
| 0.055 | 1/8 | 0.165 | 1-1/2 | 4 | US501051 |
| 0.056 | 1/8 | 0.168 | 1-1/2 | 4 | US501052 |
| 0.057 | 1/8 | 0.171 | 1-1/2 | 4 | US501053 |
| 0.058 | 1/8 | 0.174 | 1-1/2 | 4 | US501054 |
| 0.059 | 1/8 | 0.177 | 1-1/2 | 4 | US501055 |
| 0.060 | 1/8 | 0.180 | 1-1/2 | 4 | US501056 |
| 0.061 | 1/8 | 0.183 | 1-1/2 | 4 | US501057 |
| 0.062 | 1/8 | 0.186 | 1-1/2 | 4 | US501058 |
| 0.063 | 1/8 | 0.189 | 1-1/2 | 4 | US501059 |
| 0.064 | 1/8 | 0.192 | 1-1/2 | 4 | US501060 |
| 0.065 | 1/8 | 0.195 | 1-1/2 | 4 | US501061 |
| 0.066 | 1/8 | 0.198 | 1-1/2 | 4 | US501062 |
| 0.067 | 1/8 | 0.201 | 1-1/2 | 4 | US501063 |
| 0.068 | 1/8 | 0.204 | 1-1/2 | 4 | US501064 |

**Additional Sizes On Pages 22, 24 & 25**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 44

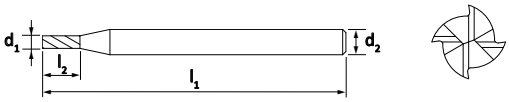
PROMAX Premier

# Series US501

## 4 Flute Micro

UN | 4 FL | S

$\lambda_S = 30°$ | $\gamma_S = 13°$




**Tolerances**

Shank: 1/8" = -.0001/-.0004

Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.069 | 1/8 | 0.207 | 1-1/2 | 4 | US501065 |
| 0.070 | 1/8 | 0.210 | 1-1/2 | 4 | US501066 |
| 0.071 | 1/8 | 0.213 | 1-1/2 | 4 | US501067 |
| 0.072 | 1/8 | 0.216 | 1-1/2 | 4 | US501068 |
| 0.073 | 1/8 | 0.219 | 1-1/2 | 4 | US501069 |
| 0.074 | 1/8 | 0.222 | 1-1/2 | 4 | US501070 |
| 0.075 | 1/8 | 0.225 | 1-1/2 | 4 | US501071 |
| 0.076 | 1/8 | 0.228 | 1-1/2 | 4 | US501072 |
| 0.077 | 1/8 | 0.231 | 1-1/2 | 4 | US501073 |
| 0.078 | 1/8 | 0.234 | 1-1/2 | 4 | US501074 |
| 0.079 | 1/8 | 0.237 | 1-1/2 | 4 | US501075 |
| 0.080 | 1/8 | 0.240 | 1-1/2 | 4 | US501076 |
| 0.081 | 1/8 | 0.243 | 1-1/2 | 4 | US501077 |
| 0.082 | 1/8 | 0.246 | 1-1/2 | 4 | US501078 |
| 0.083 | 1/8 | 0.249 | 1-1/2 | 4 | US501079 |
| 0.084 | 1/8 | 0.252 | 1-1/2 | 4 | US501080 |
| 0.085 | 1/8 | 0.255 | 1-1/2 | 4 | US501081 |
| 0.086 | 1/8 | 0.258 | 1-1/2 | 4 | US501082 |
| 0.087 | 1/8 | 0.261 | 1-1/2 | 4 | US501083 |
| 0.088 | 1/8 | 0.264 | 1-1/2 | 4 | US501084 |
| 0.089 | 1/8 | 0.267 | 1-1/2 | 4 | US501085 |
| 0.090 | 1/8 | 0.270 | 1-1/2 | 4 | US501086 |
| 0.091 | 1/8 | 0.273 | 1-1/2 | 4 | US501087 |
| 0.092 | 1/8 | 0.276 | 1-1/2 | 4 | US501088 |
| 0.093 | 1/8 | 0.279 | 1-1/2 | 4 | US501089 |
| 0.094 | 1/8 | 0.282 | 1-1/2 | 4 | US501090 |
| 0.095 | 1/8 | 0.285 | 1-1/2 | 4 | US501091 |
| 0.096 | 1/8 | 0.288 | 1-1/2 | 4 | US501092 |
| 0.097 | 1/8 | 0.291 | 1-1/2 | 4 | US501093 |
| 0.098 | 1/8 | 0.294 | 1-1/2 | 4 | US501094 |
| 0.099 | 1/8 | 0.297 | 1-1/2 | 4 | US501095 |
| 0.100 | 1/8 | 0.300 | 1-1/2 | 4 | US501096 |

**Additional Sizes On Pages 22, 23 & 25**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 44



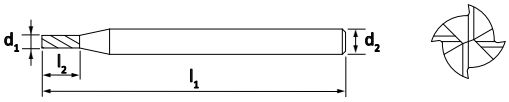
PROMAX Premier

# Series US501

## 4 Flute Micro

UN | 4 FL | S

$\lambda_S = 30°$ | $\gamma_S = 13°$




**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.101 | 1/8 | 0.303 | 1-1/2 | 4 | US501097 |
| 0.102 | 1/8 | 0.306 | 1-1/2 | 4 | US501098 |
| 0.103 | 1/8 | 0.309 | 1-1/2 | 4 | US501099 |
| 0.104 | 1/8 | 0.312 | 1-1/2 | 4 | US501100 |
| 0.105 | 1/8 | 0.315 | 1-1/2 | 4 | US501101 |
| 0.106 | 1/8 | 0.318 | 1-1/2 | 4 | US501102 |
| 0.107 | 1/8 | 0.321 | 1-1/2 | 4 | US501103 |
| 0.108 | 1/8 | 0.324 | 1-1/2 | 4 | US501104 |
| 0.109 | 1/8 | 0.327 | 1-1/2 | 4 | US501105 |
| 0.110 | 1/8 | 0.330 | 1-1/2 | 4 | US501106 |
| 0.111 | 1/8 | 0.333 | 1-1/2 | 4 | US501107 |
| 0.112 | 1/8 | 0.336 | 1-1/2 | 4 | US501108 |
| 0.113 | 1/8 | 0.339 | 1-1/2 | 4 | US501109 |
| 0.114 | 1/8 | 0.341 | 1-1/2 | 4 | US501110 |
| 0.115 | 1/8 | 0.345 | 1-1/2 | 4 | US501111 |
| 0.116 | 1/8 | 0.348 | 1-1/2 | 4 | US501112 |
| 0.117 | 1/8 | 0.351 | 1-1/2 | 4 | US501113 |
| 0.118 | 1/8 | 0.354 | 1-1/2 | 4 | US501114 |
| 0.119 | 1/8 | 0.357 | 1-1/2 | 4 | US501115 |
| 0.120 | 1/8 | 0.360 | 1-1/2 | 4 | US501116 |

**Additional Sizes On Pages 22, 23 & 24**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

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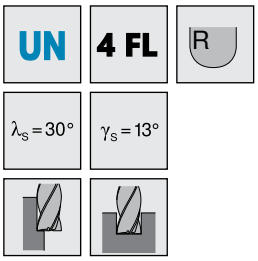
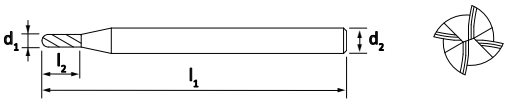
# Series US503

## 4 Flute Micro Ball






**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.005 | 1/8 | 0.015 | 1-1/2 | 4 | US503001 |
| 0.006 | 1/8 | 0.018 | 1-1/2 | 4 | US503002 |
| 0.007 | 1/8 | 0.021 | 1-1/2 | 4 | US503003 |
| 0.008 | 1/8 | 0.024 | 1-1/2 | 4 | US503004 |
| 0.009 | 1/8 | 0.027 | 1-1/2 | 4 | US503005 |
| 0.010 | 1/8 | 0.030 | 1-1/2 | 4 | US503006 |
| 0.011 | 1/8 | 0.033 | 1-1/2 | 4 | US503007 |
| 0.012 | 1/8 | 0.036 | 1-1/2 | 4 | US503008 |
| 0.013 | 1/8 | 0.039 | 1-1/2 | 4 | US503009 |
| 0.014 | 1/8 | 0.042 | 1-1/2 | 4 | US503010 |
| 0.015 | 1/8 | 0.045 | 1-1/2 | 4 | US503011 |
| 0.016 | 1/8 | 0.048 | 1-1/2 | 4 | US503012 |
| 0.017 | 1/8 | 0.051 | 1-1/2 | 4 | US503013 |
| 0.018 | 1/8 | 0.054 | 1-1/2 | 4 | US503014 |
| 0.019 | 1/8 | 0.057 | 1-1/2 | 4 | US503015 |
| 0.020 | 1/8 | 0.060 | 1-1/2 | 4 | US503016 |
| 0.021 | 1/8 | 0.063 | 1-1/2 | 4 | US503017 |
| 0.022 | 1/8 | 0.066 | 1-1/2 | 4 | US503018 |
| 0.023 | 1/8 | 0.069 | 1-1/2 | 4 | US503019 |
| 0.024 | 1/8 | 0.072 | 1-1/2 | 4 | US503020 |
| 0.025 | 1/8 | 0.075 | 1-1/2 | 4 | US503021 |
| 0.026 | 1/8 | 0.078 | 1-1/2 | 4 | US503022 |
| 0.027 | 1/8 | 0.081 | 1-1/2 | 4 | US503023 |
| 0.028 | 1/8 | 0.084 | 1-1/2 | 4 | US503024 |
| 0.029 | 1/8 | 0.087 | 1-1/2 | 4 | US503025 |
| 0.030 | 1/8 | 0.090 | 1-1/2 | 4 | US503026 |
| 0.031 | 1/8 | 0.093 | 1-1/2 | 4 | US503027 |
| 0.032 | 1/8 | 0.096 | 1-1/2 | 4 | US503028 |
| 0.033 | 1/8 | 0.099 | 1-1/2 | 4 | US503029 |
| 0.034 | 1/8 | 0.102 | 1-1/2 | 4 | US503030 |
| 0.035 | 1/8 | 0.105 | 1-1/2 | 4 | US503031 |
| 0.036 | 1/8 | 0.108 | 1-1/2 | 4 | US503032 |
| 0.037 | 1/8 | 0.111 | 1-1/2 | 4 | US503033 |
| 0.038 | 1/8 | 0.114 | 1-1/2 | 4 | US503034 |

**Additional Sizes On Pages 27, 28 & 29**

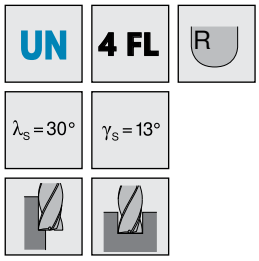
Application Range:

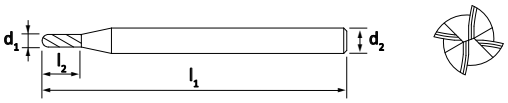
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 44

# Series US503

## 4 Flute Micro Ball






**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.039 | 1/8 | 0.117 | 1-1/2 | 4 | US503035 |
| 0.040 | 1/8 | 0.120 | 1-1/2 | 4 | US503036 |
| 0.041 | 1/8 | 0.123 | 1-1/2 | 4 | US503037 |
| 0.042 | 1/8 | 0.126 | 1-1/2 | 4 | US503038 |
| 0.043 | 1/8 | 0.129 | 1-1/2 | 4 | US503039 |
| 0.044 | 1/8 | 0.132 | 1-1/2 | 4 | US503040 |
| 0.045 | 1/8 | 0.135 | 1-1/2 | 4 | US503041 |
| 0.046 | 1/8 | 0.138 | 1-1/2 | 4 | US503042 |
| 0.047 | 1/8 | 0.141 | 1-1/2 | 4 | US503043 |
| 0.048 | 1/8 | 0.144 | 1-1/2 | 4 | US503044 |
| 0.049 | 1/8 | 0.147 | 1-1/2 | 4 | US503045 |
| 0.050 | 1/8 | 0.150 | 1-1/2 | 4 | US503046 |
| 0.051 | 1/8 | 0.153 | 1-1/2 | 4 | US503047 |
| 0.052 | 1/8 | 0.156 | 1-1/2 | 4 | US503048 |
| 0.053 | 1/8 | 0.159 | 1-1/2 | 4 | US503049 |
| 0.054 | 1/8 | 0.162 | 1-1/2 | 4 | US503050 |
| 0.055 | 1/8 | 0.165 | 1-1/2 | 4 | US503051 |
| 0.056 | 1/8 | 0.168 | 1-1/2 | 4 | US503052 |
| 0.057 | 1/8 | 0.171 | 1-1/2 | 4 | US503053 |
| 0.058 | 1/8 | 0.174 | 1-1/2 | 4 | US503054 |
| 0.059 | 1/8 | 0.177 | 1-1/2 | 4 | US503055 |
| 0.060 | 1/8 | 0.180 | 1-1/2 | 4 | US503056 |
| 0.061 | 1/8 | 0.183 | 1-1/2 | 4 | US503057 |
| 0.062 | 1/8 | 0.186 | 1-1/2 | 4 | US503058 |
| 0.063 | 1/8 | 0.189 | 1-1/2 | 4 | US503059 |
| 0.064 | 1/8 | 0.192 | 1-1/2 | 4 | US503060 |
| 0.065 | 1/8 | 0.195 | 1-1/2 | 4 | US503061 |
| 0.066 | 1/8 | 0.198 | 1-1/2 | 4 | US503062 |
| 0.067 | 1/8 | 0.201 | 1-1/2 | 4 | US503063 |
| 0.068 | 1/8 | 0.204 | 1-1/2 | 4 | US503064 |
| 0.069 | 1/8 | 0.207 | 1-1/2 | 4 | US503065 |
| 0.070 | 1/8 | 0.210 | 1-1/2 | 4 | US503066 |

**Additional Sizes On Pages 26, 28 & 29**

Application Range:

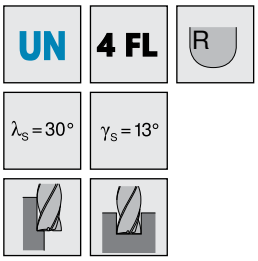
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

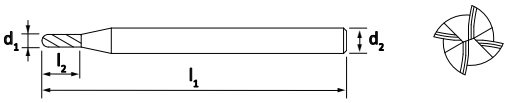
Feeds & Speeds Available on Page 44

PROMAX Premier

# Series US503

## 4 Flute Micro Ball






**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.071 | 1/8 | 0.213 | 1-1/2 | 4 | US503067 |
| 0.072 | 1/8 | 0.216 | 1-1/2 | 4 | US503068 |
| 0.073 | 1/8 | 0.219 | 1-1/2 | 4 | US503069 |
| 0.074 | 1/8 | 0.222 | 1-1/2 | 4 | US503070 |
| 0.075 | 1/8 | 0.225 | 1-1/2 | 4 | US503071 |
| 0.076 | 1/8 | 0.228 | 1-1/2 | 4 | US503072 |
| 0.077 | 1/8 | 0.231 | 1-1/2 | 4 | US503073 |
| 0.078 | 1/8 | 0.234 | 1-1/2 | 4 | US503074 |
| 0.079 | 1/8 | 0.237 | 1-1/2 | 4 | US503075 |
| 0.080 | 1/8 | 0.240 | 1-1/2 | 4 | US503076 |
| 0.081 | 1/8 | 0.243 | 1-1/2 | 4 | US503077 |
| 0.082 | 1/8 | 0.246 | 1-1/2 | 4 | US503078 |
| 0.083 | 1/8 | 0.249 | 1-1/2 | 4 | US503079 |
| 0.084 | 1/8 | 0.252 | 1-1/2 | 4 | US503080 |
| 0.085 | 1/8 | 0.255 | 1-1/2 | 4 | US503081 |
| 0.086 | 1/8 | 0.258 | 1-1/2 | 4 | US503082 |
| 0.087 | 1/8 | 0.261 | 1-1/2 | 4 | US503083 |
| 0.088 | 1/8 | 0.264 | 1-1/2 | 4 | US503084 |
| 0.089 | 1/8 | 0.267 | 1-1/2 | 4 | US503085 |
| 0.090 | 1/8 | 0.270 | 1-1/2 | 4 | US503086 |
| 0.091 | 1/8 | 0.273 | 1-1/2 | 4 | US503087 |
| 0.092 | 1/8 | 0.276 | 1-1/2 | 4 | US503088 |
| 0.093 | 1/8 | 0.279 | 1-1/2 | 4 | US503089 |
| 0.094 | 1/8 | 0.282 | 1-1/2 | 4 | US503090 |
| 0.095 | 1/8 | 0.285 | 1-1/2 | 4 | US503091 |
| 0.096 | 1/8 | 0.288 | 1-1/2 | 4 | US503092 |
| 0.097 | 1/8 | 0.291 | 1-1/2 | 4 | US503093 |
| 0.098 | 1/8 | 0.294 | 1-1/2 | 4 | US503094 |
| 0.099 | 1/8 | 0.297 | 1-1/2 | 4 | US503095 |
| 0.100 | 1/8 | 0.300 | 1-1/2 | 4 | US503096 |
| 0.101 | 1/8 | 0.303 | 1-1/2 | 4 | US503097 |
| 0.102 | 1/8 | 0.306 | 1-1/2 | 4 | US503098 |

**Additional Sizes On Pages 26, 27 & 29**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

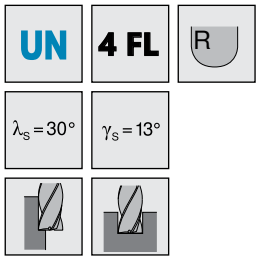
Feeds & Speeds Available on Page 44

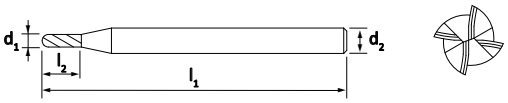


PROMAX Premier

# Series US503

## 4 Flute Micro Ball






**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.103 | 1/8 | 0.309 | 1-1/2 | 4 | US503099 |
| 0.104 | 1/8 | 0.312 | 1-1/2 | 4 | US503100 |
| 0.105 | 1/8 | 0.315 | 1-1/2 | 4 | US503101 |
| 0.106 | 1/8 | 0.318 | 1-1/2 | 4 | US503102 |
| 0.107 | 1/8 | 0.321 | 1-1/2 | 4 | US503103 |
| 0.108 | 1/8 | 0.324 | 1-1/2 | 4 | US503104 |
| 0.109 | 1/8 | 0.327 | 1-1/2 | 4 | US503105 |
| 0.110 | 1/8 | 0.330 | 1-1/2 | 4 | US503106 |
| 0.111 | 1/8 | 0.333 | 1-1/2 | 4 | US503107 |
| 0.112 | 1/8 | 0.336 | 1-1/2 | 4 | US503108 |
| 0.113 | 1/8 | 0.339 | 1-1/2 | 4 | US503109 |
| 0.114 | 1/8 | 0.341 | 1-1/2 | 4 | US503110 |
| 0.115 | 1/8 | 0.345 | 1-1/2 | 4 | US503111 |
| 0.116 | 1/8 | 0.348 | 1-1/2 | 4 | US503112 |
| 0.117 | 1/8 | 0.351 | 1-1/2 | 4 | US503113 |
| 0.118 | 1/8 | 0.354 | 1-1/2 | 4 | US503114 |
| 0.119 | 1/8 | 0.357 | 1-1/2 | 4 | US503115 |
| 0.120 | 1/8 | 0.360 | 1-1/2 | 4 | US503116 |

**Additional Sizes On Pages 26, 27 & 28**

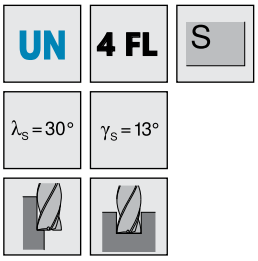
Application Range:

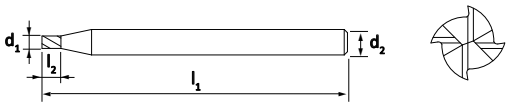
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 44

# Series US504

## 4 Flute Micro Stub






**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.005 | 1/8 | 0.008 | 1-1/2 | 4 | US504001 |
| 0.006 | 1/8 | 0.009 | 1-1/2 | 4 | US504002 |
| 0.007 | 1/8 | 0.011 | 1-1/2 | 4 | US504003 |
| 0.008 | 1/8 | 0.012 | 1-1/2 | 4 | US504004 |
| 0.009 | 1/8 | 0.014 | 1-1/2 | 4 | US504005 |
| 0.010 | 1/8 | 0.015 | 1-1/2 | 4 | US504006 |
| 0.011 | 1/8 | 0.017 | 1-1/2 | 4 | US504007 |
| 0.012 | 1/8 | 0.018 | 1-1/2 | 4 | US504008 |
| 0.013 | 1/8 | 0.020 | 1-1/2 | 4 | US504009 |
| 0.014 | 1/8 | 0.021 | 1-1/2 | 4 | US504010 |
| 0.015 | 1/8 | 0.023 | 1-1/2 | 4 | US504011 |
| 0.016 | 1/8 | 0.024 | 1-1/2 | 4 | US504012 |
| 0.017 | 1/8 | 0.026 | 1-1/2 | 4 | US504013 |
| 0.018 | 1/8 | 0.027 | 1-1/2 | 4 | US504014 |
| 0.019 | 1/8 | 0.029 | 1-1/2 | 4 | US504015 |
| 0.020 | 1/8 | 0.030 | 1-1/2 | 4 | US504016 |
| 0.021 | 1/8 | 0.032 | 1-1/2 | 4 | US504017 |
| 0.022 | 1/8 | 0.033 | 1-1/2 | 4 | US504018 |
| 0.023 | 1/8 | 0.035 | 1-1/2 | 4 | US504019 |
| 0.024 | 1/8 | 0.036 | 1-1/2 | 4 | US504020 |
| 0.025 | 1/8 | 0.038 | 1-1/2 | 4 | US504021 |
| 0.026 | 1/8 | 0.039 | 1-1/2 | 4 | US504022 |
| 0.027 | 1/8 | 0.041 | 1-1/2 | 4 | US504023 |
| 0.028 | 1/8 | 0.042 | 1-1/2 | 4 | US504024 |
| 0.029 | 1/8 | 0.044 | 1-1/2 | 4 | US504025 |
| 0.03 | 1/8 | 0.045 | 1-1/2 | 4 | US504026 |
| 0.031 | 1/8 | 0.047 | 1-1/2 | 4 | US504027 |
| 0.032 | 1/8 | 0.048 | 1-1/2 | 4 | US504028 |
| 0.033 | 1/8 | 0.050 | 1-1/2 | 4 | US504029 |
| 0.034 | 1/8 | 0.051 | 1-1/2 | 4 | US504030 |
| 0.035 | 1/8 | 0.053 | 1-1/2 | 4 | US504031 |
| 0.036 | 1/8 | 0.054 | 1-1/2 | 4 | US504032 |

**Additional Sizes On Pages 31 & 32**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

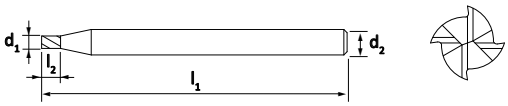
Feeds & Speeds Available on Page 45

# Series US504

## 4 Flute Micro Stub

UN | 4 FL | S

$\lambda_S = 30°$ | $\gamma_S = 13°$




**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.037 | 1/8 | 0.056 | 1-1/2 | 4 | US504033 |
| 0.038 | 1/8 | 0.057 | 1-1/2 | 4 | US504034 |
| 0.039 | 1/8 | 0.059 | 1-1/2 | 4 | US504035 |
| 0.040 | 1/8 | 0.060 | 1-1/2 | 4 | US504036 |
| 0.041 | 1/8 | 0.062 | 1-1/2 | 4 | US504037 |
| 0.042 | 1/8 | 0.063 | 1-1/2 | 4 | US504038 |
| 0.043 | 1/8 | 0.065 | 1-1/2 | 4 | US504039 |
| 0.044 | 1/8 | 0.066 | 1-1/2 | 4 | US504040 |
| 0.045 | 1/8 | 0.068 | 1-1/2 | 4 | US504041 |
| 0.046 | 1/8 | 0.069 | 1-1/2 | 4 | US504042 |
| 0.047 | 1/8 | 0.071 | 1-1/2 | 4 | US504043 |
| 0.048 | 1/8 | 0.072 | 1-1/2 | 4 | US504044 |
| 0.049 | 1/8 | 0.074 | 1-1/2 | 4 | US504045 |
| 0.050 | 1/8 | 0.075 | 1-1/2 | 4 | US504046 |
| 0.051 | 1/8 | 0.077 | 1-1/2 | 4 | US504047 |
| 0.052 | 1/8 | 0.078 | 1-1/2 | 4 | US504048 |
| 0.053 | 1/8 | 0.080 | 1-1/2 | 4 | US504049 |
| 0.054 | 1/8 | 0.081 | 1-1/2 | 4 | US504050 |
| 0.055 | 1/8 | 0.083 | 1-1/2 | 4 | US504051 |
| 0.056 | 1/8 | 0.084 | 1-1/2 | 4 | US504052 |
| 0.057 | 1/8 | 0.086 | 1-1/2 | 4 | US504053 |
| 0.058 | 1/8 | 0.087 | 1-1/2 | 4 | US504054 |
| 0.059 | 1/8 | 0.089 | 1-1/2 | 4 | US504055 |
| 0.060 | 1/8 | 0.090 | 1-1/2 | 4 | US504056 |
| 0.061 | 1/8 | 0.092 | 1-1/2 | 4 | US504057 |
| 0.062 | 1/8 | 0.093 | 1-1/2 | 4 | US504058 |
| 0.063 | 1/8 | 0.095 | 1-1/2 | 4 | US504059 |
| 0.064 | 1/8 | 0.096 | 1-1/2 | 4 | US504060 |
| 0.065 | 1/8 | 0.098 | 1-1/2 | 4 | US504061 |
| 0.066 | 1/8 | 0.099 | 1-1/2 | 4 | US504062 |
| 0.067 | 1/8 | 0.101 | 1-1/2 | 4 | US504063 |
| 0.068 | 1/8 | 0.102 | 1-1/2 | 4 | US504064 |

**Additional Sizes On Pages 30 & 32**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

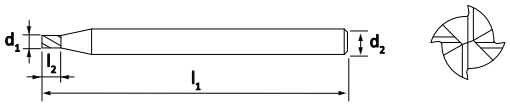
Feeds & Speeds Available on Page 45

# Series US504

## 4 Flute Micro Stub

UN | 4 FL | S

$\lambda_S = 30°$ | $\gamma_S = 13°$




**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.069 | 1/8 | 0.104 | 1-1/2 | 4 | US504065 |
| 0.070 | 1/8 | 0.105 | 1-1/2 | 4 | US504066 |
| 0.071 | 1/8 | 0.107 | 1-1/2 | 4 | US504067 |
| 0.072 | 1/8 | 0.108 | 1-1/2 | 4 | US504068 |
| 0.073 | 1/8 | 0.110 | 1-1/2 | 4 | US504069 |
| 0.074 | 1/8 | 0.111 | 1-1/2 | 4 | US504070 |
| 0.075 | 1/8 | 0.113 | 1-1/2 | 4 | US504071 |
| 0.076 | 1/8 | 0.114 | 1-1/2 | 4 | US504072 |
| 0.077 | 1/8 | 0.116 | 1-1/2 | 4 | US504073 |
| 0.078 | 1/8 | 0.117 | 1-1/2 | 4 | US504074 |
| 0.079 | 1/8 | 0.119 | 1-1/2 | 4 | US504075 |
| 0.080 | 1/8 | 0.120 | 1-1/2 | 4 | US504076 |
| 0.081 | 1/8 | 0.122 | 1-1/2 | 4 | US504077 |
| 0.082 | 1/8 | 0.123 | 1-1/2 | 4 | US504078 |
| 0.083 | 1/8 | 0.125 | 1-1/2 | 4 | US504079 |
| 0.084 | 1/8 | 0.126 | 1-1/2 | 4 | US504080 |
| 0.085 | 1/8 | 0.128 | 1-1/2 | 4 | US504081 |
| 0.086 | 1/8 | 0.129 | 1-1/2 | 4 | US504082 |
| 0.087 | 1/8 | 0.131 | 1-1/2 | 4 | US504083 |
| 0.088 | 1/8 | 0.132 | 1-1/2 | 4 | US504084 |
| 0.089 | 1/8 | 0.134 | 1-1/2 | 4 | US504085 |
| 0.090 | 1/8 | 0.135 | 1-1/2 | 4 | US504086 |

**Additional Sizes On Pages 30 & 31**

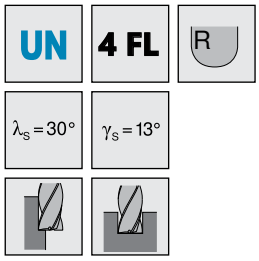
Application Range:

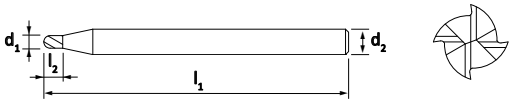
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 45

# Series US506

## 4 Flute Micro Stub Ball






**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.005 | 1/8 | 0.008 | 1-1/2 | 4 | US506001 |
| 0.006 | 1/8 | 0.009 | 1-1/2 | 4 | US506002 |
| 0.007 | 1/8 | 0.011 | 1-1/2 | 4 | US506003 |
| 0.008 | 1/8 | 0.012 | 1-1/2 | 4 | US506004 |
| 0.009 | 1/8 | 0.014 | 1-1/2 | 4 | US506005 |
| 0.010 | 1/8 | 0.015 | 1-1/2 | 4 | US506006 |
| 0.011 | 1/8 | 0.017 | 1-1/2 | 4 | US506007 |
| 0.012 | 1/8 | 0.018 | 1-1/2 | 4 | US506008 |
| 0.013 | 1/8 | 0.020 | 1-1/2 | 4 | US506009 |
| 0.014 | 1/8 | 0.021 | 1-1/2 | 4 | US506010 |
| 0.015 | 1/8 | 0.023 | 1-1/2 | 4 | US506011 |
| 0.016 | 1/8 | 0.024 | 1-1/2 | 4 | US506012 |
| 0.017 | 1/8 | 0.026 | 1-1/2 | 4 | US506013 |
| 0.018 | 1/8 | 0.027 | 1-1/2 | 4 | US506014 |
| 0.019 | 1/8 | 0.029 | 1-1/2 | 4 | US506015 |
| 0.020 | 1/8 | 0.030 | 1-1/2 | 4 | US506016 |
| 0.021 | 1/8 | 0.032 | 1-1/2 | 4 | US506017 |
| 0.022 | 1/8 | 0.033 | 1-1/2 | 4 | US506018 |
| 0.023 | 1/8 | 0.035 | 1-1/2 | 4 | US506019 |
| 0.024 | 1/8 | 0.036 | 1-1/2 | 4 | US506020 |
| 0.025 | 1/8 | 0.038 | 1-1/2 | 4 | US506021 |
| 0.026 | 1/8 | 0.039 | 1-1/2 | 4 | US506022 |
| 0.027 | 1/8 | 0.041 | 1-1/2 | 4 | US506023 |
| 0.028 | 1/8 | 0.042 | 1-1/2 | 4 | US506024 |
| 0.029 | 1/8 | 0.044 | 1-1/2 | 4 | US506025 |
| 0.030 | 1/8 | 0.045 | 1-1/2 | 4 | US506026 |
| 0.031 | 1/8 | 0.047 | 1-1/2 | 4 | US506027 |
| 0.032 | 1/8 | 0.048 | 1-1/2 | 4 | US506028 |
| 0.033 | 1/8 | 0.050 | 1-1/2 | 4 | US506029 |
| 0.034 | 1/8 | 0.051 | 1-1/2 | 4 | US506030 |
| 0.035 | 1/8 | 0.053 | 1-1/2 | 4 | US506031 |
| 0.036 | 1/8 | 0.054 | 1-1/2 | 4 | US506032 |

**Additional Sizes On Pages 34, 35 & 36**

Application Range:

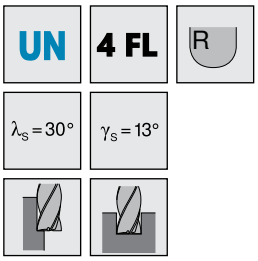
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

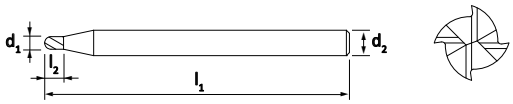
Feeds & Speeds Available on Page 45

PROMAX Premier

# Series US506

## 4 Flute Micro Stub Ball






**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.037 | 1/8 | 0.056 | 1-1/2 | 4 | US506033 |
| 0.038 | 1/8 | 0.057 | 1-1/2 | 4 | US506034 |
| 0.039 | 1/8 | 0.059 | 1-1/2 | 4 | US506035 |
| 0.040 | 1/8 | 0.060 | 1-1/2 | 4 | US506036 |
| 0.041 | 1/8 | 0.062 | 1-1/2 | 4 | US506037 |
| 0.042 | 1/8 | 0.063 | 1-1/2 | 4 | US506038 |
| 0.043 | 1/8 | 0.065 | 1-1/2 | 4 | US506039 |
| 0.044 | 1/8 | 0.066 | 1-1/2 | 4 | US506040 |
| 0.045 | 1/8 | 0.068 | 1-1/2 | 4 | US506041 |
| 0.046 | 1/8 | 0.069 | 1-1/2 | 4 | US506042 |
| 0.047 | 1/8 | 0.071 | 1-1/2 | 4 | US506043 |
| 0.048 | 1/8 | 0.072 | 1-1/2 | 4 | US506044 |
| 0.049 | 1/8 | 0.074 | 1-1/2 | 4 | US506045 |
| 0.050 | 1/8 | 0.075 | 1-1/2 | 4 | US506046 |
| 0.051 | 1/8 | 0.077 | 1-1/2 | 4 | US506047 |
| 0.052 | 1/8 | 0.078 | 1-1/2 | 4 | US506048 |
| 0.053 | 1/8 | 0.080 | 1-1/2 | 4 | US506049 |
| 0.054 | 1/8 | 0.081 | 1-1/2 | 4 | US506050 |
| 0.055 | 1/8 | 0.083 | 1-1/2 | 4 | US506051 |
| 0.056 | 1/8 | 0.084 | 1-1/2 | 4 | US506052 |
| 0.057 | 1/8 | 0.086 | 1-1/2 | 4 | US506053 |
| 0.058 | 1/8 | 0.087 | 1-1/2 | 4 | US506054 |
| 0.059 | 1/8 | 0.089 | 1-1/2 | 4 | US506055 |
| 0.060 | 1/8 | 0.090 | 1-1/2 | 4 | US506056 |
| 0.061 | 1/8 | 0.092 | 1-1/2 | 4 | US506057 |
| 0.062 | 1/8 | 0.093 | 1-1/2 | 4 | US506058 |
| 0.063 | 1/8 | 0.095 | 1-1/2 | 4 | US506059 |
| 0.064 | 1/8 | 0.096 | 1-1/2 | 4 | US506060 |
| 0.065 | 1/8 | 0.098 | 1-1/2 | 4 | US506061 |
| 0.066 | 1/8 | 0.099 | 1-1/2 | 4 | US506062 |
| 0.067 | 1/8 | 0.101 | 1-1/2 | 4 | US506063 |
| 0.068 | 1/8 | 0.102 | 1-1/2 | 4 | US506064 |

**Additional Sizes On Pages 33, 35 & 36**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

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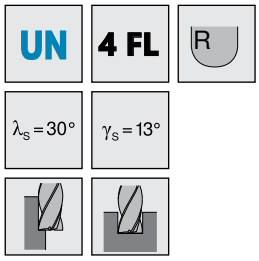
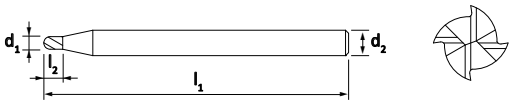
PROMAX Premier

# Series US506

## 4 Flute Micro Stub Ball






**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.069 | 1/8 | 0.104 | 1-1/2 | 4 | US506065 |
| 0.070 | 1/8 | 0.105 | 1-1/2 | 4 | US506066 |
| 0.071 | 1/8 | 0.107 | 1-1/2 | 4 | US506067 |
| 0.072 | 1/8 | 0.108 | 1-1/2 | 4 | US506068 |
| 0.073 | 1/8 | 0.110 | 1-1/2 | 4 | US506069 |
| 0.074 | 1/8 | 0.111 | 1-1/2 | 4 | US506070 |
| 0.075 | 1/8 | 0.113 | 1-1/2 | 4 | US506071 |
| 0.076 | 1/8 | 0.114 | 1-1/2 | 4 | US506072 |
| 0.077 | 1/8 | 0.116 | 1-1/2 | 4 | US506073 |
| 0.078 | 1/8 | 0.117 | 1-1/2 | 4 | US506074 |
| 0.079 | 1/8 | 0.119 | 1-1/2 | 4 | US506075 |
| 0.080 | 1/8 | 0.120 | 1-1/2 | 4 | US506076 |
| 0.081 | 1/8 | 0.122 | 1-1/2 | 4 | US506077 |
| 0.082 | 1/8 | 0.123 | 1-1/2 | 4 | US506078 |
| 0.083 | 1/8 | 0.125 | 1-1/2 | 4 | US506079 |
| 0.084 | 1/8 | 0.126 | 1-1/2 | 4 | US506080 |
| 0.085 | 1/8 | 0.128 | 1-1/2 | 4 | US506081 |
| 0.086 | 1/8 | 0.129 | 1-1/2 | 4 | US506082 |
| 0.087 | 1/8 | 0.131 | 1-1/2 | 4 | US506083 |
| 0.088 | 1/8 | 0.132 | 1-1/2 | 4 | US506084 |
| 0.089 | 1/8 | 0.134 | 1-1/2 | 4 | US506085 |
| 0.090 | 1/8 | 0.135 | 1-1/2 | 4 | US506086 |
| 0.091 | 1/8 | 0.137 | 1-1/2 | 4 | US506087 |
| 0.092 | 1/8 | 0.138 | 1-1/2 | 4 | US506088 |
| 0.093 | 1/8 | 0.140 | 1-1/2 | 4 | US506089 |
| 0.094 | 1/8 | 0.141 | 1-1/2 | 4 | US506090 |
| 0.095 | 1/8 | 0.143 | 1-1/2 | 4 | US506091 |
| 0.096 | 1/8 | 0.144 | 1-1/2 | 4 | US506092 |
| 0.097 | 1/8 | 0.146 | 1-1/2 | 4 | US506093 |
| 0.098 | 1/8 | 0.147 | 1-1/2 | 4 | US506094 |
| 0.099 | 1/8 | 0.149 | 1-1/2 | 4 | US506095 |
| 0.100 | 1/8 | 0.150 | 1-1/2 | 4 | US506096 |

**Additional Sizes On Pages 33, 34 & 36**

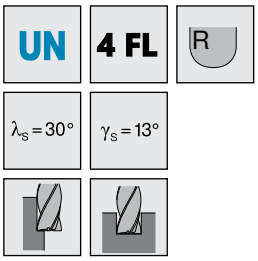
Application Range:

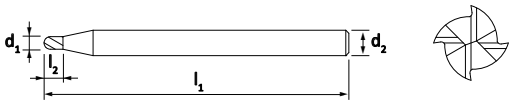
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 45

# Series US506

## 4 Flute Micro Stub Ball






**Tolerances**

Shank: 1/8" = -.0001/-.0004
Cutting Dia: 1/8" = +/-.0005

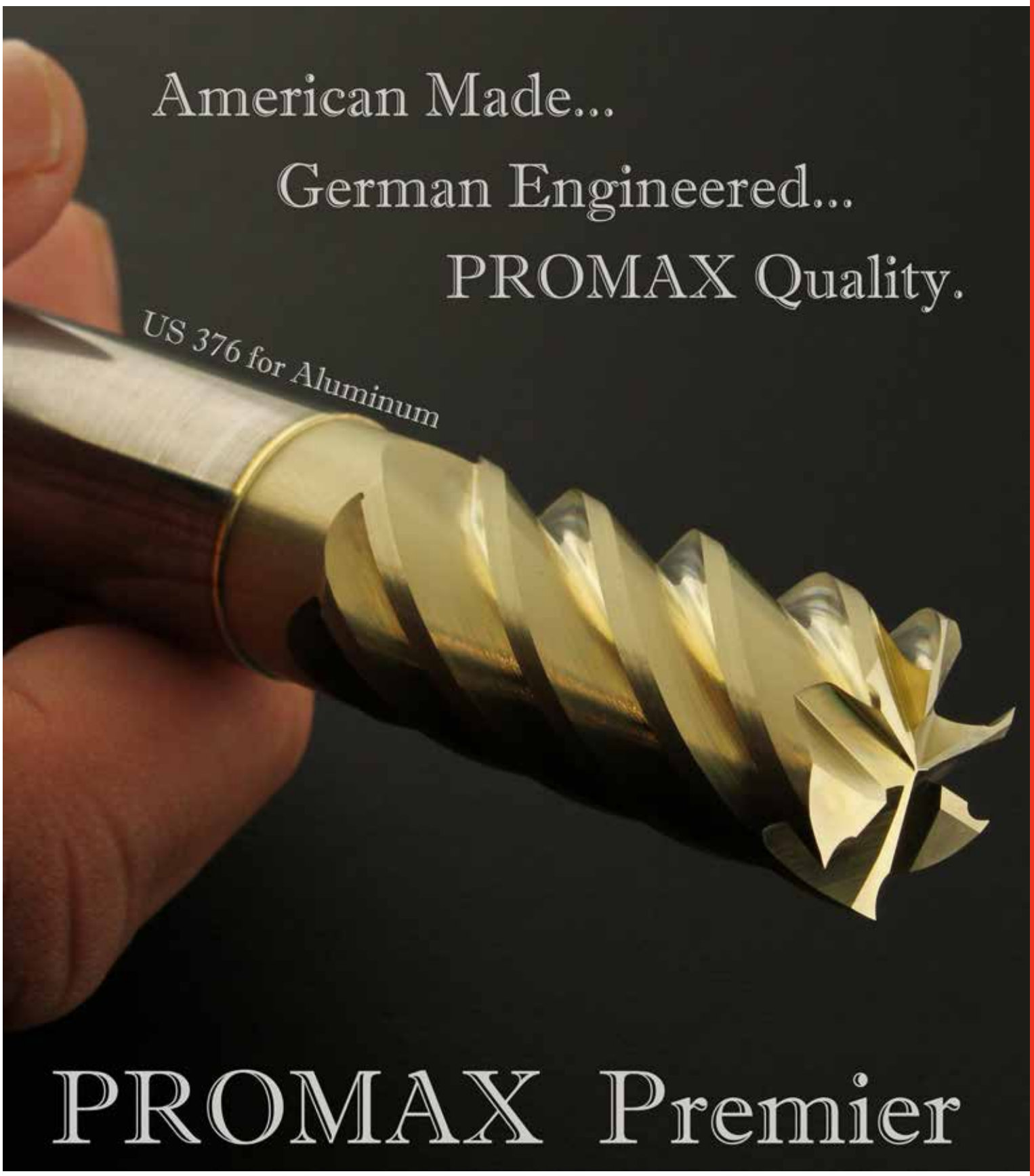
| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flute | AlTiN |
|---|---|---|---|---|---|
| 0.101 | 1/8 | 0.152 | 1-1/2 | 4 | US506097 |
| 0.102 | 1/8 | 0.153 | 1-1/2 | 4 | US506098 |
| 0.103 | 1/8 | 0.155 | 1-1/2 | 4 | US506099 |
| 0.104 | 1/8 | 0.156 | 1-1/2 | 4 | US506100 |
| 0.105 | 1/8 | 0.158 | 1-1/2 | 4 | US506101 |
| 0.106 | 1/8 | 0.159 | 1-1/2 | 4 | US506102 |
| 0.107 | 1/8 | 0.161 | 1-1/2 | 4 | US506103 |
| 0.108 | 1/8 | 0.162 | 1-1/2 | 4 | US506104 |
| 0.109 | 1/8 | 0.164 | 1-1/2 | 4 | US506105 |
| 0.110 | 1/8 | 0.165 | 1-1/2 | 4 | US506106 |
| 0.111 | 1/8 | 0.167 | 1-1/2 | 4 | US506107 |
| 0.112 | 1/8 | 0.168 | 1-1/2 | 4 | US506108 |
| 0.113 | 1/8 | 0.170 | 1-1/2 | 4 | US506109 |
| 0.114 | 1/8 | 0.171 | 1-1/2 | 4 | US506110 |
| 0.115 | 1/8 | 0.173 | 1-1/2 | 4 | US506111 |
| 0.116 | 1/8 | 0.174 | 1-1/2 | 4 | US506112 |
| 0.117 | 1/8 | 0.176 | 1-1/2 | 4 | US506113 |
| 0.118 | 1/8 | 0.177 | 1-1/2 | 4 | US506114 |
| 0.119 | 1/8 | 0.179 | 1-1/2 | 4 | US506115 |
| 0.120 | 1/8 | 0.180 | 1-1/2 | 4 | US506116 |

**Additional Sizes On Pages 33, 34 & 35**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 45


American Made...
German Engineered...
PROMAX Quality.
US 376 for Aluminum
PROMAX Premier

PROMAX Premier

## Universal - US451

| Material Designation | | SFM [ft/min] | ae max [inch] | ap max [inch] | Chip Load Per Tooth [Inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 853 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | > 500 N/mm² | 787 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Construction Steel | Non-Alloy < 500 N/mm² | 820 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Non-Alloy > 500 N/mm² | 755 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloy | 722 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Cementation Steel | < 150 HB | 689 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | 150-200 HB | 656 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | > 200 HB | 623 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| Nitriding Steel | < 1000 N/mm² | 623 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | > 1000 N/mm² | 558 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 656 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Non-Alloy 800-1000 N/mm² | 623 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloy < 800 N/mm² | 623 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloy 800-1000 N/mm² | 591 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloy 1000-1300 N/mm² | 558 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | Alloy 1300-1600 N/mm² | 492 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| Non-Alloy Tool Steel | General | 607 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 591 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Low Alloy < 1200 N/mm² | 558 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Low Alloy < 1500 N/mm² | 492 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | High Alloy Annealed < 1000 N/mm² | 525 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | High Alloy Hardened < 1300 N/mm² | 459 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Tool Steel for Warm Processing | Low Alloy < 1200 N/mm² | 656 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Low Alloy < 1500 N/mm² | 591 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | High Alloy Annealed < 1000 N/mm² | 492 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | High Alloy Hardened < 1300 N/mm² | 459 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | High Alloy Hardened < 1600 N/mm² | 427 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| Stainless Steel | Ferric | 328 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| | Martensitic | 262 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| | Austenitic A5 < 40% | 328 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| | Austenitic A5 > 40% | 328 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| | Sulphured | 361 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| High Temperature Alloy | Fe-Alloy | 98 | 1xø | 0.5xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| | Ni-Alloy not hardened | 98 | 1xø | 0.5xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| | Ni-Alloy hardened | 98 | 1xø | 0.5xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| | Co-Alloy | 98 | 1xø | 0.5xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| Cast Iron | Non-Alloy | 656 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Low-Alloy | 525 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | High-Alloy | 394 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Stainless Cast Steel | Ferric/Martensitic | 328 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| | Austenitic | 328 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 656 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Non-Alloy > 180 HB | 591 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Alloy | 525 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | High Alloy | 394 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 623 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Non-Alloy > 180 HB | 558 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloy | 492 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| White Malleable Cast Iron | < 180 HB | 591 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | > 180 HB | 525 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Black Malleable Cast Iron | < 180 HB | 591 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | > 180 HB | 525 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Copper | Non-Alloy | 919 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Wrought Alloy Non-Hardened | 787 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Wrought Alloy Hardened | 656 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | CuNi-Alloy | 787 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | CuNiZn-Alloy Long-Chipping | 656 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | CuNiZn-Alloy Short-Chipping | 787 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| CuZn (Brass) | Long-Chipping | 984 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Short-Chipping | 1148 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| CuSn (Bronze) | Long-Chipping | 787 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Short-Chipping | 919 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| CuAlFe (Ampco) | Long-Chipping | 459 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Short-Chipping | 525 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| Titanium | Non-Alloy | 295 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloyed-Annealed | 262 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | Alloyed-Hardened | 164 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |

*** Feeds and Speeds are starting points for Overall Lengths of 3" and shorter.**
**For End Mills with Overall Lengths over 3" decrease the Feeds and Speeds.**



PROMAX Premier

## Hardened Steel - US367

| Material Designation | | SFM [ft/min] | ae max [inch] | ap max [inch] | Chip Load Per Tooth [Inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Spring Steel | Annealed < 250 HB | 427 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | Natural Hardened 250-350 HB | 394 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | Spring Hardened 1200-1600 N/mm² | 377 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| Nitriding Steel | > 1000 N/mm² | 394 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| Quenched & Tempered Steel | Alloy 1000-1300 N/mm² | 394 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | Alloy 1300-1600 N/mm² | 361 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| Non-Alloy Tool Steel | General | 443 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 427 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | Low Alloy < 1200 N/mm² | 394 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | Low Alloy < 1500 N/mm² | 361 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | High Alloy Annealed < 1000 N/mm² | 328 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | High Alloy Hardened < 1300 N/mm² | 295 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| Tool Steel for Warm Processing | Low Alloy < 1200 N/mm² | 394 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | Low Alloy < 1500 N/mm² | 361 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | High Alloy Annealed < 1000 N/mm² | 328 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | High Alloy Hardened < 1300 N/mm² | 295 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | High Alloy Hardened < 1600 N/mm² | 279 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| Hardened Tool Steel | < 55 HRC | 262 | 0.05xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | 55–58 HRC | 230 | 0.03xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | 58–60 HRC | 197 | 0.03xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | 60–62 HRC | 148 | 0.03xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |
| | 62–64 HRC | 115 | 0.03xø | 1.5xø | 0.0016 | 0.0018 | 0.0024 | 0.0028 | 0.0039 | 0.0049 |

## Hardened Steel - US453

| Material Designation | | SFM [ft/min] | ae max [inch] | ap max [inch] | Chip Load Per Tooth [Inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Spring Steel | Annealed < 250 HB | 525 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0030 |
| | Natural Hardened 250-350 HB | 443 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0030 |
| | Spring Hardened 1200-1600 N/mm² | 328 | 1xø | 1xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| Nitriding Steel | > 1000 N/mm² | 525 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0030 |
| Quenched & Tempered Steel | Alloy 800-1000 N/mm² | 525 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0030 |
| | Alloy 1000-1300 N/mm² | 443 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0030 |
| | Alloy 1300-1600 N/mm² | 377 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0030 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 525 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0030 |
| | Low Alloy < 1200 N/mm² | 377 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0030 |
| | Low Alloy < 1500 N/mm² | 295 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0030 |
| | High Alloy Annealed < 1000 N/mm² | 443 | 1xø | 1xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| | High Alloy Hardened < 1300 N/mm² | 427 | 1xø | 1xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| Tool Steel for Warm Processing | Low Alloy < 1200 N/mm² | 410 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0030 |
| | Low Alloy < 1500 N/mm² | 377 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0030 |
| | High Alloy Annealed < 1000 N/mm² | 443 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0030 |
| | High Alloy Hardened < 1300 N/mm² | 410 | 1xø | 1xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| | High Alloy Hardened < 1600 N/mm² | 377 | 1xø | 1xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| Hardened Tool Steel | < 55 HRC | 164 | 1xø | 1xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| | 55–58 HRC | 115 | 1xø | 0.5xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| | 58–60 HRC | 82 | 1xø | 0.5xø | 0.0003 | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 |
| | 60–62 HRC | 66 | 1xø | 0.5xø | 0.0003 | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 |
| | 62–64 HRC | 49 | 1xø | 0.5xø | 0.0003 | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 |

*** Feeds and Speeds are starting points for Overall Lengths of 3" and shorter.**
**For End Mills with Overall Lengths over 3" decrease the Feeds and Speeds.**

PROMAX Premier

## Stainless Steel - US445

| Material Designation | | SFM [ft/min] | ae max [inch] | ap max [inch] | Chip Load Per Tooth [Inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | > 500 N/mm² | 787 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| Construction Steel | Non-Alloy < 500 N/mm² | 820 | 0.8xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Non-Alloy > 500 N/mm² | 755 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | Alloy | 722 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| Cementation Steel | < 150 HB | 689 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | 150-200 HB | 656 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | > 200 HB | 623 | 0.8xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| Nitriding Steel | < 1000 N/mm² | 623 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | > 1000 N/mm² | 558 | 0.8xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 656 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | Non-Alloy 800-1000 N/mm² | 623 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | Alloy < 800 N/mm² | 623 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | Alloy 800-1000 N/mm² | 591 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | Alloy 1000-1300 N/mm² | 558 | 0.8xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| | Alloy 1300-1600 N/mm² | 492 | 0.8xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| Non-Alloy Tool Steel | General | 607 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 591 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | Low Alloy < 1200 N/mm² | 558 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | Low Alloy < 1500 N/mm² | 492 | 0.8xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| | High Alloy Annealed < 1000 N/mm² | 525 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | High Alloy Hardened < 1300 N/mm² | 459 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| Tool Steel for Warm Processing | Low Alloy < 1200 N/mm² | 656 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | Low Alloy < 1500 N/mm² | 591 | 0.8xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| | High Alloy Annealed < 1000 N/mm² | 492 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | High Alloy Hardened < 1300 N/mm² | 459 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | High Alloy Hardened < 1600 N/mm² | 427 | 0.8xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| Stainless Steel | Ferric | 328 | 0.8xø | 1xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | Martensitic | 262 | 0.8xø | 1xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | Austenitic A5 < 40% | 328 | 0.8xø | 1xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | Austenitic A5 > 40% | 328 | 0.8xø | 1xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | Sulphured | 361 | 0.8xø | 1xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| Cast Iron | Non-Alloy | 656 | 0.8xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Low-Alloy | 525 | 0.8xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | High-Alloy | 394 | 0.8xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Stainless Cast Steel | Ferric/Martensitic | 328 | 0.8xø | 1xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | Austenitic | 328 | 0.8xø | 1xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 656 | 0.8xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Non-Alloy > 180 HB | 591 | 0.8xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloy | 525 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | High Alloy | 394 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 623 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | Non-Alloy > 180 HB | 558 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | Alloy | 492 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| White Malleable Cast Iron | < 180 HB | 591 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | > 180 HB | 525 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| Black Malleable Cast Iron | < 180 HB | 591 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | > 180 HB | 525 | 0.8xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |

*** Feeds and Speeds are starting points for Overall Lengths of 3" and shorter.**
**For End Mills with Overall Lengths over 3" decrease the Feeds and Speeds.**



PROMAX Premier

## Stainless Steel - US340

| Material Designation | | SFM [ft/min] | ae max [inch] | ap max [inch] | Chip Load Per Tooth [Inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 853 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | > 500 N/mm² | 787 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Construction Steel | Non-Alloy < 500 N/mm² | 820 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Non-Alloy > 500 N/mm² | 755 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloy | 722 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Cementation Steel | < 150 HB | 689 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | 150-200 HB | 656 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | > 200 HB | 623 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| Nitriding Steel | < 1000 N/mm² | 623 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | > 1000 N/mm² | 558 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 656 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Non-Alloy 800-1000 N/mm² | 623 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloy < 800 N/mm² | 623 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloy 800-1000 N/mm² | 591 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloy 1000-1300 N/mm² | 558 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| Stainless Steel | Ferric | 328 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| | Martensitic | 262 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| | Austenitic A5 < 40% | 328 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| | Austenitic A5 > 40% | 328 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| | Sulphured | 361 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| High Temperature Alloy | Fe-Alloy | 82 | 1xø | 0.5xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| | Ni-Alloy not hardened | 82 | 1xø | 0.5xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| | Ni-Alloy hardened | 82 | 1xø | 0.5xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| | Co-Alloy | 82 | 1xø | 0.5xø | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 |
| Cast Iron | Non-Alloy | 656 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Low-Alloy | 525 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | High-Alloy | 394 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Stainless Cast Steel | Ferric/Martensitic | 328 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| | Austenitic | 328 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |
| Cast iron with Lamellar Graphite | Non-Alloy < 180 HB | 656 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Non-Alloy > 180 HB | 591 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Alloy | 525 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | High Alloy | 394 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 623 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Non-Alloy > 180 HB | 558 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloy | 492 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| White Malleable Cast Iron | < 180 HB | 591 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | > 180 HB | 525 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Black Malleable Cast Iron | < 180 HB | 591 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | > 180 HB | 525 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| Copper | Non-Alloy | 919 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Wrought Alloy Non-Hardened | 787 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Wrought Alloy Hardened | 656 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | CuNi-Alloy | 787 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | CuNiZn-Alloy Long-Chipping | 656 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | CuNiZn-Alloy Short-Chipping | 787 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| CuZn (Brass) | Long-Chipping | 984 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Short-Chipping | 1148 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| CuSn (Bronze) | Long-Chipping | 787 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Short-Chipping | 919 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| CuAlFe (Ampco) | Long-Chipping | 459 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Short-Chipping | 525 | 1xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| Titanium | Non-Alloy | 295 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloyed-Annealed | 262 | 1xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |
| | Alloyed-Hardened | 164 | 1xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 | 0.0035 |

*** Feeds and Speeds are starting points for Overall Lengths of 3" and shorter.**
**For End Mills with Overall Lengths over 3" decrease the Feeds and Speeds.**

PROMAX Premier

## Titanium - US456 / US457

| Material Designation | | SFM [ft/min] | ae max [inch] | ap max [inch] | Chip Load Per Tooth [Inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| High Temperature Alloy | Fe-Alloy | 180 | 1xø | 0.5xø | 0.0008 | 0.0016 | 0.0020 | 0.0024 | 0.0028 | 0.0031 |
| | Ni-Alloy not hardened | 180 | 1xø | 0.5xø | 0.0008 | 0.0016 | 0.0020 | 0.0024 | 0.0028 | 0.0031 |
| | Ni-Alloy hardened | 180 | 1xø | 0.5xø | 0.0008 | 0.0016 | 0.0020 | 0.0024 | 0.0028 | 0.0031 |
| | Co-Alloy | 180 | 1xø | 0.5xø | 0.0008 | 0.0016 | 0.0020 | 0.0024 | 0.0028 | 0.0031 |
| Titanium | Non-Alloy | 394 | 1xø | 0.5xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 | 0.0055 |
| | Alloyed-Annealed | 328 | 1xø | 0.5xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |
| | Alloyed-Hardened | 262 | 1xø | 0.5xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 | 0.0039 |

## Titanium - US556

| Material Designation | | SFM [ft/min] | ae max [inch] | ap max [inch] | Chip Load Per Tooth [Inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" |
|---|---|---|---|---|---|---|---|---|---|
| Stainless Steel | Ferric | 328 | 0.5xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 |
| | Martensitic | 262 | 0.5xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 |
| | Austenitic A5 < 40% | 328 | 0.5xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 |
| | Austenitic A5 > 40% | 328 | 0.5xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 |
| | Sulphured | 361 | 0.5xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 |
| High Temperature Alloy | Fe-Alloy | 180 | 0.5xø | 1xø | 0.0008 | 0.0016 | 0.0020 | 0.0024 | 0.0028 |
| | Ni-Alloy not hardened | 180 | 0.5xø | 1xø | 0.0008 | 0.0016 | 0.0020 | 0.0024 | 0.0028 |
| | Ni-Alloy hardened | 180 | 0.5xø | 1xø | 0.0008 | 0.0016 | 0.0020 | 0.0024 | 0.0028 |
| | Co-Alloy | 180 | 0.5xø | 1xø | 0.0008 | 0.0016 | 0.0020 | 0.0024 | 0.0028 |
| Stainless Cast Steel | Ferric/Martensitic | 328 | 0.5xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 |
| | Austenitic | 328 | 0.5xø | 1xø | 0.0005 | 0.0010 | 0.0016 | 0.0020 | 0.0028 |
| Titanium | Non-Alloy | 394 | 0.5xø | 1xø | 0.0010 | 0.0018 | 0.0028 | 0.0039 | 0.0047 |
| | Alloyed-Annealed | 328 | 0.5xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0039 |
| | Alloyed-Hardened | 262 | 0.5xø | 1xø | 0.0006 | 0.0012 | 0.0020 | 0.0024 | 0.0031 |

## Aluminum - US360

| Material Designation | | SFM [ft/min] | ae max [inch] | ap max [inch] | Chip Load Per Tooth [Inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium | Non-Alloy | 1968 | 1xø | 1xø | 0.0014 | 0.0024 | 0.0028 | 0.0035 | 0.0047 | 0.0055 |
| | Wrought Alloy Non-Hardened | 1968 | 1xø | 1xø | 0.0014 | 0.0024 | 0.0028 | 0.0035 | 0.0047 | 0.0055 |
| | Wrought Alloy Hardened | 1968 | 1xø | 1xø | 0.0014 | 0.0024 | 0.0028 | 0.0035 | 0.0047 | 0.0055 |
| | Casting Alloy < 6% Si | 1575 | 1xø | 1xø | 0.0014 | 0.0024 | 0.0028 | 0.0035 | 0.0047 | 0.0055 |
| | Casting Alloy 6-12% Si | 1181 | 1xø | 1xø | 0.0012 | 0.0020 | 0.0028 | 0.0047 | 0.0067 | 0.0083 |
| | Casting Alloy > 6% Si | 787 | 1xø | 1xø | 0.0012 | 0.0020 | 0.0028 | 0.0047 | 0.0067 | 0.0083 |
| Magnesium | Wrought Alloy | 722 | 1xø | 1xø | 0.0012 | 0.0020 | 0.0028 | 0.0047 | 0.0067 | 0.0083 |
| | Casting Alloy | 656 | 1xø | 1xø | 0.0012 | 0.0020 | 0.0028 | 0.0047 | 0.0067 | 0.0083 |
| Copper | Non-Alloy | 558 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Wrought Alloy Non-Hardened | 509 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Wrought Alloy Hardened | 394 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | CuNi-Alloy | 492 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | CuNiZn-Alloy Long-Chipping | 394 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | CuNiZn-Alloy Short-Chipping | 492 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| CuZn (Brass) | Long-Chipping | 591 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Short-Chipping | 787 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| CuSn (Bronze) | Long-Chipping | 492 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Short-Chipping | 558 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| CuAlFe (Ampco) | Long-Chipping | 180 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Short-Chipping | 230 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |

*** Feeds and Speeds are starting points for Overall Lengths of 3" and shorter.**
**For End Mills with Overall Lengths over 3" decrease the Feeds and Speeds.**



PROMAX Premier

## Aluminum - US376

| Material Designation | | SFM [ft/min] | ae max [inch] | ap max [inch] | Chip Load Per Tooth [Inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium | Non-Alloy | 1640 | 0.05xø | 2xø | 0.0008 | 0.0016 | 0.0020 | 0.0024 | 0.0028 | 0.0031 |
| | Wrought Alloy Non-Hardened | 1640 | 0.05xø | 2xø | 0.0008 | 0.0016 | 0.0020 | 0.0024 | 0.0028 | 0.0031 |
| | Wrought Alloy Hardened | 1640 | 0.05xø | 2xø | 0.0008 | 0.0016 | 0.0020 | 0.0024 | 0.0028 | 0.0031 |
| | Casting Alloy < 6% Si | 1312 | 0.05xø | 2xø | 0.0008 | 0.0016 | 0.0020 | 0.0024 | 0.0028 | 0.0031 |
| | Casting Alloy 6-12% Si | 984 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | Casting Alloy > 6% Si | 689 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| Magnesium | Wrought Alloy | 656 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | Casting Alloy | 558 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| Copper | Non-Alloy | 492 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | Wrought Alloy Non-Hardened | 459 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | Wrought Alloy Hardened | 361 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | CuNi-Alloy | 427 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | CuNiZn-Alloy Long-Chipping | 361 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | CuNiZn-Alloy Short-Chipping | 427 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| CuZn (Brass) | Long-Chipping | 492 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | Short-Chipping | 689 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| CuSn (Bronze) | Long-Chipping | 427 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | Short-Chipping | 459 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| CuAlFe (Ampco) | Long-Chipping | 197 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |
| | Short-Chipping | 230 | 0.05xø | 2xø | 0.0006 | 0.0008 | 0.0012 | 0.0020 | 0.0024 | 0.0028 |

## Aluminum - US220

| Material Designation | | SFM [ft/min] | ae max [inch] | ap max [inch] | Chip Load Per Tooth [Inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium | Non-Alloy | 1968 | 1xø | 1xø | 0.0016 | 0.0024 | 0.0031 | 0.0059 | 0.0079 | 0.0089 |
| | Wrought Alloy Non-Hardened | 1968 | 1xø | 1xø | 0.0016 | 0.0024 | 0.0031 | 0.0059 | 0.0079 | 0.0089 |
| | Wrought Alloy Hardened | 1968 | 1xø | 1xø | 0.0016 | 0.0024 | 0.0031 | 0.0059 | 0.0079 | 0.0089 |
| | Casting Alloy < 6% Si | 1575 | 1xø | 1xø | 0.0016 | 0.0024 | 0.0031 | 0.0059 | 0.0079 | 0.0089 |
| | Casting Alloy 6-12% Si | 1181 | 1xø | 1xø | 0.0012 | 0.0020 | 0.0028 | 0.0047 | 0.0067 | 0.0083 |
| | Casting Alloy > 6% Si | 787 | 1xø | 1xø | 0.0012 | 0.0020 | 0.0028 | 0.0047 | 0.0067 | 0.0083 |
| Magnesium | Wrought Alloy | 722 | 1xø | 1xø | 0.0012 | 0.0020 | 0.0028 | 0.0047 | 0.0067 | 0.0083 |
| | Casting Alloy | 656 | 1xø | 1xø | 0.0012 | 0.0020 | 0.0028 | 0.0047 | 0.0067 | 0.0083 |
| Copper | Non-Alloy | 558 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Wrought Alloy Non-Hardened | 509 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Wrought Alloy Hardened | 394 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | CuNi-Alloy | 492 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | CuNiZn-Alloy Long-Chipping | 394 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | CuNiZn-Alloy Short-Chipping | 492 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| CuZn (Brass) | Long-Chipping | 591 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Short-Chipping | 787 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| CuSn (Bronze) | Long-Chipping | 492 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Short-Chipping | 558 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| CuAlFe (Ampco) | Long-Chipping | 180 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Short-Chipping | 230 | 1xø | 1xø | 0.0008 | 0.0016 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |

*** Feeds and Speeds are starting points for Overall Lengths of 3" and shorter.**
**For End Mills with Overall Lengths over 3" decrease the Feeds and Speeds.**

PROMAX Premier

## Micro - US501/US503

| Hardness: ≤ 28 Rc | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Material | | | Chip Load - IPT | | | Depth of Cut | | Chip Load - IPT | | | | Depth of Cut | |
| | | SFM | 0.005 - 0.015 | 0.015 - 0.031 | 0.031 - 0.047 | Radial | Axial | 0.047 - 0.062 | 0.062 - 0.078 | 0.078 - 0.093 | 0.093 - 0.120 | Radial | Axial |
| Aluminum Alloys | Castings | 750 | 0.00015 | 0.00031 | 0.00047 | .13xDia. | 3xDia. | 0.00055 | 0.00069 | 0.00082 | 0.00110 | .25xDia. | 3xDia. |
| | Wrought | 1000 | 0.00015 | 0.00031 | 0.00047 | .13xDia. | 3xDia. | 0.00055 | 0.00069 | 0.00082 | 0.00110 | .25xDia. | 3xDia. |
| Copper Alloys | Coppers | 225 | 0.00012 | 0.00025 | 0.00038 | .13xDia. | 3xDia. | 0.00044 | 0.00055 | 0.00065 | 0.00088 | .13xDia. | 3xDia. |
| | Brass | 500 | 0.00012 | 0.00025 | 0.00038 | .13xDia. | 3xDia. | 0.00044 | 0.00055 | 0.00065 | 0.00088 | .13xDia. | 3xDia. |
| | Bronze | 225 | 0.00012 | 0.00025 | 0.00038 | .13xDia. | 3xDia. | 0.00044 | 0.00055 | 0.00065 | 0.00088 | .13xDia. | 3xDia. |
| | Aluminum Bronze | 500 | 0.00012 | 0.00025 | 0.00038 | .13xDia. | 3xDia. | 0.00044 | 0.00055 | 0.00065 | 0.00088 | .13xDia. | 3xDia. |
| | Nickel | 225 | 0.00012 | 0.00025 | 0.00038 | .13xDia. | 3xDia. | 0.00044 | 0.00055 | 0.00065 | 0.00088 | .13xDia. | 3xDia. |
| | Copper Alloys | 550 | 0.00012 | 0.00025 | 0.00038 | .13xDia. | 3xDia. | 0.00044 | 0.00055 | 0.00065 | 0.00088 | .13xDia. | 3xDia. |
| Cast Iron | Ductile | 300 | 0.00005 | 0.00010 | 0.00015 | .13xDia. | 3xDia. | 0.00017 | 0.00021 | 0.00025 | 0.00034 | .13xDia. | 3xDia. |
| | Gray | 400 | 0.00005 | 0.00010 | 0.00015 | .13xDia. | 3xDia. | 0.00017 | 0.00021 | 0.00025 | 0.00034 | .13xDia. | 3xDia. |
| | Malleable | 250 | 0.00005 | 0.00010 | 0.00015 | .13xDia. | 3xDia. | 0.00017 | 0.00021 | 0.00025 | 0.00034 | .13xDia. | 3xDia. |
| Magnesium Alloys | General | 1500 | 0.00015 | 0.00031 | 0.00048 | .13xDia. | 3xDia. | 0.00055 | 0.00069 | 0.00082 | 0.00110 | .13xDia. | 3xDia. |
| Zinc Alloys | General | 800 | 0.00015 | 0.00031 | 0.00048 | .13xDia. | 3xDia. | 0.00055 | 0.00069 | 0.00082 | 0.00110 | .13xDia. | 3xDia. |

| Hardness: 29 - 37 Rc | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Material | | | Chip Load - IPT | | | Depth of Cut | | Chip Load - IPT | | | | Depth of Cut | |
| | | SFM | 0.005 - 0.015 | 0.015 - 0.031 | 0.031 - 0.047 | Radial | Axial | 0.047 - 0.062 | 0.062 - 0.078 | 0.078 - 0.093 | 0.093 - 0.120 | Radial | Axial |
| Carbon Steel | Low Carbon | 600 | 0.00005 | 0.00010 | 0.00015 | .13xDia. | 3xDia. | 0.00170 | 0.00021 | 0.00025 | 0.00034 | .25xDia. | 3xDia. |
| | Medium Carbon | 200 | 0.00004 | 0.00009 | 0.00013 | .13xDia. | 3xDia. | 0.00020 | 0.00025 | 0.00030 | 0.00040 | .25xDia. | 3xDia. |
| Stainless Steels | Martensitic\ Ferritic | 450 | 0.00005 | 0.00010 | 0.00015 | .13xDia. | 3xDia. | 0.00017 | 0.00021 | 0.00025 | 0.00034 | .25xDia. | 3xDia. |
| | Austenitic | 200 | 0.00004 | 0.00009 | 0.00013 | .13xDia. | 3xDia. | 0.00015 | 0.00019 | 0.00023 | 0.00031 | .25xDia. | 3xDia. |
| Tool Steels | Low Alloy | 200 | 0.00004 | 0.00009 | 0.00013 | .13xDia. | 3xDia. | 0.00015 | 0.00019 | 0.00023 | 0.00031 | .25xDia. | 3xDia. |
| | High Alloy | 150 | 0.00003 | 0.00006 | 0.00008 | .13xDia. | 3xDia. | 0.00010 | 0.00012 | 0.00014 | 0.00019 | .25xDia. | 3xDia. |
| Titanium Alloys | General | 150 | 0.00003 | 0.00006 | 0.00008 | .13xDia. | 3xDia. | 0.00010 | 0.00012 | 0.00014 | 0.00019 | .25xDia. | 3xDia. |
| High Temp Alloys | Iron Alloy | 70 | 0.00003 | 0.00006 | 0.00009 | .13xDia. | 3xDia. | 0.00010 | 0.00012 | 0.00014 | 0.00019 | .25xDia. | 3xDia. |
| | Nickel Alloy | 70 | 0.00003 | 0.00006 | 0.00009 | .13xDia. | 3xDia. | 0.00010 | 0.00012 | 0.00014 | 0.00019 | .25xDia. | 3xDia. |
| | Hardened Nickel Alloy | 70 | 0.00003 | 0.00006 | 0.00009 | .13xDia. | 3xDia. | 0.00010 | 0.00012 | 0.00014 | 0.00019 | .25xDia. | 3xDia. |
| | Cobalt Alloy | 70 | 0.00003 | 0.00006 | 0.00009 | .13xDia. | 3xDia. | 0.00010 | 0.00012 | 0.00014 | 0.00019 | .25xDia. | 3xDia. |

| Hardness: 38- 45 Rc | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Material | | | Chip Load - IPT | | | Depth of Cut | | Chip Load - IPT | | | | Depth of Cut | |
| | | SFM | 0.005 - 0.015 | 0.015 - 0.031 | 0.031 - 0.047 | Radial | Axial | 0.047 - 0.062 | 0.062 - 0.078 | 0.078 - 0.093 | 0.093 - 0.120 | Radial | Axial |
| Stainless Steels | Austenitic | 100 | 0.00002 | 0.00004 | 0.00007 | .13xDia. | 3xDia. | 0.00008 | 0.00100 | 0.00012 | 0.00016 | .25xDia. | 3xDia. |
| Tool Steels | Low Alloy | 100 | 0.00002 | 0.00004 | 0.00007 | .13xDia. | 3xDia. | 0.00008 | 0.00100 | 0.00012 | 0.00016 | .25xDia. | 3xDia. |
| | High Alloy | 90 | 0.00001 | 0.00003 | 0.00004 | .13xDia. | 3xDia. | 0.00005 | 0.00006 | 0.00007 | 0.00010 | .25xDia. | 3xDia. |
| Titanium Alloys | General | 75 | 0.00001 | 0.00003 | 0.00004 | .13xDia. | 3xDia. | 0.00005 | 0.00006 | 0.00007 | 0.00010 | .25xDia. | 3xDia. |
| High Temp Alloys | Iron Alloy | 50 | 0.00001 | 0.00003 | 0.00004 | .13xDia. | 3xDia. | 0.00005 | 0.00006 | 0.00007 | 0.00010 | .25xDia. | 3xDia. |
| | Nickel Alloy | 50 | 0.00001 | 0.00003 | 0.00004 | .13xDia. | 3xDia. | 0.00005 | 0.00006 | 0.00007 | 0.00010 | .25xDia. | 3xDia. |
| | Hardened Nickel Alloy | 50 | 0.00001 | 0.00003 | 0.00004 | .13xDia. | 3xDia. | 0.00005 | 0.00006 | 0.00007 | 0.00010 | .25xDia. | 3xDia. |
| | Cobalt Alloy | 50 | 0.00001 | 0.00003 | 0.00004 | .13xDia. | 3xDia. | 0.00005 | 0.00006 | 0.00007 | 0.00010 | .25xDia. | 3xDia. |

## Micro US504/US506

| Hardness: ≤ 28 Rc | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Material | | | Chip Load - IPT | | | Depth of Cut | | Chip Load - IPT | | | | Depth of Cut | |
| | | SFM | 0.005 - 0.015 | 0.015 - 0.031 | 0.031 - 0.047 | Radial | Axial | 0.047 - 0.062 | 0.062 - 0.078 | 0.078 - 0.093 | 0.093 - 0.120 | Radial | Axial |
| Aluminum Alloys | Castings | 750 | 0.00022 | 0.00045 | 0.00068 | .30xDia. | 1xDia | 0.00780 | 0.00099 | 0.00118 | 0.00158 | .60xDia. | 1xDia. |
| | Wrought | 1000 | 0.00022 | 0.00045 | 0.00068 | .30xDia. | 1xDia | 0.00780 | 0.00099 | 0.00118 | 0.00158 | .60xDia. | 1xDia. |
| Copper Alloys | Coppers | 225 | 0.00017 | 0.00036 | 0.00055 | .30xDia. | 1xDia | 0.00063 | 0.00079 | 0.00094 | 0.00127 | .60xDia. | 1xDia. |
| | Brass | 500 | 0.00017 | 0.00036 | 0.00055 | .30xDia. | 1xDia | 0.00063 | 0.00079 | 0.00094 | 0.00127 | .60xDia. | 1xDia. |
| | Bronze | 225 | 0.00017 | 0.00036 | 0.00055 | .30xDia. | 1xDia | 0.00063 | 0.00079 | 0.00094 | 0.00127 | .60xDia. | 1xDia. |
| | Aluminum Bronze | 500 | 0.00017 | 0.00036 | 0.00055 | .30xDia. | 1xDia | 0.00063 | 0.00079 | 0.00094 | 0.00127 | .60xDia. | 1xDia. |
| | Nickel | 225 | 0.00017 | 0.00036 | 0.00055 | .30xDia. | 1xDia | 0.00063 | 0.00079 | 0.00094 | 0.00127 | .60xDia. | 1xDia. |
| | Copper Alloys | 550 | 0.00017 | 0.00036 | 0.00055 | .30xDia. | 1xDia | 0.00063 | 0.00079 | 0.00094 | 0.00127 | .60xDia. | 1xDia. |
| Cast Iron | Ductile | 300 | 0.00007 | 0.00014 | 0.00021 | .30xDia. | 1xDia | 0.00024 | 0.00031 | 0.00036 | 0.00049 | .60xDia. | 1xDia. |
| | Gray | 400 | 0.00007 | 0.00014 | 0.00021 | .30xDia. | 1xDia | 0.00024 | 0.00031 | 0.00036 | 0.00049 | .60xDia. | 1xDia. |
| | Malleable | 250 | 0.00007 | 0.00014 | 0.00021 | .30xDia. | 1xDia | 0.00024 | 0.00031 | 0.00036 | 0.00049 | .60xDia. | 1xDia. |
| Magnesium Alloys | General | 1500 | 0.00022 | 0.00045 | 0.00068 | .30xDia. | 1xDia | 0.00078 | 0.00099 | 0.00118 | 0.00158 | .60xDia. | 1xDia. |
| Zinc Alloys | General | 800 | 0.00022 | 0.00045 | 0.00068 | .30xDia. | 1xDia | 0.00078 | 0.00099 | 0.00118 | 0.00158 | .60xDia. | 1xDia. |

| Hardness: 29 - 37 Rc | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Material | | | Chip Load - IPT | | | Depth of Cut | | Chip Load - IPT | | | | Depth of Cut | |
| | | SFM | 0.005 - 0.015 | 0.015 - 0.031 | 0.031 - 0.047 | Radial | Axial | 0.047 - 0.062 | 0.062 - 0.078 | 0.078 - 0.093 | 0.093 - 0.120 | Radial | Axial |
| Carbon Steel | Low Carbon | 600 | 0.00007 | 0.00014 | 0.00021 | .30xDia. | 1xDia | 0.00024 | 0.00031 | 0.00036 | 0.00049 | .60xDia. | 1xDia. |
| | Medium Carbon | 200 | 0.00006 | 0.00013 | 0.00019 | .30xDia. | 1xDia | 0.00022 | 0.00028 | 0.00033 | 0.00045 | .60xDia. | 1xDia. |
| Stainless Steels | Martensitic\ Ferritic | 450 | 0.00007 | 0.00014 | 0.00021 | .30xDia. | 1xDia | 0.00024 | 0.00031 | 0.00036 | 0.00049 | .60xDia. | 1xDia. |
| | Austenitic | 200 | 0.00006 | 0.00013 | 0.00019 | .30xDia. | 1xDia | 0.00022 | 0.00028 | 0.00033 | 0.00045 | .60xDia. | 1xDia. |
| Tool Steels | Low Alloy | 200 | 0.00006 | 0.00013 | 0.00019 | .30xDia. | 1xDia | 0.00022 | 0.00028 | 0.00033 | 0.00045 | .60xDia. | 1xDia. |
| | High Alloy | 150 | 0.00004 | 0.00008 | 0.00012 | .30xDia. | 1xDia | 0.00014 | 0.00017 | 0.00021 | 0.00028 | .60xDia. | 1xDia. |
| Titanium Alloys | General | 150 | 0.00004 | 0.00008 | 0.00012 | .30xDia. | 1xDia | 0.00014 | 0.00017 | 0.00021 | 0.00028 | .60xDia. | 1xDia |
| High Temp Alloys | Iron Alloy | 70 | 0.00004 | 0.00008 | 0.00012 | .30xDia. | 1xDia | 0.00014 | 0.00017 | 0.00021 | 0.00028 | .60xDia. | 1xDia. |
| | Nickel Alloy | 70 | 0.00004 | 0.00008 | 0.00012 | .30xDia. | 1xDia | 0.00014 | 0.00017 | 0.00021 | 0.00028 | .60xDia. | 1xDia. |
| | Hardened Nickel Alloy | 70 | 0.00004 | 0.00008 | 0.00012 | .30xDia. | 1xDia | 0.00014 | 0.00017 | 0.00021 | 0.00028 | .60xDia. | 1xDia. |
| | Cobalt Alloy | 70 | 0.00004 | 0.00008 | 0.00012 | .30xDia. | 1xDia | 0.00014 | 0.00017 | 0.00021 | 0.00028 | .60xDia. | 1xDia. |

| Hardness: 38- 45 Rc | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Material | | | Chip Load - IPT | | | Depth of Cut | | Chip Load - IPT | | | | Depth of Cut | |
| | | SFM | 0.005 - 0.015 | 0.015 - 0.031 | 0.031 - 0.047 | Radial | Axial | 0.047 - 0.062 | 0.062 - 0.078 | 0.078 - 0.093 | 0.093 - 0.120 | Radial | Axial |
| Stainless Steels | Austenitic | 100 | 0.00003 | 0.00006 | 0.00010 | .30xDia. | 1xDia | 0.00011 | 0.00014 | 0.00017 | 0.00022 | .60xDia. | 1xDia. |
| Tool Steels | Low Alloy | 100 | 0.00003 | 0.00006 | 0.00010 | .30xDia. | 1xDia | 0.00011 | 0.00014 | 0.00017 | 0.00022 | .60xDia. | 1xDia. |
| | High Alloy | 90 | 0.00002 | 0.00004 | 0.00006 | .30xDia. | 1xDia | 0.00007 | 0.00009 | 0.00012 | 0.00018 | .60xDia. | 1xDia. |
| Titanium Alloys | General | 75 | 0.00002 | 0.00004 | 0.00006 | .30xDia. | 1xDia | 0.00007 | 0.00009 | 0.00012 | 0.00018 | .60xDia. | 1xDia. |
| High Temp Alloys | Iron Alloy | 50 | 0.00002 | 0.00004 | 0.00006 | .30xDia. | 1xDia | 0.00007 | 0.00009 | 0.00012 | 0.00018 | .60xDia. | 1xDia. |
| | Nickel Alloy | 50 | 0.00002 | 0.00004 | 0.00006 | .30xDia. | 1xDia | 0.00007 | 0.00009 | 0.00012 | 0.00018 | .60xDia. | 1xDia. |
| | Hardened Nickel Alloy | 50 | 0.00002 | 0.00004 | 0.00006 | .30xDia. | 1xDia | 0.00007 | 0.00009 | 0.00012 | 0.00018 | .60xDia. | 1xDia. |
| | Cobalt Alloy | 50 | 0.00002 | 0.00004 | 0.00006 | .30xDia. | 1xDia | 0.00007 | 0.00009 | 0.00012 | 0.00018 | .60xDia. | 1xDia. |

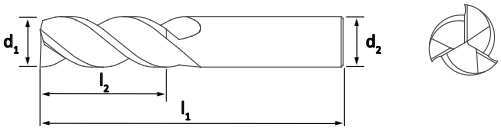
PROMAX Premium

# Series 109

## 3 Flute Aluminum

AL | 3 FL | S

$\lambda_S = 40°$ | $\gamma_S = 10°$




**Tolerances**

Shank: 1/8" - 1" = -.0001/-.0004

Cutting Dia: 1/8" - 1" = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | Flutes | Uncoated | AlTiN | ZrN |
|---|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | | | 3 | 109-00820 | 109-00824 | 109-00826 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | | | 3 | 109-00810 | 109-00814 | 109-00816 |
| 5/32 | 3/16 | 1/2 | 2 | | | 3 | 109-01010 | 109-01014 | 109-01016 |
| 5/32 | 3/16 | 3/8 | 2 | | | 3 | 109-01020 | 109-01024 | 109-01026 |
| 3/16 | 3/16 | 3/8 | 2 | | | 3 | 109-01220 | 109-01224 | 109-01226 |
| 3/16 | 3/16 | 5/8 | 2 | | | 3 | 109-01210 | 109-01214 | 109-01216 |
| 7/32 | 1/4 | 3/4 | 2-1/2 | | | 3 | 109-01410 | 109-01414 | 109-01416 |
| 7/32 | 1/4 | 3/8 | 2 | | | 3 | 109-01420 | 109-01424 | 109-01426 |
| 1/4 | 1/4 | 3/8 | 2 | | | 3 | 109-01620 | 109-01624 | 109-01626 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 3 | 109-01610 | 109-01614 | 109-01616 |
| 1/4 | 1/4 | 1-1/4 | 3 | | | 3 | 109-01630 | 109-01634 | 109-01636 |
| 1/4 | 1/4 | 1-1/2 | 3-1/2 | | | 3 | 109-01640 | 109-01644 | 109-01646 |
| 1/4 | 1/4 | 3/4 | 4 | 2-1/8 | 0.240 | 3 | 109-01660 | 109-01664 | 109-01666 |
| 9/32 | 5/16 | 1/2 | 2-1/2 | | | 3 | 109-01820 | 109-01824 | 109-01826 |
| 9/32 | 5/16 | 3/4 | 2-1/2 | | | 3 | 109-01810 | 109-01814 | 109-01816 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | | | 3 | 109-02020 | 109-02024 | 109-02026 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | | | 3 | 109-02010 | 109-02014 | 109-02016 |
| 3/8 | 3/8 | 5/8 | 2 | | | 3 | 109-02420 | 109-02424 | 109-02426 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | | | 3 | 109-02410 | 109-02414 | 109-02416 |
| 3/8 | 3/8 | 1-1/2 | 3-1/2 | | | 3 | 109-02430 | 109-02434 | 109-02436 |
| 3/8 | 3/8 | 2 | 4 | | | 3 | 109-02440 | 109-02444 | 109-02446 |
| 3/8 | 3/8 | 1 | 6 | 2-3/8 | 0.360 | 3 | 109-02460 | 109-02464 | 109-02466 |
| 7/16 | 7/16 | 1 | 2-3/4 | | | 3 | 109-02810 | 109-02814 | 109-02816 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | | | 3 | 109-03220 | 109-03224 | 109-03226 |
| 1/2 | 1/2 | 1-1/4 | 3 | | | 3 | 109-03210 | 109-03214 | 109-03216 |
| 1/2 | 1/2 | 1-1/2 | 3-1/2 | | | 3 | 109-03230 | 109-03234 | 109-03236 |
| 1/2 | 1/2 | 2 | 4 | | | 3 | 109-03240 | 109-03244 | 109-03246 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | | | 3 | 109-03610 | 109-03614 | 109-03616 |
| 5/8 | 5/8 | 7/8 | 3 | | | 3 | 109-04020 | 109-04024 | 109-04026 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | | | 3 | 109-04010 | 109-04014 | 109-04016 |
| 5/8 | 5/8 | 1-3/4 | 4 | | | 3 | 109-04030 | 109-04034 | 109-04036 |
| 5/8 | 5/8 | 2-1/2 | 5 | | | 3 | 109-04040 | 109-04044 | 109-04046 |
| 3/4 | 3/4 | 1 | 3 | | | 3 | 109-04820 | 109-04824 | 109-04826 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 3 | 109-04810 | 109-04814 | 109-04816 |
| 3/4 | 3/4 | 2-1/2 | 5 | | | 3 | 109-04830 | 109-04834 | 109-04836 |
| 3/4 | 3/4 | 3-1/4 | 6 | | | 3 | 109-04840 | 109-04844 | 109-04846 |
| 1 | 1 | 1-3/4 | 4 | | | 3 | 12178621 | 109-06414 | 109-06416 |
| 1 | 1 | 2-3/4 | 5 | | | 3 | 12178622 | 109-06434 | 109-06436 |
| 1 | 1 | 3-3/8 | 6 | | | 3 | 12178623 | 109-06444 | 109-06446 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ● | ● | ● | |

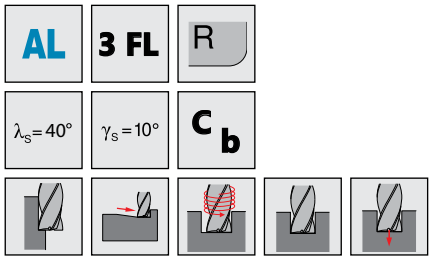
Feeds & Speeds Available on Page 82

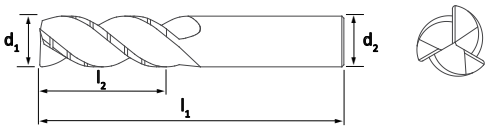


PROMAX Premium

# Series 119

## 3 Flute Aluminum Rougher-Finisher






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | 1/8” - 1” = +.002/-.0001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | AlTiN | ZrN |
|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | 0.010 | 3 | 119-00824 | 119-00826 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.010 | 3 | 119-00814 | 119-00816 |
| 5/32 | 3/16 | 3/8 | 2 | 0.010 | 3 | 119-01024 | 119-01026 |
| 5/32 | 3/16 | 1/2 | 2 | 0.010 | 3 | 119-01014 | 119-01016 |
| 3/16 | 3/16 | 3/8 | 2 | 0.010 | 3 | 119-01224 | 119-01226 |
| 3/16 | 3/16 | 5/8 | 2 | 0.010 | 3 | 119-01214 | 119-01216 |
| 7/32 | 1/4 | 3/8 | 2 | 0.020 | 3 | 119-01424 | 119-01426 |
| 7/32 | 1/4 | 3/4 | 2-1/2 | 0.020 | 3 | 119-01414 | 119-01416 |
| 1/4 | 1/4 | 3/8 | 2 | 0.020 | 3 | 119-01624 | 119-01626 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.020 | 3 | 119-01614 | 119-01616 |
| 1/4 | 1/4 | 1-1/4 | 3 | 0.020 | 3 | 119-01634 | 119-01636 |
| 1/4 | 1/4 | 1-1/2 | 3-1/2 | 0.020 | 3 | 119-01644 | 119-01646 |
| 9/32 | 5/16 | 1/2 | 2-1/2 | 0.020 | 3 | 119-01824 | 119-01826 |
| 9/32 | 5/16 | 3/4 | 2-1/2 | 0.020 | 3 | 119-01814 | 119-01816 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | 0.020 | 3 | 119-02024 | 119-02026 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.020 | 3 | 119-02014 | 119-02016 |
| 11/32 | 3/8 | 5/8 | 2 | 0.020 | 3 | 119-02224 | 119-02226 |
| 11/32 | 3/8 | 7/8 | 2-1/2 | 0.020 | 3 | 119-02214 | 119-02216 |
| 3/8 | 3/8 | 5/8 | 2 | 0.020 | 3 | 119-02424 | 119-02426 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.020 | 3 | 119-02414 | 119-02416 |
| 3/8 | 3/8 | 1-1/2 | 3-1/2 | 0.020 | 3 | 119-02434 | 119-02436 |
| 3/8 | 3/8 | 2 | 4 | 0.020 | 3 | 119-02444 | 119-02446 |
| 7/16 | 7/16 | 1 | 2-3/4 | 0.020 | 3 | 119-02814 | 119-02816 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.020 | 3 | 119-03224 | 119-03226 |
| 1/2 | 1/2 | 1-1/4 | 3 | 0.020 | 3 | 119-03214 | 119-03216 |
| 1/2 | 1/2 | 1-1/2 | 3-1/2 | 0.020 | 3 | 119-03234 | 119-03236 |
| 1/2 | 1/2 | 2 | 4 | 0.020 | 3 | 119-03244 | 119-03246 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | 0.030 | 3 | 119-03614 | 119-03616 |
| 5/8 | 5/8 | 7/8 | 3 | 0.030 | 3 | 119-04024 | 119-04026 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.030 | 3 | 119-04014 | 119-04016 |
| 5/8 | 5/8 | 1-3/4 | 4 | 0.030 | 3 | 119-04034 | 119-04036 |
| 5/8 | 5/8 | 2-1/2 | 5 | 0.030 | 3 | 119-04044 | 119-04046 |
| 3/4 | 3/4 | 1 | 3 | 0.030 | 3 | 119-04824 | 119-04826 |
| 3/4 | 3/4 | 1-5/8 | 4 | 0.030 | 3 | 119-04814 | 119-04816 |
| 3/4 | 3/4 | 2-1/2 | 5 | 0.030 | 3 | 119-04834 | 119-04836 |
| 3/4 | 3/4 | 3-1/4 | 6 | 0.030 | 3 | 119-04844 | 119-04846 |
| 1 | 1 | 1-3/4 | 4 | 0.030 | 3 | 119-06414 | 119-06416 |
| 1 | 1 | 2-3/4 | 5 | 0.030 | 3 | 119-06434 | 119-06436 |
| 1 | 1 | 3-3/8 | 6 | 0.030 | 3 | 119-06444 | 119-06446 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ● | ● | ● | |

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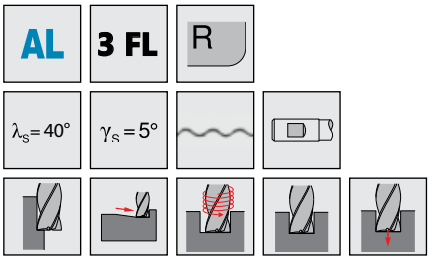
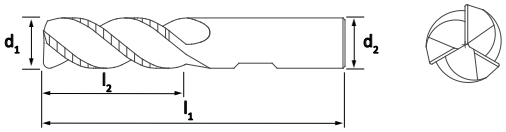
# Series 102

## 3 Flute Aluminum Rougher






**Tolerances**

| | |
|---|---|
| Shank: | 3/16” - 1” = -.0001/-.0004 |
| Cutting Dia: | 3/16” - 1” = +.000/-.002 |
| Radius: | 3/16” - 1” = +/-.005 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | AlTiN | ZrN |
|---|---|---|---|---|---|---|---|
| 3/16 | 3/16 | 3/8 | 2 | 0.030 | 3 | 102-01224 | 102-01226 |
| 3/16 | 3/16 | 5/8 | 2 | 0.030 | 3 | 102-01214 | 102-01216 |
| 1/4 | 1/4 | 3/8 | 2 | 0.045 | 3 | 102-01624 | 102-01626 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.045 | 3 | 102-01614 | 102-01616 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | 0.045 | 3 | 102-02024 | 102-02026 |
| 5/16 | 5/16 | 3/4 | 2 | 0.045 | 3 | 102-02014 | 102-02016 |
| 3/8 | 3/8 | 5/8 | 2 | 0.060 | 3 | 102-02424 | 102-02426 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.060 | 3 | 102-02414 | 102-02416 |
| 7/16 | 7/16 | 1 | 2-3/4 | 0.060 | 3 | 102-02814 | 102-02816 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.060 | 3 | 102-03224 | 102-03226 |
| 1/2 | 1/2 | 1-1/4 | 3 | 0.060 | 3 | 102-03214 | 102-03216 |
| 1/2 | 1/2 | 1-1/2 | 3-1/2 | 0.060 | 3 | 102-03234 | 102-03236 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | 0.060 | 3 | 102-03614 | 102-03616 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.060 | 3 | 102-04014 | 102-04016 |
| 3/4 | 3/4 | 1-5/8 | 4 | 0.060 | 3 | 102-04814 | 102-04816 |
| 3/4 | 3/4 | 2-1/4 | 5 | 0.060 | 3 | 102-04834 | 102-04836 |
| 1 | 1 | 1-3/4 | 4 | 0.060 | 3 | 102-06414 | 102-06416 |
| 1 | 1 | 2-5/8 | 5 | 0.060 | 3 | 102-06434 | 102-06436 |

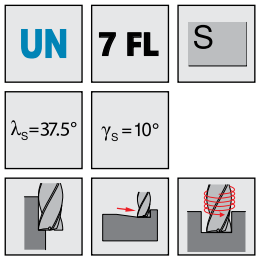
Application Range:

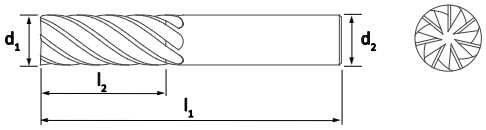
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ● | ● | ● | |

Feeds & Speeds Available on Page 82

# Series 160

## 7 Flute Universal






**Tolerances**

Shank: 1/4” - 1” = -.0001/-.0004

Cutting Dia: 1/4” - 1” = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | Flutes | nACRo® |
|---|---|---|---|---|---|---|---|
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 7 | 160-01615 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | | | 7 | 160-02415 |
| 3/8 | 3/8 | 1-1/4 | 3 | | | 7 | 160-02445 |
| 3/8 | 3/8 | 1/2 | 6 | 3-1/8 | 0.360 | 7 | 160-02485 |
| 1/2 | 1/2 | 1-1/4 | 3 | | | 7 | 160-03215 |
| 1/2 | 1/2 | 1-5/8 | 4 | | | 7 | 160-03245 |
| 1/2 | 1/2 | 5/8 | 6 | 3-1/8 | 0.480 | 7 | 160-03275 |
| 5/8 | 5/8 | 1-5/8 | 3-1/2 | | | 7 | 160-04015 |
| 5/8 | 5/8 | 2-1/8 | 4 | | | 7 | 160-04045 |
| 5/8 | 5/8 | 3/4 | 6 | 3 1/8 | 0.600 | 7 | 160-04075 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 7 | 160-04815 |
| 3/4 | 3/4 | 2-1/4 | 5 | | | 7 | 160-04845 |
| 3/4 | 3/4 | 1 | 6 | 3-1/8 | 0.720 | 7 | 160-04875 |
| 1 | 1 | 2 | 4 | | | 7 | 160-06415 |
| 1 | 1 | 2-5/8 | 5 | | | 7 | 160-06445 |

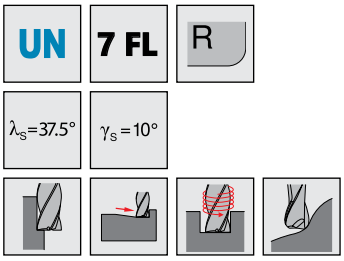
Application Range:

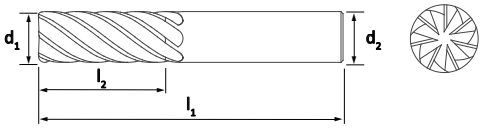
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | | |

Feeds & Speeds Available on Page 83

# Series 161

## 7 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/4” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/4” - 1” = +.000/-.002 |
| Radius: | 1/4” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | R Radius | Flutes | nACRo® |
|---|---|---|---|---|---|---|---|---|
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 0.020 | 7 | 161-31615 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 0.030 | 7 | 161-41615 |
| 1/4 | 1/4 | 1-1/8 | 3 | | | 0.020 | 7 | 161-31645 |
| 1/4 | 1/4 | 3/8 | 4 | 2-1/2 | 0.240 | 0.020 | 7 | 161-31675 |
| 1/4 | 1/4 | 3/8 | 4 | 2-1/2 | 0.240 | 0.030 | 7 | 161-41675 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | | | 0.020 | 7 | 161-32415 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | | | 0.030 | 7 | 161-42415 |
| 3/8 | 3/8 | 1-1/4 | 3 | | | 0.020 | 7 | 161-32445 |
| 3/8 | 3/8 | 1-1/4 | 3 | | | 0.030 | 7 | 161-42445 |
| 3/8 | 3/8 | 1/2 | 6 | 3-1/8 | 0.360 | 0.020 | 7 | 161-32485 |
| 1/2 | 1/2 | 1-1/4 | 3 | | | 0.020 | 7 | 161-33215 |
| 1/2 | 1/2 | 1-1/4 | 3 | | | 0.030 | 7 | 161-43215 |
| 1/2 | 1/2 | 1-5/8 | 4 | | | 0.020 | 7 | 161-33245 |
| 1/2 | 1/2 | 1-5/8 | 4 | | | 0.030 | 7 | 161-43245 |
| 1/2 | 1/2 | 5/8 | 6 | 3-1/8 | 0.480 | 0.020 | 7 | 161-33275 |
| 1/2 | 1/2 | 5/8 | 6 | 3-1/8 | 0.480 | 0.030 | 7 | 161-43275 |
| 5/8 | 5/8 | 1-5/8 | 3-1/2 | | | 0.030 | 7 | 161-44015 |
| 5/8 | 5/8 | 2-1/8 | 4 | | | 0.030 | 7 | 161-44045 |
| 5/8 | 5/8 | 3/4 | 6 | 3-1/8 | 0.600 | 0.030 | 7 | 161-44075 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 0.030 | 7 | 161-44815 |
| 3/4 | 3/4 | 2-1/4 | 5 | | | 0.030 | 7 | 161-44845 |
| 3/4 | 3/4 | 1 | 6 | 3-1/8 | 0.720 | 0.030 | 7 | 161-44875 |
| 1 | 1 | 2-5/8 | 5 | | | 0.030 | 7 | 161-46445 |

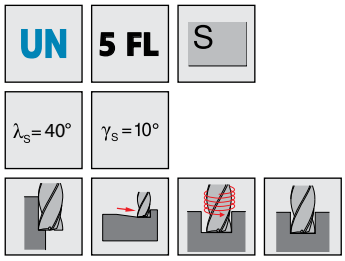
Application Range:

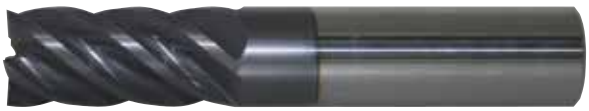
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | | |

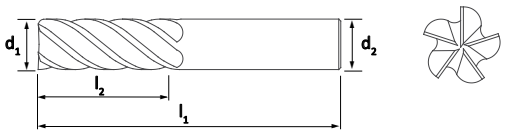
Feeds & Speeds Available on Page 83

# Series 112

## 5 Flute Universal






**Tolerances**

Shank: 1/8” - 1” = -.0001/-.0004

Cutting Dia: 1/8” - 1” = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | TiCN | AlTiN | nACRo® |
|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | 5 | 112-00822 | 112-00824 | 112-00825 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 5 | 112-00812 | 112-00814 | 112-00815 |
| 5/32 | 3/16 | 3/8 | 2 | 5 | 112-01022 | 112-01024 | 112-01025 |
| 5/32 | 3/16 | 1/2 | 2 | 5 | 112-01012 | 112-01014 | 112-01015 |
| 3/16 | 3/16 | 3/8 | 2 | 5 | 112-01222 | 112-01224 | 112-01225 |
| 3/16 | 3/16 | 5/8 | 2 | 5 | 112-01212 | 112-01214 | 112-01215 |
| 7/32 | 1/4 | 3/4 | 2-1/2 | 5 | 112-01412 | 112-01414 | 112-01415 |
| 1/4 | 1/4 | 3/8 | 2 | 5 | 112-01622 | 112-01624 | 112-01625 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 5 | 112-01612 | 112-01614 | 112-01615 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | 5 | 112-02022 | 112-02024 | 112-02025 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 5 | 112-02012 | 112-02014 | 112-02015 |
| 3/8 | 3/8 | 5/8 | 2 | 5 | 112-02422 | 112-02424 | 112-02425 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 5 | 112-02412 | 112-02414 | 112-02415 |
| 3/8 | 3/8 | 1-1/2 | 3-1/2 | 5 | 112-02432 | 112-02434 | 112-02435 |
| 7/16 | 7/16 | 1 | 2-3/4 | 5 | 112-02812 | 112-02814 | 112-02815 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 5 | 112-03222 | 112-03224 | 112-03225 |
| 1/2 | 1/2 | 1-1/4 | 3 | 5 | 112-03212 | 112-03214 | 112-03215 |
| 1/2 | 1/2 | 1-1/2 | 3-1/2 | 5 | 112-03232 | 112-03234 | 112-03235 |
| 1/2 | 1/2 | 2 | 4 | 5 | 112-03242 | 112-03244 | 112-03245 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | 5 | 112-03612 | 112-03614 | 112-03615 |
| 5/8 | 5/8 | 7/8 | 3 | 5 | 112-04022 | 112-04024 | 112-04025 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 5 | 112-04012 | 112-04014 | 112-04015 |
| 5/8 | 5/8 | 1-3/4 | 4 | 5 | 112-04032 | 112-04034 | 112-04035 |
| 3/4 | 3/4 | 1 | 3 | 5 | 112-04822 | 112-04824 | 112-04825 |
| 3/4 | 3/4 | 1-5/8 | 4 | 5 | 112-04812 | 112-04814 | 112-04815 |
| 3/4 | 3/4 | 2-1/2 | 5 | 5 | 112-04832 | 112-04834 | 112-04835 |
| 3/4 | 3/4 | 3-1/4 | 6 | 5 | 112-04842 | 112-04844 | 112-04845 |
| 1 | 1 | 1-3/4 | 4 | 5 | 112-06412 | 112-06414 | 112-06415 |
| 1 | 1 | 2-3/4 | 5 | 5 | 112-06432 | 112-06434 | 112-06435 |
| 1 | 1 | 3-3/8 | 6 | 5 | 112-06442 | 112-06444 | 112-06445 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | | |

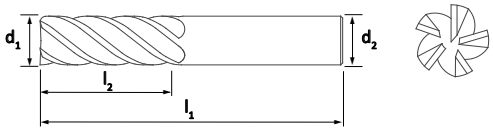
Feeds & Speeds Available on Page 84

PROMAX Premium

# Series 158

## 5 Flute Universal

| UN | 5 FL | S |
|---|---|---|
| $\lambda_S = 40°$ | $\gamma_S = 10°$ | UE |




**Tolerances**

Shank: 1/8” - 1” = -.0001/-.0004

Cutting Dia: 1/8” - 1” = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | AlTiN | nACRo® |
|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/2 | 1-1/2 | 5 | 158-00814 | 158-00815 |
| 5/32 | 3/16 | 1/2 | 2 | 5 | 158-01014 | 158-01015 |
| 3/16 | 3/16 | 3/8 | 2 | 5 | 158-01224 | 158-01225 |
| 3/16 | 3/16 | 5/8 | 2 | 5 | 158-01214 | 158-01215 |
| 7/32 | 1/4 | 3/4 | 2-1/2 | 5 | 158-01414 | 158-01415 |
| 1/4 | 1/4 | 3/8 | 2 | 5 | 158-01624 | 158-01625 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 5 | 158-01614 | 158-01615 |
| 1/4 | 1/4 | 1-1/4 | 3 | 5 | 158-01634 | 158-01635 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 5 | 158-02014 | 158-02015 |
| 3/8 | 3/8 | 5/8 | 2 | 5 | 158-02424 | 158-02425 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 5 | 158-02414 | 158-02415 |
| 3/8 | 3/8 | 1-1/2 | 3-1/2 | 5 | 158-02434 | 158-02435 |
| 7/16 | 7/16 | 1 | 2-3/4 | 5 | 158-02814 | 158-02815 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 5 | 158-03224 | 158-03225 |
| 1/2 | 1/2 | 1-1/4 | 3 | 5 | 158-03214 | 158-03215 |
| 1/2 | 1/2 | 1-1/2 | 3-1/2 | 5 | 158-03234 | 158-03235 |
| 1/2 | 1/2 | 2 | 4 | 5 | 158-03244 | 158-03245 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | 5 | 158-03614 | 158-03615 |
| 5/8 | 5/8 | 7/8 | 3 | 5 | 158-04024 | 158-04025 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 5 | 158-04014 | 158-04015 |
| 5/8 | 5/8 | 1-3/4 | 4 | 5 | 158-04034 | 158-04035 |
| 5/8 | 5/8 | 2-1/2 | 5 | 5 | 158-04044 | 158-04045 |
| 3/4 | 3/4 | 1 | 3 | 5 | 158-04824 | 158-04825 |
| 3/4 | 3/4 | 1-5/8 | 4 | 5 | 158-04814 | 158-04815 |
| 3/4 | 3/4 | 2-1/2 | 5 | 5 | 158-04834 | 158-04835 |
| 3/4 | 3/4 | 3-1/4 | 6 | 5 | 158-04844 | 158-04845 |
| 1 | 1 | 1-3/4 | 4 | 5 | 158-06414 | 158-06415 |
| 1 | 1 | 2-3/4 | 5 | 5 | 158-06434 | 158-06435 |
| 1 | 1 | 3-3/8 | 6 | 5 | 158-06444 | 158-06445 |

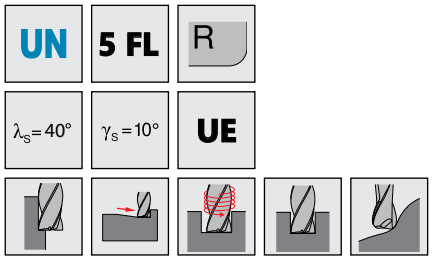
Application Range:

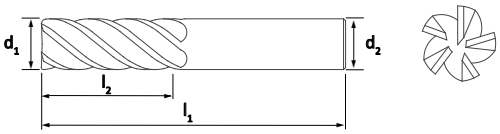
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | | |

Feeds & Speeds Available on Page 85

# Series 159

## 5 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | nACRo® |
|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.010 | 5 | 159-10815 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.015 | 5 | 159-20815 |
| 5/32 | 3/16 | 1/2 | 2 | 0.010 | 5 | 159-11015 |
| 3/16 | 3/16 | 3/8 | 2 | 0.010 | 5 | 159-11225 |
| 3/16 | 3/16 | 3/8 | 2 | 0.020 | 5 | 159-31225 |
| 3/16 | 3/16 | 5/8 | 2 | 0.010 | 5 | 159-11215 |
| 3/16 | 3/16 | 5/8 | 2 | 0.020 | 5 | 159-31215 |
| 7/32 | 1/4 | 3/4 | 2-1/2 | 0.015 | 5 | 159-21415 |
| 1/4 | 1/4 | 3/8 | 2 | 0.010 | 5 | 159-11625 |
| 1/4 | 1/4 | 3/8 | 2 | 0.015 | 5 | 159-21625 |
| 1/4 | 1/4 | 3/8 | 2 | 0.020 | 5 | 159-31625 |
| 1/4 | 1/4 | 3/8 | 2 | 0.030 | 5 | 159-41625 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.010 | 5 | 159-11615 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.015 | 5 | 159-21615 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.020 | 5 | 159-31615 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.030 | 5 | 159-41615 |
| 1/4 | 1/4 | 1-1/4 | 3 | 0.030 | 5 | 159-41635 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.015 | 5 | 159-22015 |
| 3/8 | 3/8 | 5/8 | 2 | 0.010 | 5 | 159-12425 |
| 3/8 | 3/8 | 5/8 | 2 | 0.015 | 5 | 159-22425 |
| 3/8 | 3/8 | 5/8 | 2 | 0.020 | 5 | 159-32425 |
| 3/8 | 3/8 | 5/8 | 2 | 0.030 | 5 | 159-42425 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.010 | 5 | 159-12415 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.015 | 5 | 159-22415 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.020 | 5 | 159-32415 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.030 | 5 | 159-42415 |
| 3/8 | 3/8 | 1-1/2 | 3-1/2 | 0.010 | 5 | 159-12435 |
| 3/8 | 3/8 | 1-1/2 | 3-1/2 | 0.015 | 5 | 159-22435 |
| 3/8 | 3/8 | 1-1/2 | 3-1/2 | 0.030 | 5 | 159-42435 |

**Additional Sizes On Page 54**

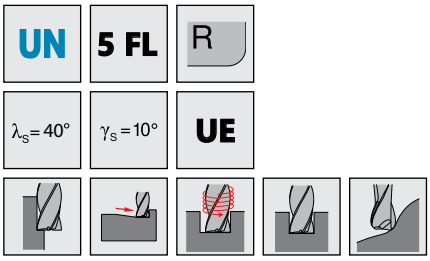
Application Range:

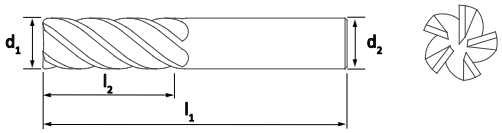
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | | |

Feeds & Speeds Available on Page 85

# Series 159

## 5 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | nACRo® |
|---|---|---|---|---|---|---|
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.010 | 5 | 159-13225 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.015 | 5 | 159-23225 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.020 | 5 | 159-33225 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.030 | 5 | 159-43225 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.060 | 5 | 159-63225 |
| 1/2 | 1/2 | 1-1/4 | 3 | 0.010 | 5 | 159-13215 |
| 1/2 | 1/2 | 1-1/4 | 3 | 0.015 | 5 | 159-23215 |
| 1/2 | 1/2 | 1-1/4 | 3 | 0.020 | 5 | 159-33215 |
| 1/2 | 1/2 | 1-1/4 | 3 | 0.030 | 5 | 159-43215 |
| 1/2 | 1/2 | 1-1/4 | 3 | 0.060 | 5 | 159-63215 |
| 1/2 | 1/2 | 2 | 4 | 0.030 | 5 | 159-43245 |
| 1/2 | 1/2 | 2 | 4 | 0.060 | 5 | 159-63245 |
| 5/8 | 5/8 | 7/8 | 3 | 0.030 | 5 | 159-44025 |
| 5/8 | 5/8 | 7/8 | 3 | 0.060 | 5 | 159-64025 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.030 | 5 | 159-44015 |
| 5/8 | 5/8 | 2-1/2 | 5 | 0.030 | 5 | 159-44045 |
| 5/8 | 5/8 | 2-1/2 | 5 | 0.060 | 5 | 159-64045 |
| 3/4 | 3/4 | 1 | 3 | 0.030 | 5 | 159-44825 |
| 3/4 | 3/4 | 1-5/8 | 4 | 0.030 | 5 | 159-44815 |
| 3/4 | 3/4 | 2-1/2 | 5 | 0.030 | 5 | 159-44835 |
| 3/4 | 3/4 | 2-1/2 | 5 | 0.060 | 5 | 159-64835 |
| 1 | 1 | 1-3/4 | 4 | 0.030 | 5 | 159-46415 |
| 1 | 1 | 2-3/4 | 5 | 0.030 | 5 | 159-46435 |
| 1 | 1 | 2-3/4 | 5 | 0.060 | 5 | 159-66435 |
| 1 | 1 | 3-3/8 | 6 | 0.030 | 5 | 159-46445 |

**Additional Sizes On Page 53**

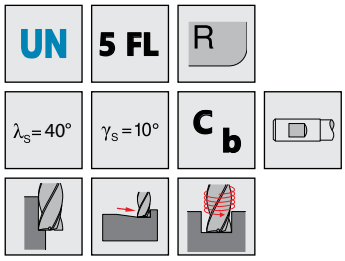
Application Range:

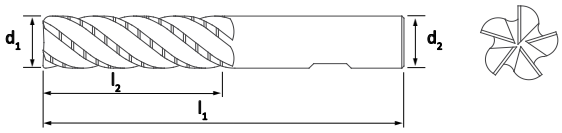
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | | |

Feeds & Speeds Available on Page 85

# Series 121

## 5 Flute Universal Rougher-Finisher






**Tolerances**

| | |
|---|---|
| Shank: | 3/4” - 1” = -.0001/-.0004 |
| Cutting Dia: | 3/4” - 1” = +.000/-.003 |
| Radius: | 3/4” - 1” = +.002/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | TiCN | AlTiN | nACRo® |
|---|---|---|---|---|---|---|---|---|
| 3/4 | 3/4 | 2-1/2 | 5 | 0.030 | 5 | 121-04832 | 121-04834 | 121-04835 |
| 3/4 | 3/4 | 3-1/4 | 6 | 0.030 | 5 | 121-04842 | 121-04844 | 121-04845 |
| 1 | 1 | 2-3/4 | 5 | 0.030 | 5 | 121-06432 | 121-06434 | 121-06435 |
| 1 | 1 | 3-3/8 | 6 | 0.030 | 5 | 121-06442 | 121-06444 | 121-06445 |

Application Range:

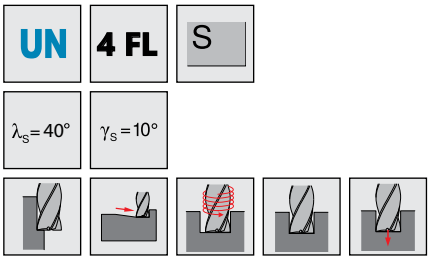
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | | | | | | | | |

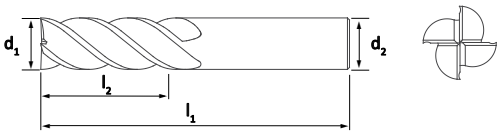
Feeds & Speeds Available on Page 86

PROMAX Premium

# Series 111

## 4 Flute Universal






**Tolerances**

Shank: 1/32” - 1” = -.0001/-.0004
Cutting Dia: 1/32” - 7/64” = +/–.0005
1/8” - 1” = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | TiCN | AlTiN |
|---|---|---|---|---|---|---|
| 1/32 | 1/8 | 3/32 | 1-1/2 | 4 | 111-00212 | 111-00214 |
| 3/64 | 1/8 | 9/64 | 1-1/2 | 4 | 111-00312 | 111-00314 |
| 1/16 | 1/8 | 1/8 | 1-1/2 | 4 | 111-00422 | 111-00424 |
| 1/16 | 1/8 | 3/16 | 1-1/2 | 4 | 111-00412 | 111-00414 |
| 5/64 | 1/8 | 1/4 | 1-1/2 | 4 | 111-00512 | 111-00514 |
| 3/32 | 1/8 | 3/16 | 1-1/2 | 4 | 111-00622 | 111-00624 |
| 3/32 | 1/8 | 9/32 | 1-1/2 | 4 | 111-00612 | 111-00614 |
| 7/64 | 1/8 | 3/16 | 1-1/2 | 4 | 111-00722 | 111-00724 |
| 7/64 | 1/8 | 3/8 | 1-1/2 | 4 | 111-00712 | 111-00714 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 4 | 111-00822 | 111-00824 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 4 | 111-00812 | 111-00814 |
| 5/32 | 3/16 | 3/8 | 2 | 4 | 111-01022 | 111-01024 |
| 5/32 | 3/16 | 1/2 | 2 | 4 | 111-01012 | 111-01014 |
| 3/16 | 3/16 | 3/8 | 2 | 4 | 111-01222 | 111-01224 |
| 3/16 | 3/16 | 5/8 | 2 | 4 | 111-01212 | 111-01214 |
| 7/32 | 1/4 | 3/4 | 2-1/2 | 4 | 111-01412 | 111-01414 |
| 1/4 | 1/4 | 3/8 | 2 | 4 | 111-01622 | 111-01624 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 4 | 111-01612 | 111-01614 |
| 1/4 | 1/4 | 1-1/4 | 3 | 4 | 111-01632 | 111-01634 |
| 1/4 | 1/4 | 1-1/2 | 3-1/2 | 4 | 111-01642 | 111-01644 |
| 1/4 | 1/4 | 3/8 | 4 | 4 | 111-01662 | 111-01664 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | 4 | 111-02022 | 111-02024 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 4 | 111-02012 | 111-02014 |
| 5/16 | 5/16 | 7/16 | 4 | 4 | 111-02062 | 111-02064 |

**Additional Sizes On Page 57**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | ● | ● | ● | ● | | | ● | |

Feeds & Speeds Available on Page 86-87



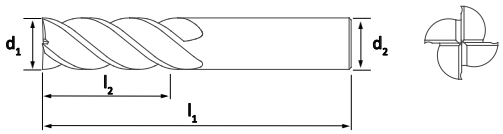
PROMAX Premium

# Series 111

## 4 Flute Universal

UN | 4 FL | S

$\lambda_S = 40°$ | $\gamma_S = 10°$




**Tolerances**

Shank: 1/32” - 1” = -.0001/-.0004
Cutting Dia: 1/32” - 7/64” = +/–.0005
1/8” - 1” = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | TiCN | AlTiN |
|---|---|---|---|---|---|---|
| 3/8 | 3/8 | 5/8 | 2 | 4 | 111-02422 | 111-02424 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 4 | 111-02412 | 111-02414 |
| 3/8 | 3/8 | 1-1/2 | 3-1/2 | 4 | 111-02432 | 111-02434 |
| 3/8 | 3/8 | 2 | 4 | 4 | 111-02442 | 111-02444 |
| 3/8 | 3/8 | 1/2 | 6 | 4 | 111-02472 | 111-02474 |
| 7/16 | 7/16 | 1 | 2-3/4 | 4 | 111-02812 | 111-02814 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 4 | 111-03222 | 111-03224 |
| 1/2 | 1/2 | 1-1/4 | 3 | 4 | 111-03212 | 111-03214 |
| 1/2 | 1/2 | 1-1/2 | 3-1/2 | 4 | 111-03232 | 111-03234 |
| 1/2 | 1/2 | 2 | 4 | 4 | 111-03242 | 111-03244 |
| 1/2 | 1/2 | 5/8 | 6 | 4 | 111-03272 | 111-03274 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | 4 | 111-03612 | 111-03614 |
| 5/8 | 5/8 | 7/8 | 3 | 4 | 111-04022 | 111-04024 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 4 | 111-04012 | 111-04014 |
| 5/8 | 5/8 | 1-3/4 | 4 | 4 | 111-04032 | 111-04034 |
| 5/8 | 5/8 | 2-1/2 | 5 | 4 | 111-04042 | 111-04044 |
| 3/4 | 3/4 | 1-5/8 | 4 | 4 | 111-04812 | 111-04814 |
| 3/4 | 3/4 | 2-1/2 | 5 | 4 | 111-04832 | 111-04834 |
| 3/4 | 3/4 | 3-1/4 | 6 | 4 | 111-04842 | 111-04844 |
| 1 | 1 | 1-3/4 | 4 | 4 | 111-06412 | 111-06414 |
| 1 | 1 | 2-3/4 | 5 | 4 | 111-06432 | 111-06434 |

**Additional Sizes On Page 56**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | ● | ● | ● | ● | | | ● | |

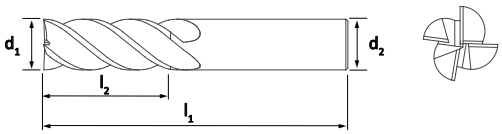
Feeds & Speeds Available on Page 86-87

PROMAX Premium

# Series 155

## 4 Flute Universal

| UN | 4 FL | S |
|---|---|---|
| $\lambda_S = 40°$ | $\gamma_S = 10°$ | UE |




**Tolerances**

Shank: 1/8" - 1" = -.0001/-.0004

Cutting Dia: 1/8" - 1" = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | Flutes | AlTiN | nACRo® |
|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | | | 4 | 155-00824 | 155-00825 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | | | 4 | 155-00814 | 155-00815 |
| 5/32 | 3/16 | 3/8 | 2 | | | 4 | 155-01024 | 155-01025 |
| 5/32 | 3/16 | 1/2 | 2 | | | 4 | 155-01014 | 155-01015 |
| 3/16 | 3/16 | 3/8 | 2 | | | 4 | 155-01224 | 155-01225 |
| 3/16 | 3/16 | 5/8 | 2 | | | 4 | 155-01214 | 155-01215 |
| 7/32 | 1/4 | 3/8 | 2 | | | 4 | 155-01424 | 155-01425 |
| 7/32 | 1/4 | 3/4 | 2-1/2 | | | 4 | 155-01414 | 155-01415 |
| 1/4 | 1/4 | 3/8 | 2 | | | 4 | 155-01624 | 155-01625 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 4 | 155-01614 | 155-01615 |
| 1/4 | 1/4 | 3/4 | 4 | 2-1/8 | 0.240 | 4 | 155-01664 | 155-01665 |
| 1/4 | 1/4 | 1-1/4 | 3 | | | 4 | 155-01634 | 155-01635 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | | | 4 | 155-02024 | 155-02025 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | | | 4 | 155-02014 | 155-02015 |
| 3/8 | 3/8 | 5/8 | 2 | | | 4 | 155-02424 | 155-02425 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | | | 4 | 155-02414 | 155-02415 |
| 3/8 | 3/8 | 1-1/2 | 3-1/2 | | | 4 | 155-02434 | 155-02435 |
| 3/8 | 3/8 | 7/8 | 4 | 2-3/8 | 0.360 | 4 | 155-02464 | 155-02465 |
| 3/8 | 3/8 | 7/8 | 6 | 3-3/8 | 0.360 | 4 | 155-02474 | 155-02475 |
| 7/16 | 7/16 | 1 | 2-3/4 | | | 4 | 155-02814 | 155-02815 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | | | 4 | 155-03224 | 155-03225 |
| 1/2 | 1/2 | 1-1/4 | 3 | | | 4 | 155-03214 | 155-03215 |
| 1/2 | 1/2 | 2 | 4 | | | 4 | 155-03244 | 155-03245 |
| 1/2 | 1/2 | 1 | 6 | 2-3/8 | 0.480 | 4 | 155-03264 | 155-03265 |
| 1/2 | 1/2 | 1 | 6 | 3-3/8 | 0.480 | 4 | 155-03274 | 155-03275 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | | | 4 | 155-03614 | 155-03615 |
| 5/8 | 5/8 | 7/8 | 3 | | | 4 | 155-04024 | 155-04025 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | | | 4 | 155-04014 | 155-04015 |
| 5/8 | 5/8 | 2-1/2 | 5 | | | 4 | 155-04044 | 155-04045 |
| 3/4 | 3/4 | 1 | 3 | | | 4 | 155-04824 | 155-04825 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 4 | 155-04814 | 155-04815 |
| 3/4 | 3/4 | 2-1/2 | 5 | | | 4 | 155-04834 | 155-04835 |
| 1 | 1 | 1-3/4 | 4 | | | 4 | 155-06414 | 155-06415 |
| 1 | 1 | 2-3/4 | 5 | | | 4 | 155-06434 | 155-06435 |
| 1 | 1 | 3-3/8 | 6 | | | 4 | 155-06444 | 155-06445 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | | |

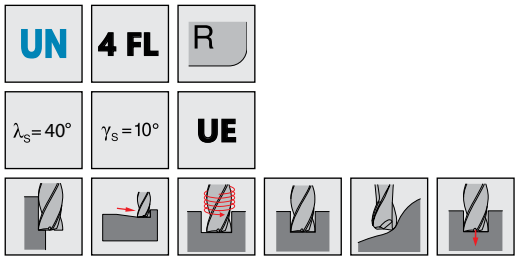
Feeds & Speeds Available on Page 87-88

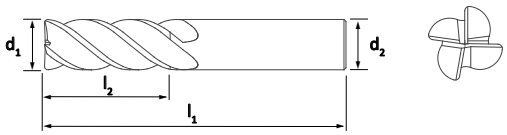


PROMAX Premium

# Series 156

## 4 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | R Radius | Flutes | AlTiN | nACRo® |
|---|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | | | 0.010 | 4 | 156-10824 | 156-10825 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | | | 0.020 | 4 | 156-30824 | 156-30825 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | | | 0.010 | 4 | 156-10814 | 156-10815 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | | | 0.015 | 4 | 156-20814 | 156-20815 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | | | 0.020 | 4 | 156-30814 | 156-30815 |
| 5/32 | 3/16 | 3/8 | 2 | | | 0.010 | 4 | 156-11024 | 156-11025 |
| 5/32 | 3/16 | 3/8 | 2 | | | 0.015 | 4 | 156-21024 | 156-21025 |
| 5/32 | 3/16 | 3/8 | 2 | | | 0.020 | 4 | 156-31024 | 156-31025 |
| 5/32 | 3/16 | 1/2 | 2 | | | 0.010 | 4 | 156-11014 | 156-11015 |
| 5/32 | 3/16 | 1/2 | 2 | | | 0.015 | 4 | 156-21014 | 156-21015 |
| 5/32 | 3/16 | 1/2 | 2 | | | 0.020 | 4 | 156-31014 | 156-31015 |
| 3/16 | 3/16 | 3/8 | 2 | | | 0.010 | 4 | 156-11224 | 156-11225 |
| 3/16 | 3/16 | 3/8 | 2 | | | 0.020 | 4 | 156-31224 | 156-31225 |
| 3/16 | 3/16 | 5/8 | 2 | | | 0.010 | 4 | 156-11214 | 156-11215 |
| 3/16 | 3/16 | 5/8 | 2 | | | 0.020 | 4 | 156-31214 | 156-31215 |
| 7/32 | 1/4 | 3/8 | 2 | | | 0.020 | 4 | 156-31424 | 156-31425 |
| 7/32 | 1/4 | 3/4 | 2-1/2 | | | 0.015 | 4 | 156-21414 | 156-21415 |
| 7/32 | 1/4 | 3/4 | 2-1/2 | | | 0.020 | 4 | 156-31414 | 156-31415 |
| 1/4 | 1/4 | 3/8 | 2 | | | 0.010 | 4 | 156-11624 | 156-11625 |
| 1/4 | 1/4 | 3/8 | 2 | | | 0.015 | 4 | 156-21624 | 156-21625 |
| 1/4 | 1/4 | 3/8 | 2 | | | 0.020 | 4 | 156-31624 | 156-31625 |
| 1/4 | 1/4 | 3/8 | 2 | | | 0.030 | 4 | 156-41624 | 156-41625 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 0.010 | 4 | 156-11614 | 156-11615 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 0.015 | 4 | 156-21614 | 156-21615 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 0.020 | 4 | 156-31614 | 156-31615 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 0.030 | 4 | 156-41614 | 156-41615 |
| 1/4 | 1/4 | 1-1/4 | 3 | | | 0.010 | 4 | 156-11634 | 156-11635 |
| 1/4 | 1/4 | 1-1/4 | 3 | | | 0.015 | 4 | 156-21634 | 156-21635 |
| 1/4 | 1/4 | 1-1/4 | 3 | | | 0.020 | 4 | 156-31634 | 156-31635 |
| 1/4 | 1/4 | 1-1/4 | 3 | | | 0.030 | 4 | 156-41634 | 156-41635 |
| 1/4 | 1/4 | 3/4 | 4 | 2 1/8 | 0.240 | 0.015 | 4 | 156-21664 | 156-21665 |
| 1/4 | 1/4 | 3/4 | 4 | 2 1/8 | 0.240 | 0.020 | 4 | 156-31664 | 156-31665 |
| 1/4 | 1/4 | 3/4 | 4 | 2 1/8 | 0.240 | 0.030 | 4 | 156-41664 | 156-41665 |
| 9/32 | 5/16 | 3/4 | 2-1/2 | | | 0.020 | 4 | 156-31814 | 156-31815 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | | | 0.020 | 4 | 156-32024 | 156-32025 |

**Additional Sizes On Page 60 & 61**

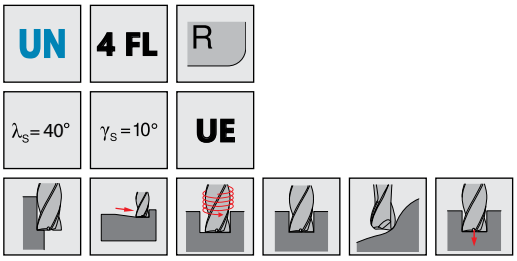
Application Range:

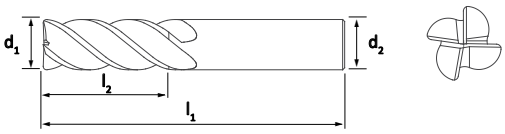
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | | |

Feeds & Speeds Available on Page 87-88

# Series 156

## 4 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8" - 1" = -.0001/-.0004 |
| Cutting Dia: | 1/8" - 1" = +.000/-.002 |
| Radius: | 1/8" - 1" = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | R Radius | Flutes | AlTiN | nACRo® |
|---|---|---|---|---|---|---|---|---|---|
| 5/16 | 5/16 | 3/4 | 2-1/2 | | | 0.030 | 4 | 156-42014 | 156-42015 |
| 3/8 | 3/8 | 5/8 | 2 | | | 0.010 | 4 | 156-12424 | 156-12425 |
| 3/8 | 3/8 | 5/8 | 2 | | | 0.015 | 4 | 156-22424 | 156-22425 |
| 3/8 | 3/8 | 5/8 | 2 | | | 0.020 | 4 | 156-32424 | 156-32425 |
| 3/8 | 3/8 | 5/8 | 2 | | | 0.030 | 4 | 156-42424 | 156-42425 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | | | 0.010 | 4 | 156-12414 | 156-12415 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | | | 0.020 | 4 | 156-32414 | 156-32415 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | | | 0.030 | 4 | 156-42414 | 156-42415 |
| 3/8 | 3/8 | 1-1/2 | 3-1/2 | | | 0.010 | 4 | 156-12434 | 156-12435 |
| 3/8 | 3/8 | 1-1/2 | 3-1/2 | | | 0.020 | 4 | 156-32434 | 156-32435 |
| 3/8 | 3/8 | 1-1/2 | 3-1/2 | | | 0.030 | 4 | 156-42434 | 156-42435 |
| 3/8 | 3/8 | 7/8 | 4 | 2 3/8 | 0.360 | 0.030 | 4 | 156-42464 | 156-42465 |
| 7/16 | 7/16 | 5/8 | 2-3/4 | | | 0.020 | 4 | 156-32824 | 156-32825 |
| 7/16 | 7/16 | 1 | 2-3/4 | | | 0.020 | 4 | 156-32814 | 156-32815 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | | | 0.010 | 4 | 156-13224 | 156-13225 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | | | 0.015 | 4 | 156-23224 | 156-23225 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | | | 0.020 | 4 | 156-33224 | 156-33225 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | | | 0.030 | 4 | 156-43224 | 156-43225 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | | | 0.060 | 4 | 156-63224 | 156-63225 |
| 1/2 | 1/2 | 1-1/4 | 3 | | | 0.010 | 4 | 156-13214 | 156-13215 |
| 1/2 | 1/2 | 1-1/4 | 3 | | | 0.015 | 4 | 156-23214 | 156-23215 |
| 1/2 | 1/2 | 1-1/4 | 3 | | | 0.020 | 4 | 156-33214 | 156-33215 |
| 1/2 | 1/2 | 1-1/4 | 3 | | | 0.030 | 4 | 156-43214 | 156-43215 |
| 1/2 | 1/2 | 1-1/4 | 3 | | | 0.060 | 4 | 156-63214 | 156-63215 |
| 1/2 | 1/2 | 2 | 4 | | | 0.020 | 4 | 156-33244 | 156-33245 |
| 1/2 | 1/2 | 2 | 4 | | | 0.030 | 4 | 156-43244 | 156-43245 |
| 1/2 | 1/2 | 2 | 4 | | | 0.060 | 4 | 156-63244 | 156-63245 |
| 1/2 | 1/2 | 1 | 6 | 2 3/8 | 0.480 | 0.030 | 4 | 156-43264 | 156-43265 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | | | 0.030 | 4 | 156-43614 | 156-43615 |

**Additional Sizes On Page 59 & 61**

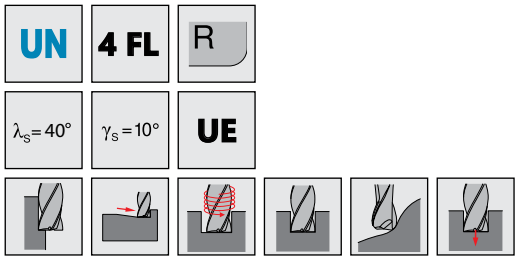
Application Range:

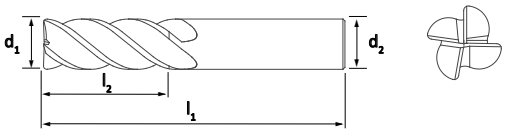
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | | |

Feeds & Speeds Available on Page 87-88

# Series 156

## 4 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | R Radius | Flutes | AlTiN | nACRo® |
|---|---|---|---|---|---|---|---|---|---|
| 5/8 | 5/8 | 7/8 | 3 | | | 0.030 | 4 | 156-44024 | 156-44025 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | | | 0.010 | 4 | 156-14014 | 156-14015 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | | | 0.030 | 4 | 156-44014 | 156-44015 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | | | 0.060 | 4 | 156-64014 | 156-64015 |
| 5/8 | 5/8 | 2-1/2 | 5 | | | 0.030 | 4 | 156-44044 | 156-44045 |
| 5/8 | 5/8 | 2-1/2 | 5 | | | 0.060 | 4 | 156-64044 | 156-64045 |
| 5/8 | 5/8 | 1-1/4 | 6 | 2 3/8 | 0.600 | 0.030 | 4 | 156-44064 | 156-44065 |
| 3/4 | 3/4 | 1 | 3 | | | 0.010 | 4 | 156-14824 | 156-14825 |
| 3/4 | 3/4 | 1 | 3 | | | 0.030 | 4 | 156-44824 | 156-44825 |
| 3/4 | 3/4 | 1 | 3 | | | 0.060 | 4 | 156-64824 | 156-64825 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 0.010 | 4 | 156-14814 | 156-14815 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 0.020 | 4 | 156-34814 | 156-34815 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 0.030 | 4 | 156-44814 | 156-44815 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 0.060 | 4 | 156-64814 | 156-64815 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 0.125 | 4 | 156-84814 | 156-84815 |
| 3/4 | 3/4 | 2-1/2 | 5 | | | 0.030 | 4 | 156-44834 | 156-44835 |
| 3/4 | 3/4 | 2-1/2 | 5 | | | 0.060 | 4 | 156-64834 | 156-64835 |
| 3/4 | 3/4 | 1-5/8 | 6 | 2 1/2 | 0.720 | 0.030 | 4 | 156-44864 | 156-44865 |
| 1 | 1 | 1-3/4 | 4 | | | 0.030 | 4 | 156-46414 | 156-46415 |
| 1 | 1 | 1-3/4 | 4 | | | 0.060 | 4 | 156-66414 | 156-66415 |
| 1 | 1 | 2-3/4 | 5 | | | 0.030 | 4 | 156-46434 | 156-46435 |
| 1 | 1 | 2-3/4 | 5 | | | 0.060 | 4 | 156-66434 | 156-66435 |
| 1 | 1 | 3-3/8 | 6 | | | 0.030 | 4 | 156-46444 | 156-46445 |
| 1 | 1 | 3-3/8 | 6 | | | 0.060 | 4 | 156-66444 | 156-66445 |

**Additional Sizes On Page 59 & 60**

Application Range:

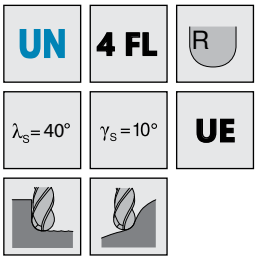
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | | |

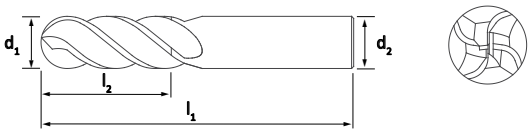
Feeds & Speeds Available on Page 87-88

PROMAX Premium

# Series 157

## 4 Flute Universal Ball






**Tolerances**

| | |
|---|---|
| Shank: | 1/8" - 1" = -.0001/-.0004 |
| Cutting Dia: | 1/8" - 1" = +.000/-.002 |
| Ball Radius: | 1/8" - 1" = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | R Radius | Flutes | AlTiN | nACRo® |
|---|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | | | 0.063 | 4 | 157-00824 | 157-00825 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | | | 0.063 | 4 | 157-00814 | 157-00815 |
| 5/32 | 3/16 | 1/2 | 2 | | | 0.078 | 4 | 157-01014 | 157-01015 |
| 3/16 | 3/16 | 3/8 | 2 | | | 0.094 | 4 | 157-01224 | 157-01225 |
| 3/16 | 3/16 | 5/8 | 2 | | | 0.094 | 4 | 157-01214 | 157-01215 |
| 7/32 | 1/4 | 3/8 | 2 | | | 0.109 | 4 | 157-01424 | 157-01425 |
| 7/32 | 1/4 | 3/4 | 2-1/2 | | | 0.109 | 4 | 157-01414 | 157-01415 |
| 1/4 | 1/4 | 3/8 | 2 | | | 0.125 | 4 | 157-01624 | 157-01625 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 0.125 | 4 | 157-01614 | 157-01615 |
| 1/4 | 1/4 | 3/4 | 4 | 2-1/8 | 0.240 | 0.125 | 4 | 157-01664 | 157-01665 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | | | 0.156 | 4 | 157-02024 | 157-02025 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | | | 0.156 | 4 | 157-02014 | 157-02015 |
| 3/8 | 3/8 | 5/8 | 2 | | | 0.188 | 4 | 157-02424 | 157-02425 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | | | 0.188 | 4 | 157-02414 | 157-02415 |
| 3/8 | 3/8 | 7/8 | 4 | 2-3/8 | 0.360 | 0.188 | 4 | 157-02464 | 157-02465 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | | | 0.250 | 4 | 157-03224 | 157-03225 |
| 1/2 | 1/2 | 1 | 3 | | | 0.250 | 4 | 157-03214 | 157-03215 |
| 1/2 | 1/2 | 1 | 6 | 2-3/8 | 0.480 | 0.250 | 4 | 157-03264 | 157-03265 |
| 1/2 | 1/2 | 1 | 6 | 3-3/8 | 0.480 | 0.250 | 4 | 157-03274 | 157-03275 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | | | 0.281 | 4 | 157-03614 | 157-03615 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | | | 0.313 | 4 | 157-04014 | 157-04015 |
| 5/8 | 5/8 | 1-1/4 | 6 | 3-3/8 | 0.600 | 0.313 | 4 | 157-04074 | 157-04075 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 0.375 | 4 | 157-04814 | 157-04815 |
| 1 | 1 | 1-3/4 | 4 | | | 0.500 | 4 | 157-06414 | 157-06415 |
| 1 | 1 | 2-3/4 | 5 | | | 0.500 | 4 | 157-06434 | 157-06435 |
| 1 | 1 | 1-7/8 | 6 | 3-3/8 | 0.960 | 0.500 | 4 | 157-06474 | 157-06475 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | | |

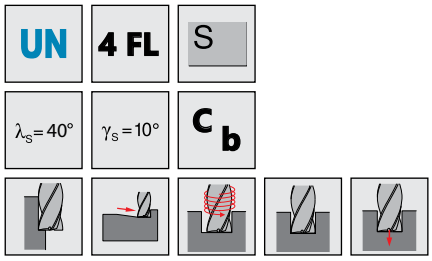
Feeds & Speeds Available on Page 88-89

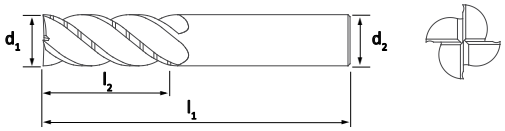


PROMAX Premium

# Series 190

## 4 Flute Universal Multi-Geometry






**Tolerances**

Shank: 3/16” - 1” = -.0001/-.0004

Cutting Dia: 3/16” - 1” = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | Flutes | AlTiN | nACRo® |
|---|---|---|---|---|---|---|---|---|
| 3/16 | 3/16 | 5/8 | 2 | | | 4 | 190-01214 | 190-01215 |
| 1/4 | 1/4 | 3/8 | 2 | | | 4 | 190-01624 | 190-01625 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 4 | 190-01614 | 190-01615 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | | | 4 | 190-02014 | 190-02015 |
| 3/8 | 3/8 | 5/8 | 2 | | | 4 | 190-02424 | 190-02425 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | | | 4 | 190-02414 | 190-02415 |
| 3/8 | 3/8 | 7/8 | 4 | 2-1/8 | 0.360 | 4 | 190-02464 | 190-02465 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | | | 4 | 190-03224 | 190-03225 |
| 1/2 | 1/2 | 1-1/4 | 3 | | | 4 | 190-03214 | 190-03215 |
| 1/2 | 1/2 | 2 | 4 | | | 4 | 190-03234 | 190-03235 |
| 1/2 | 1/2 | 1 | 6 | 2-3/8 | 0.480 | 4 | 190-03264 | 190-03265 |
| 5/8 | 5/8 | 7/8 | 3 | | | 4 | 190-04024 | 190-04025 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | | | 4 | 190-04014 | 190-04015 |
| 3/4 | 3/4 | 1 | 3 | | | 4 | 190-04824 | 190-04825 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 4 | 190-04814 | 190-04815 |
| 1 | 1 | 1-3/4 | 4 | | | 4 | 190-06414 | 190-06415 |

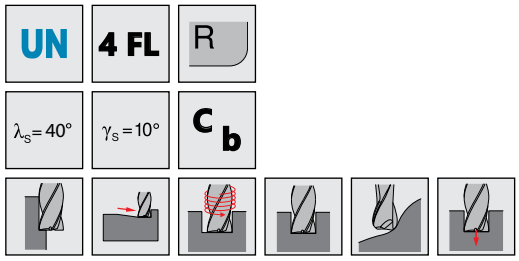
Application Range:

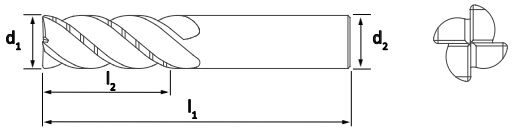
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | ● | ● | ● | ● | | | | |

Feeds & Speeds Available on Page 89

# Series 191

## 4 Flute Universal Multi-Geometry Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 3/16” - 1” = -.0001/-.0004 |
| Cutting Dia: | 3/16” - 1” = +.000/-.002 |
| Radius: | 3/16” - 1” = +.002/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | AlTiN | nACRo® |
|---|---|---|---|---|---|---|---|
| 3/16 | 3/16 | 5/8 | 2 | 0.010 | 4 | 191-11214 | 191-11215 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.020 | 4 | 191-31614 | 191-31615 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.020 | 4 | 191-32014 | 191-32015 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.030 | 4 | 191-42014 | 191-42015 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.020 | 4 | 191-32414 | 191-32415 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.030 | 4 | 191-42414 | 191-42415 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.020 | 4 | 191-33224 | 191-33225 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.030 | 4 | 191-43224 | 191-43225 |
| 1/2 | 1/2 | 1-1/4 | 3 | 0.020 | 4 | 191-33214 | 191-33215 |
| 1/2 | 1/2 | 1-1/4 | 3 | 0.030 | 4 | 191-43214 | 191-43215 |
| 1/2 | 1/2 | 2 | 4 | 0.020 | 4 | 191-33234 | 191-33235 |
| 1/2 | 1/2 | 2 | 4 | 0.030 | 4 | 191-43234 | 191-43235 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.030 | 4 | 191-44014 | 191-44015 |
| 3/4 | 3/4 | 1-5/8 | 4 | 0.030 | 4 | 191-44814 | 191-44815 |
| 1 | 1 | 1-3/4 | 4 | 0.030 | 4 | 191-46414 | 191-46415 |

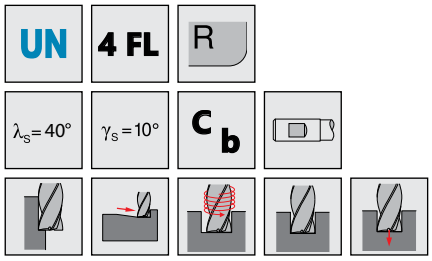
Application Range:

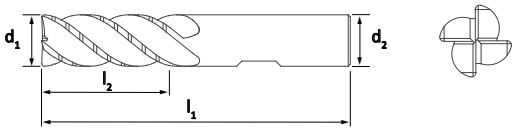
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | ● | ● | ● | ● | | | | |

Feeds & Speeds Available on Page 89

# Series 120

## 4 Flute Universal Rougher-Finisher






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.003 |
| Radius: | 1/8” - 1” = +.002/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | R Radius | Flutes | TiCN | AlTiN | nACRo® |
|---|---|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | | | 0.010 | 4 | 120-00822 | 120-00824 | 120-00825 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | | | 0.010 | 4 | 120-00812 | 120-00814 | 120-00815 |
| 5/32 | 3/16 | 3/8 | 2 | | | 0.010 | 4 | 120-01022 | 120-01024 | 120-01025 |
| 5/32 | 3/16 | 1/2 | 2 | | | 0.010 | 4 | 120-01012 | 120-01014 | 120-01015 |
| 3/16 | 3/16 | 3/8 | 2 | | | 0.010 | 4 | 120-01222 | 120-01224 | 120-01225 |
| 3/16 | 3/16 | 5/8 | 2 | | | 0.010 | 4 | 120-01212 | 120-01214 | 120-01215 |
| 7/32 | 1/4 | 3/8 | 2 | | | 0.020 | 4 | 120-01422 | 120-01424 | 120-01425 |
| 7/32 | 1/4 | 3/4 | 2-1/2 | | | 0.020 | 4 | 120-01412 | 120-01414 | 120-01415 |
| 1/4 | 1/4 | 3/8 | 2 | | | 0.020 | 4 | 120-01622 | 120-01624 | 120-01625 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 0.020 | 4 | 120-01612 | 120-01614 | 120-01615 |
| 1/4 | 1/4 | 1-1/4 | 3 | | | 0.020 | 4 | 120-01632 | 120-01634 | 120-01635 |
| 1/4 | 1/4 | 1-1/2 | 3-1/2 | | | 0.020 | 4 | 120-01642 | 120-01644 | 120-01645 |
| 1/4 | 1/4 | 3/4 | 4 | 2-1/8 | 0.240 | 0.020 | 4 | 120-01662 | 120-01664 | 120-01665 |
| 9/32 | 5/16 | 1/2 | 2-1/2 | | | 0.020 | 4 | 120-01822 | 120-01824 | 120-01825 |
| 9/32 | 5/16 | 3/4 | 2-1/2 | | | 0.020 | 4 | 120-01812 | 120-01814 | 120-01815 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | | | 0.020 | 4 | 120-02022 | 120-02024 | 120-02025 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | | | 0.020 | 4 | 120-02012 | 120-02014 | 120-02015 |
| 11/32 | 3/8 | 5/8 | 2 | | | 0.020 | 4 | 120-02222 | 120-02224 | 120-02225 |
| 11/32 | 3/8 | 7/8 | 2-1/2 | | | 0.020 | 4 | 120-02212 | 120-02214 | 120-02215 |
| 3/8 | 3/8 | 5/8 | 2 | | | 0.020 | 4 | 120-02422 | 120-02424 | 120-02425 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | | | 0.020 | 4 | 120-02412 | 120-02414 | 120-02415 |
| 3/8 | 3/8 | 1-1/2 | 3-1/2 | | | 0.020 | 4 | 120-02432 | 120-02434 | 120-02435 |
| 3/8 | 3/8 | 7/8 | 4 | 2-1/8 | 0.360 | 0.020 | 4 | 120-02462 | 120-02464 | 120-02465 |
| 3/8 | 3/8 | 2 | 4 | | | 0.020 | 4 | 120-02442 | 120-02444 | 120-02445 |
| 3/8 | 3/8 | 7/8 | 6 | 3-3/8 | 0.360 | 0.020 | 4 | 120-02472 | 120-02474 | 120-02475 |
| 7/16 | 7/16 | 1 | 2-3/4 | | | 0.020 | 4 | 120-02812 | 120-02814 | 120-02815 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | | | 0.020 | 4 | 120-03222 | 120-03224 | 120-03225 |

**Additional Sizes On Page 66**

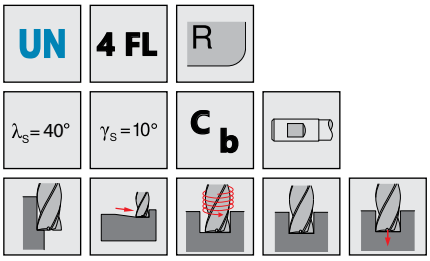
Application Range:

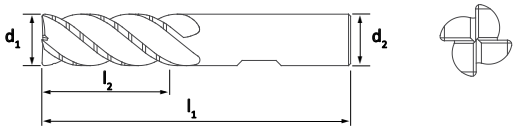
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | | |

Feeds & Speeds Available on Page 90

# Series 120

## 4 Flute Universal Rougher-Finisher






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.003 |
| Radius: | 1/8” - 1” = +.002/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | R Radius | Flutes | TiCN | AlTiN | nACRo® |
|---|---|---|---|---|---|---|---|---|---|---|
| 1/2 | 1/2 | 1-1/4 | 3 | | | 0.020 | 4 | 120-03212 | 120-03214 | 120-03215 |
| 1/2 | 1/2 | 1-1/2 | 3-1/2 | | | 0.020 | 4 | 120-03232 | 120-03234 | 120-03235 |
| 1/2 | 1/2 | 2 | 4 | | | 0.020 | 4 | 120-03242 | 120-03244 | 120-03245 |
| 1/2 | 1/2 | 1 | 6 | 2-3/8 | 0.480 | 0.020 | 4 | 120-03262 | 120-03264 | 120-03265 |
| 1/2 | 1/2 | 1 | 6 | 3-3/8 | 0.480 | 0.020 | 4 | 120-03272 | 120-03274 | 120-03275 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | | | 0.030 | 4 | 120-03612 | 120-03614 | 120-03615 |
| 5/8 | 5/8 | 7/8 | 3 | | | 0.030 | 4 | 120-04022 | 120-04024 | 120-04025 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | | | 0.030 | 4 | 120-04012 | 120-04014 | 120-04015 |
| 5/8 | 5/8 | 1-3/4 | 4 | | | 0.030 | 4 | 120-04032 | 120-04034 | 120-04035 |
| 5/8 | 5/8 | 2-1/2 | 5 | | | 0.030 | 4 | 120-04042 | 120-04044 | 120-04045 |
| 3/4 | 3/4 | 1 | 3 | | | 0.030 | 4 | 120-04822 | 120-04824 | 120-04825 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 0.030 | 4 | 120-04812 | 120-04814 | 120-04815 |
| 3/4 | 3/4 | 1-5/8 | 6 | 2-1/2 | 0.720 | 0.030 | 4 | 120-04862 | 120-04864 | 120-04865 |
| 1 | 1 | 1-3/4 | 4 | | | 0.030 | 4 | 120-06412 | 120-06414 | 120-06415 |

**Additional Sizes On Page 65**

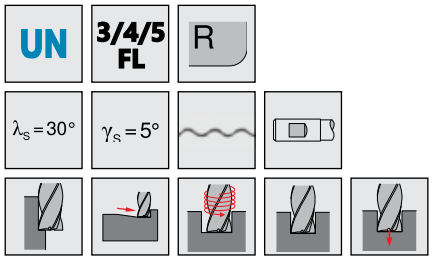
Application Range:

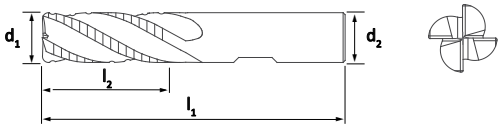
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | ● | ● | ● | | | | |

Feeds & Speeds Available on Page 90

# Series 100

## Multi Flute Universal






**Tolerances**

| | |
|---|---|
| Shank: | 3/16” - 1” = -.0001/-.0004 |
| Cutting Dia: | 3/16” - 1” = +.000/-.005 |
| Radius: | 3/16” - 1” = +/-.005 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 3/16 | 3/16 | 3/8 | 2 | 0.030 | 3 | 100-01222 | 100-01224 |
| 3/16 | 3/16 | 5/8 | 2 | 0.030 | 3 | 100-01212 | 100-01214 |
| 1/4 | 1/4 | 3/8 | 2 | 0.045 | 4 | 100-01622 | 100-01624 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.045 | 4 | 100-01612 | 100-01614 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | 0.045 | 4 | 100-02022 | 100-02024 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.045 | 4 | 100-02012 | 100-02014 |
| 3/8 | 3/8 | 5/8 | 2 | 0.060 | 4 | 100-02422 | 100-02424 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.060 | 4 | 100-02412 | 100-02414 |
| 7/16 | 7/16 | 1 | 2-3/4 | 0.060 | 4 | 100-02812 | 100-02814 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.060 | 4 | 100-03222 | 100-03224 |
| 1/2 | 1/2 | 1-1/4 | 3 | 0.060 | 4 | 100-03212 | 100-03214 |
| 1/2 | 1/2 | 1-1/2 | 3-1/2 | 0.060 | 4 | 100-03232 | 100-03234 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | 0.060 | 4 | 100-03612 | 100-03614 |
| 5/8 | 5/8 | 7/8 | 3 | 0.060 | 4 | 100-04022 | 100-04024 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.060 | 4 | 100-04012 | 100-04014 |
| 5/8 | 5/8 | 2 | 4 | 0.060 | 4 | 100-04032 | 100-04034 |
| 3/4 | 3/4 | 1 | 3 | 0.060 | 4 | 100-04822 | 100-04824 |
| 3/4 | 3/4 | 1-5/8 | 4 | 0.060 | 4 | 100-04812 | 100-04814 |
| 3/4 | 3/4 | 2-1/4 | 5 | 0.060 | 4 | 100-04832 | 100-04834 |
| 1 | 1 | 1-3/4 | 4 | 0.060 | 5 | 100-06412 | 100-06414 |
| 1 | 1 | 2-5/8 | 5 | 0.060 | 5 | 100-06432 | 100-06434 |

Application Range:

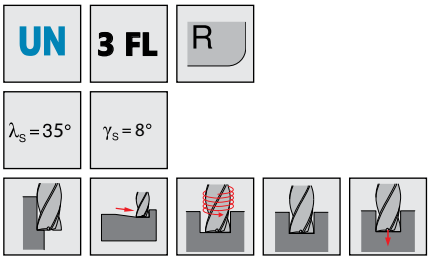
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | ● | | | ● | | | | |

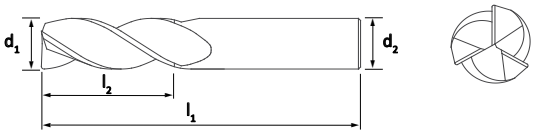
Feeds & Speeds Available on Page 90-91

PROMAX Premium

# Series 106

## 3 Flute Universal






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 3/4” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 3/4” = +.000/-.002 |
| Radius: | 1/8” - 3/4” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | R Radius | Flutes | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | | | 0.010 | 3 | 106-00822 | 106-00824 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | | | 0.010 | 3 | 106-00812 | 106-00814 |
| 5/32 | 3/16 | 5/16 | 2 | | | 0.010 | 3 | 106-01022 | 106-01024 |
| 3/16 | 3/16 | 5/16 | 2 | | | 0.010 | 3 | 106-01222 | 106-01224 |
| 3/16 | 3/16 | 5/8 | 2 | | | 0.010 | 3 | 106-01212 | 106-01214 |
| 1/4 | 1/4 | 3/8 | 2 | | | 0.020 | 3 | 106-01622 | 106-01624 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 0.020 | 3 | 106-01612 | 106-01614 |
| 1/4 | 1/4 | 3/8 | 4 | 2-1/8 | 0.240 | 0.020 | 3 | 106-01662 | 106-01664 |
| 5/16 | 5/16 | 13/16 | 2-1/2 | | | 0.020 | 3 | 106-02012 | 106-02014 |
| 3/8 | 3/8 | 1/2 | 2 | | | 0.020 | 3 | 106-02422 | 106-02424 |
| 3/8 | 3/8 | 1 | 2-1/2 | | | 0.020 | 3 | 106-02412 | 106-02414 |
| 3/8 | 3/8 | 1/2 | 6 | 2-1/8 | 0.360 | 0.020 | 3 | 106-02462 | 106-02464 |
| 7/16 | 7/16 | 1 | 2-3/4 | | | 0.020 | 3 | 106-02812 | 106-02814 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | | | 0.020 | 3 | 106-03222 | 106-03224 |
| 1/2 | 1/2 | 1-1/4 | 3 | | | 0.020 | 3 | 106-03212 | 106-03214 |
| 1/2 | 1/2 | 5/8 | 6 | 2-3/8 | 0.480 | 0.020 | 3 | 106-03262 | 106-03264 |
| 5/8 | 5/8 | 1-5/8 | 3-1/2 | | | 0.030 | 3 | 106-04012 | 106-04014 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 0.030 | 3 | 106-04812 | 106-04814 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | | | |

Feeds & Speeds Available on Page 91



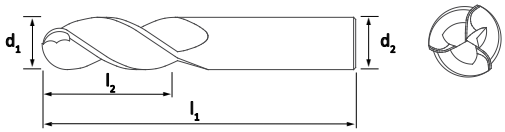
PROMAX Premium

# Series 113

## 3 Flute Universal Ball

UN | 3 FL | R

$\lambda_S = 35°$ | $\gamma_S = 8°$




**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Ball Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | R Radius | Flutes | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | | | 0.063 | 3 | 113-00822 | 113-00824 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | | | 0.063 | 3 | 113-00812 | 113-00814 |
| 3/16 | 3/16 | 5/8 | 2 | | | 0.094 | 3 | 113-01212 | 113-01214 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | | | 0.125 | 3 | 113-01612 | 113-01614 |
| 1/4 | 1/4 | 3/8 | 4 | 2-1/8 | 0.240 | 0.125 | 3 | 113-01662 | 113-01664 |
| 5/16 | 5/16 | 13/16 | 2-1/2 | | | 0.156 | 3 | 113-02012 | 113-02014 |
| 5/16 | 5/16 | 7/16 | 4 | 2-1/8 | 0.300 | 0.156 | 3 | 113-02062 | 113-02064 |
| 3/8 | 3/8 | 1 | 2-1/2 | | | 0.188 | 3 | 113-02412 | 113-02414 |
| 3/8 | 3/8 | 1/2 | 6 | 2-1/8 | 0.360 | 0.188 | 3 | 113-02462 | 113-02464 |
| 3/8 | 3/8 | 1/2 | 6 | 3-3/8 | 0.360 | 0.188 | 3 | 113-02472 | 113-02474 |
| 1/2 | 1/2 | 1-1/4 | 3 | | | 0.250 | 3 | 113-03212 | 113-03214 |
| 1/2 | 1/2 | 5/8 | 6 | 2-3/8 | 0.480 | 0.250 | 3 | 113-03262 | 113-03264 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | | | 0.313 | 3 | 113-04012 | 113-04014 |
| 3/4 | 3/4 | 1-5/8 | 4 | | | 0.375 | 3 | 113-04812 | 113-04814 |
| 1 | 1 | 1-3/4 | 4 | | | 0.500 | 3 | 113-06412 | 113-06414 |

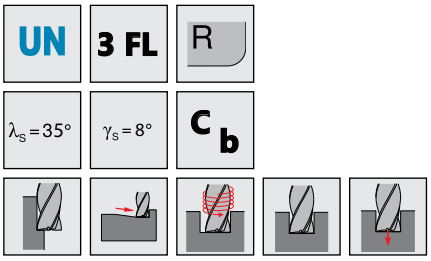
Application Range:

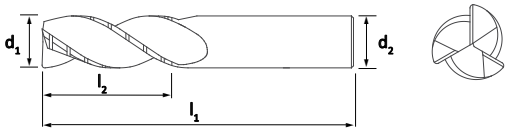
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | | | |

Feeds & Speeds Available on Page 92

# Series 117

## 3 Flute Universal Rougher-Finisher






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 3/4” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 3/4” = +.000/-.002 |
| Radius: | 1/8” - 3/4” = +.002/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.010 | 3 | 117-00812 | 117-00814 |
| 3/16 | 3/16 | 5/16 | 2 | 0.010 | 3 | 117-01222 | 117-01224 |
| 3/16 | 3/16 | 5/8 | 2 | 0.010 | 3 | 117-01212 | 117-01214 |
| 1/4 | 1/4 | 3/8 | 2 | 0.020 | 3 | 117-01622 | 117-01624 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.020 | 3 | 117-01612 | 117-01614 |
| 5/16 | 5/16 | 13/16 | 2-1/2 | 0.020 | 3 | 117-02012 | 117-02014 |
| 3/8 | 3/8 | 1 | 2-1/2 | 0.020 | 3 | 117-02412 | 117-02414 |
| 7/16 | 7/16 | 5/8 | 2-3/4 | 0.020 | 3 | 117-02822 | 117-02824 |
| 7/16 | 7/16 | 1 | 2-3/4 | 0.020 | 3 | 117-02812 | 117-02814 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.020 | 3 | 117-03222 | 117-03224 |
| 1/2 | 1/2 | 1-1/4 | 3 | 0.020 | 3 | 117-03212 | 117-03214 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.030 | 3 | 117-04012 | 117-04014 |
| 3/4 | 3/4 | 1-5/8 | 4 | 0.030 | 3 | 117-04812 | 117-04814 |

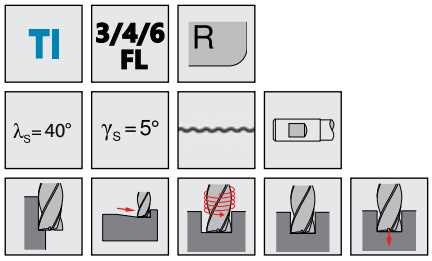
Application Range:

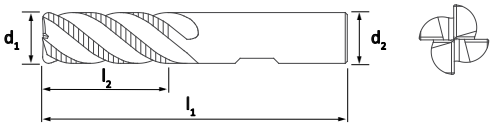
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | | | |

Feeds & Speeds Available on Page 92

# Series 101

## Multi Flute Titanium Rougher






**Tolerances**

| | |
|---|---|
| Shank: | 3/16” - 1” = -.0001/-.0004 |
| Cutting Dia: | 3/16” - 1” = +.000/-.005 |
| Radius: | 3/16” - 1” = +/-.005 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | TiCN | AlTiN | nACRo® |
|---|---|---|---|---|---|---|---|---|
| 3/16 | 3/16 | 3/8 | 2 | 0.030 | 3 | 101-01222 | 101-01224 | 101-01225 |
| 3/16 | 3/16 | 5/8 | 2 | 0.030 | 3 | 101-01212 | 101-01214 | 101-01215 |
| 1/4 | 1/4 | 3/8 | 2 | 0.045 | 4 | 101-01622 | 101-01624 | 101-01625 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.045 | 4 | 101-01612 | 101-01614 | 101-01615 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | 0.045 | 4 | 101-02022 | 101-02024 | 101-02025 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.045 | 4 | 101-02012 | 101-02014 | 101-02015 |
| 3/8 | 3/8 | 5/8 | 2 | 0.060 | 4 | 101-02422 | 101-02424 | 101-02425 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.060 | 4 | 101-02412 | 101-02414 | 101-02415 |
| 7/16 | 7/16 | 1 | 2-3/4 | 0.060 | 4 | 101-02812 | 101-02814 | 101-02815 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.060 | 4 | 101-03222 | 101-03224 | 101-03225 |
| 1/2 | 1/2 | 1-1/4 | 3 | 0.060 | 4 | 101-03212 | 101-03214 | 101-03215 |
| 1/2 | 1/2 | 1-1/2 | 3-1/2 | 0.060 | 4 | 101-03232 | 101-03234 | 101-03235 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | 0.060 | 4 | 101-03612 | 101-03614 | 101-03615 |
| 5/8 | 5/8 | 7/8 | 3 | 0.060 | 4 | 101-04022 | 101-04024 | 101-04025 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.060 | 4 | 101-04012 | 101-04014 | 101-04015 |
| 5/8 | 5/8 | 2 | 4 | 0.060 | 4 | 101-04032 | 101-04034 | 101-04035 |
| 3/4 | 3/4 | 1 | 3 | 0.060 | 4 | 101-04822 | 101-04824 | 101-04825 |
| 3/4 | 3/4 | 1-5/8 | 4 | 0.060 | 4 | 101-04812 | 101-04814 | 101-04815 |
| 3/4 | 3/4 | 2-1/4 | 5 | 0.060 | 4 | 101-04832 | 101-04834 | 101-04835 |
| 1 | 1 | 1-3/4 | 4 | 0.060 | 6 | 101-06412 | 101-06414 | 101-06415 |
| 1 | 1 | 2-5/8 | 5 | 0.060 | 6 | 101-06432 | 101-06434 | 101-06435 |

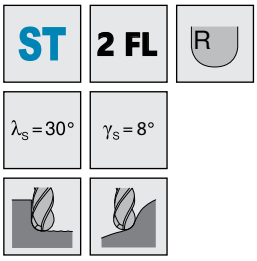
Application Range:

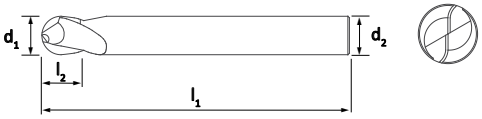
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | ● | | ● | ● | ● | | | | | |

Feeds & Speeds Available on Page 93

# Series 250

## 2 Flute 0° Die and Mold Tool Ball






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1/2” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1/2” = +.000/-.0008 |
| Ball Radius: | 1/8” - 1/2” = +.000/-.0004 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | AlTiN |
|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/8 | 3 | 0.063 | 2 | 250-00814 |
| 3/16 | 3/16 | 3/16 | 3 | 0.094 | 2 | 250-01214 |
| 1/4 | 1/4 | 1/4 | 4 | 0.125 | 2 | 250-01614 |
| 3/8 | 3/8 | 3/8 | 4 | 0.188 | 2 | 250-02414 |
| 3/8 | 3/8 | 3/8 | 6 | 0.188 | 2 | 250-02444 |
| 1/2 | 1/2 | 1/2 | 4 | 0.250 | 2 | 250-03214 |
| 1/2 | 1/2 | 1/2 | 6 | 0.250 | 2 | 250-03244 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | | | | | | | |

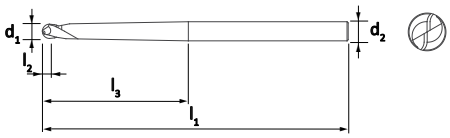
Feeds & Speeds Available on Page 93

# Series 251

## 2 Flute 1° Die and Mold Tool Ball

ST | 2 FL | R

$\lambda_S = 30°$ | $\gamma_S = 8°$




**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 3/16” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 3/16” = +.000/-.0008 |
| Ball Radius: | 1/32” - 3/16” = +.000/-.0004 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | R Radius | Flutes | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/32 | 1/4 | 1/32 | 4 | 0.625 | 0.016 | 2 | 251-00214 |
| 0.06 | 1/4 | .060 | 4 | 1.250 | 0.030 | 2 | 251-00414 |
| 0.06 | 1/4 | .080 | 4 | 1.625 | 0.040 | 2 | 251-00514 |
| 3/32 | 1/4 | 3/32 | 4 | 1.875 | 0.047 | 2 | 251-00614 |
| 1/8 | 1/4 | 1/8 | 4 | 2.500 | 0.063 | 2 | 251-00814 |
| 3/16 | 1/4 | 3/16 | 4 | 2.265 | 0.094 | 2 | 251-01214 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | | | | | | | |

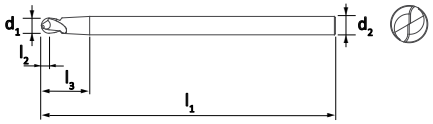
Feeds & Speeds Available on Page 94

# Series 252

## 2 Flute 3° Die and Mold Tool Ball

ST | 2 FL | R

$\lambda_S = 30°$ | $\gamma_S = 8°$




**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 3/16” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 3/16” = +.000/-.0008 |
| Ball Radius: | 1/32” - 3/16” = +.000/-.0004 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | R Radius | Flutes | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/32 | 1/4 | 1/32 | 4 | 2.112 | 0.016 | 2 | 252-00214 |
| 0.06 | 1/4 | .060 | 4 | 1.875 | 0.030 | 2 | 252-00414 |
| 0.06 | 1/4 | .080 | 4 | 1.704 | 0.040 | 2 | 252-00514 |
| 3/32 | 1/4 | 3/32 | 4 | 1.584 | 0.047 | 2 | 252-00614 |
| 1/8 | 1/4 | 1/8 | 4 | 1.324 | 0.063 | 2 | 252-00814 |
| 3/16 | 1/4 | 3/16 | 4 | 0.786 | 0.094 | 2 | 252-01214 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | | | | | | | |

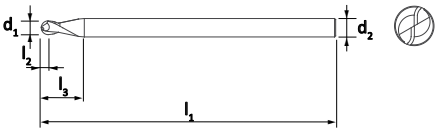
Feeds & Speeds Available on Page 94

# Series 253

## 2 Flute 5° Die and Mold Tool Ball

ST | 2 FL | R

$\lambda_S = 30°$ | $\gamma_S = 8°$




**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 3/16” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 3/16” = +.000/-.0008 |
| Ball Radius: | 1/32” - 3/16” = +.000/-.0004 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | R Radius | Flutes | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/32 | 1/4 | 1/32 | 4 | 1.282 | 0.016 | 2 | 253-00214 |
| 0.06 | 1/4 | .060 | 4 | 1.175 | 0.030 | 2 | 253-00414 |
| 0.06 | 1/4 | .080 | 4 | 1.084 | 0.040 | 2 | 253-00514 |
| 3/32 | 1/4 | 3/32 | 4 | 1.018 | 0.047 | 2 | 253-00614 |
| 1/8 | 1/4 | 1/8 | 4 | 0.897 | 0.063 | 2 | 253-00814 |
| 3/16 | 1/4 | 3/16 | 4 | 0.680 | 0.094 | 2 | 253-01214 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | | | | | | | |

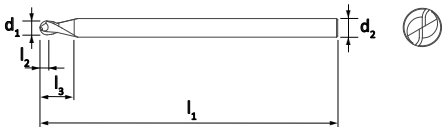
Feeds & Speeds Available on Page 94

# Series 254

## 2 Flute 8° Die and Mold Tool Ball

ST | 2 FL | R

$\lambda_S = 30°$ | $\gamma_S = 8°$




**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 3/16” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 3/16” = +.000/-.0008 |
| Ball Radius: | 1/32” - 3/16” = +.000/-.0004 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | R Radius | Flutes | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/32 | 1/4 | 1/32 | 4 | 0.851 | 0.016 | 2 | 254-00214 |
| 0.06 | 1/4 | .060 | 4 | 0.773 | 0.030 | 2 | 254-00414 |
| 0.06 | 1/4 | .080 | 4 | 0.726 | 0.040 | 2 | 254-00514 |
| 3/32 | 1/4 | 3/32 | 4 | 0.690 | 0.047 | 2 | 254-00614 |
| 1/8 | 1/4 | 1/8 | 4 | 0.636 | 0.063 | 2 | 254-00814 |
| 3/16 | 1/4 | 3/16 | 4 | 0.454 | 0.094 | 2 | 254-01214 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | | | | | | | |

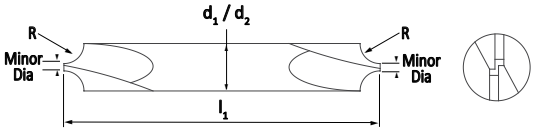
Feeds & Speeds Available on Page 94

# Series 137

## 2 Flute Corner Rounder

UN | 2 FL | R

$\gamma_S = -5°$




**Tolerances**

Shank: 1/8” - 3/8” = -.0001/-.0004
Radius: 1/8” - 3/8” = +/-.001

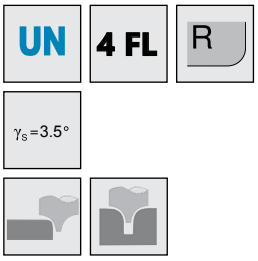
| $d_1$ Dia | $d_2$ Shank | $l_1$ OAL | Minor Dia | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1-1/2 | 0.105 | 0.010 | 2 | 137-00810 | 137-00812 | 137-00814 |
| 1/8 | 1/8 | 1-1/2 | 0.095 | 0.015 | 2 | 137-00820 | 137-00822 | 137-00824 |
| 1/8 | 1/8 | 1-1/2 | 0.085 | 0.020 | 2 | 137-00830 | 137-00832 | 137-00834 |
| 1/8 | 1/8 | 1-1/2 | 0.075 | 0.025 | 2 | 137-00840 | 137-00842 | 137-00844 |
| 1/8 | 1/8 | 1-1/2 | 0.063 | 0.031 | 2 | 137-00850 | 137-00852 | 137-00854 |
| 1/8 | 1/8 | 1-1/2 | 0.055 | 0.035 | 2 | 137-00860 | 137-00862 | 137-00864 |
| 1/8 | 1/8 | 1-1/2 | 0.045 | 0.040 | 2 | 137-00870 | 137-00872 | 137-00874 |
| 3/16 | 3/16 | 2 | 0.095 | 0.046 | 2 | 137-01210 | 137-01212 | 137-01214 |
| 3/16 | 3/16 | 2 | 0.087 | 0.050 | 2 | 137-01220 | 137-01222 | 137-01224 |
| 3/16 | 3/16 | 2 | 0.077 | 0.055 | 2 | 137-01230 | 137-01232 | 137-01234 |
| 3/16 | 3/16 | 2 | 0.058 | 0.062 | 2 | 137-01240 | 137-01242 | 137-01244 |
| 1/4 | 1/4 | 2-1/2 | 0.106 | 0.072 | 2 | 137-01610 | 137-01612 | 137-01614 |
| 1/4 | 1/4 | 2-1/2 | 0.094 | 0.078 | 2 | 137-01620 | 137-01622 | 137-01624 |
| 1/4 | 1/4 | 2-1/2 | 0.080 | 0.085 | 2 | 137-01630 | 137-01632 | 137-01634 |
| 1/4 | 1/4 | 2-1/2 | 0.062 | 0.094 | 2 | 137-01640 | 137-01642 | 137-01644 |
| 1/4 | 1/4 | 2-1/2 | 0.050 | 0.100 | 2 | 137-01650 | 137-01652 | 137-01654 |
| 5/16 | 5/16 | 2-1/2 | 0.094 | 0.109 | 2 | 137-02010 | 137-02012 | 137-02014 |
| 5/16 | 5/16 | 2-1/2 | 0.076 | 0.118 | 2 | 137-02020 | 137-02022 | 137-02024 |
| 5/16 | 5/16 | 2-1/2 | 0.063 | 0.125 | 2 | 137-02030 | 137-02032 | 137-02034 |
| 3/8 | 3/8 | 2-1/2 | 0.095 | 0.140 | 2 | 137-02410 | 137-02412 | 137-02414 |
| 3/8 | 3/8 | 2-1/2 | 0.063 | 0.156 | 2 | 137-02420 | 137-02422 | 137-02424 |

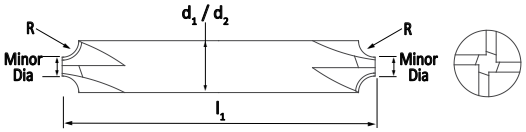
Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | | | | | | | |

# Series 139

## 4 Flute Corner Rounder






**Tolerances**

Shank: 3/16” - 1/2” = -.0001/-.0004
Radius: 3/16” - 1/2” = +/-.001

| $d_1$ Dia | $d_2$ Shank | $l_1$ OAL | Minor Dia | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 3/16 | 3/16 | 2 | 0.162 | 0.010 | 4 | 139-01200 | 139-01202 | 139-01204 |
| 3/16 | 3/16 | 2 | 0.152 | 0.015 | 4 | 139-01210 | 139-01212 | 139-01214 |
| 3/16 | 3/16 | 2 | 0.142 | 0.020 | 4 | 139-01220 | 139-01222 | 139-01224 |
| 3/16 | 3/16 | 2 | 0.132 | 0.025 | 4 | 139-01230 | 139-01232 | 139-01234 |
| 3/16 | 3/16 | 2 | 0.120 | 0.031 | 4 | 139-01240 | 139-01242 | 139-01244 |
| 3/16 | 3/16 | 2 | 0.112 | 0.035 | 4 | 139-01250 | 139-01252 | 139-01254 |
| 1/4 | 1/4 | 2-1/2 | 0.165 | 0.040 | 4 | 139-01600 | 139-01602 | 139-01604 |
| 1/4 | 1/4 | 2-1/2 | 0.153 | 0.046 | 4 | 139-01610 | 139-01612 | 139-01614 |
| 1/4 | 1/4 | 2-1/2 | 0.145 | 0.050 | 4 | 139-01620 | 139-01622 | 139-01624 |
| 1/4 | 1/4 | 2-1/2 | 0.135 | 0.055 | 4 | 139-01640 | 139-01642 | 139-01644 |
| 1/4 | 1/4 | 2-1/2 | 0.121 | 0.062 | 4 | 139-01630 | 139-01632 | 139-01634 |
| 3/8 | 3/8 | 2-1/2 | 0.214 | 0.078 | 4 | 139-02400 | 139-02402 | 139-02404 |
| 3/8 | 3/8 | 2-1/2 | 0.182 | 0.094 | 4 | 139-02410 | 139-02412 | 139-02414 |
| 3/8 | 3/8 | 2-1/2 | 0.170 | 0.100 | 4 | 139-02420 | 139-02422 | 139-02424 |
| 3/8 | 3/8 | 2-1/2 | 0.134 | 0.118 | 4 | 139-02430 | 139-02432 | 139-02434 |
| 3/8 | 3/8 | 2-1/2 | 0.120 | 0.125 | 4 | 139-02440 | 139-02442 | 139-02444 |
| 1/2 | 1/2 | 3 | 0.183 | 0.156 | 4 | 139-03200 | 139-03202 | 139-03204 |

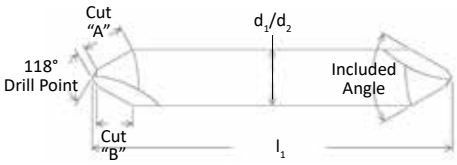
Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | | ● | | | | | | | |

# Series 132 & 133

## 2 & 4 Flute 60° Chamfer-Spot

UN | 2 FL | 4 FL




**Tolerances**
Shank: 1/8" - 1/2" = -.0001/-.0004

| $d_1$ Dia | $d_2$ Shank | $l_1$ OAL | Included Angle | Cut "A" | Cut "B" | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|---|
| * 1/8 | 1/8 | 1-1/2 | 60° | 0.098 | 0.085 | 2 | 132-00820 | 132-00822 | 132-00824 |
| * 3/16 | 3/16 | 2 | 60° | 0.147 | 0.127 | 2 | 132-01220 | 132-01222 | 132-01224 |
| 1/4 | 1/4 | 2-1/2 | 60° | 0.200 | 0.173 | 2 | 132-01520 | 132-01522 | 132-01524 |
| 3/8 | 3/8 | 2-1/2 | 60° | 0.313 | 0.271 | 2 | 132-02420 | 132-02422 | 132-02424 |
| 1/2 | 1/2 | 3 | 60° | 0.430 | 0.372 | 2 | 132-03220 | 132-03222 | 132-03224 |

* No Drill Point
Standard with 118° Drill Point

| $d_1$ Dia | $d_2$ Shank | $l_1$ OAL | Included Angle | Cut "A" | Cut "B" | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|---|
| 1/4 | 1/4 | 2-1/2 | 60° | 0.200 | 0.173 | 4 | 133-01520 | 133-01522 | 133-01524 |
| 3/8 | 3/8 | 2-1/2 | 60° | 0.313 | 0.271 | 4 | 133-02420 | 133-02422 | 133-02424 |
| 1/2 | 1/2 | 3 | 60° | 0.430 | 0.372 | 4 | 133-03220 | 133-03222 | 133-03224 |

Standard with 118° Drill Point

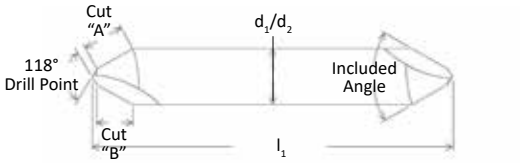
Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

# Series 134 & 135

## 2 & 4 Flute 90° Chamfer-Spot

UN | 2 FL | 4 FL




**Tolerances**
Shank: 1/8" - 1/2" = -.0001/-.0004

| $d_1$ Dia | $d_2$ Shank | $l_1$ OAL | Included Angle | Cut "A" | Cut "B" | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|---|
| * 1/8 | 1/8 | 1-1/2 | 90° | 0.071 | 0.050 | 2 | 134-00830 | 134-00832 | 134-00834 |
| * 3/16 | 3/16 | 2 | 90° | 0.107 | 0.076 | 2 | 134-01230 | 134-01232 | 134-01234 |
| 1/4 | 1/4 | 2-1/2 | 90° | 0.141 | 0.100 | 2 | 134-01530 | 134-01532 | 134-01534 |
| 3/8 | 3/8 | 2-1/2 | 90° | 0.221 | 0.157 | 2 | 134-02430 | 134-02432 | 134-02434 |
| 1/2 | 1/2 | 3 | 90° | 0.304 | 0.215 | 2 | 134-03230 | 134-03232 | 134-03234 |

* No Drill Point
Standard with 118° Drill Point

| $d_1$ Dia | $d_2$ Shank | $l_1$ OAL | Included Angle | Cut "A" | Cut "B" | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|---|
| 1/4 | 1/4 | 2-1/2 | 90° | 0.141 | 0.100 | 4 | 135-01530 | 135-01532 | 135-01534 |
| 3/8 | 3/8 | 2-1/2 | 90° | 0.221 | 0.157 | 4 | 135-02430 | 135-02432 | 135-02434 |
| 1/2 | 1/2 | 3 | 90° | 0.304 | 0.215 | 4 | 135-03230 | 135-03232 | 135-03234 |

Standard with 118° Drill Point

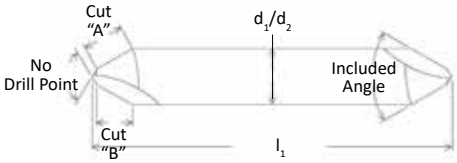
Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

# Series 130 & 131

## 2 & 4 Flute 120° Chamfer-Spot

UN | 2 FL | 4 FL




**Tolerances**
Shank: 1/4" - 1/2" = -.0001/-.0004

| $d_1$ Dia | $d_2$ Shank | $l_1$ OAL | Included Angle | Cut "A" | Cut "B" | Cut "B" | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|---|
| * 1/4 | 1/4 | 2-1/2 | 120° | 0.124 | 0.062 | 2 | 130-01510 | 130-01512 | 130-01514 |
| * 3/8 | 3/8 | 2-1/2 | 120° | 0.199 | 0.100 | 2 | 130-02410 | 130-02412 | 130-02414 |
| * 1/2 | 1/2 | 3 | 120° | 0.266 | 0.133 | 2 | 130-03210 | 130-03212 | 130-03214 |

* No Drill Point

| $d_1$ Dia | $d_2$ Shank | $l_1$ OAL | Included Angle | Cut "A" | Cut "B" | Cut "B" | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|---|
| * 1/4 | 1/4 | 2-1/2 | 120° | 0.144 | 0.072 | 4 | 131-01510 | 131-01512 | 131-01514 |
| * 3/8 | 3/8 | 2-1/2 | 120° | 0.217 | 0.108 | 4 | 131-02410 | 131-02412 | 131-02414 |
| * 1/2 | 1/2 | 3 | 120° | 0.289 | 0.144 | 4 | 131-03210 | 131-03212 | 131-03214 |

* No Drill Point

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

PROMAX Premium

## Aluminum - 109

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium | Non-Alloy | 1230 | 0.05xø | 1.4xø | 0.0008 | 0.0016 | 0.002 | 0.0041 | 0.0048 | 0.0055 |
| | Wrought Alloy Non-Hardened | 1230 | 0.05xø | 1.4xø | 0.0008 | 0.0016 | 0.002 | 0.0041 | 0.0048 | 0.0055 |
| | Wrought Alloy Hardened | 1230 | 0.05xø | 1.4xø | 0.0008 | 0.0016 | 0.002 | 0.0041 | 0.0048 | 0.0055 |
| | Casting Alloy < 6% Si | 984 | 0.05xø | 1.4xø | 0.0008 | 0.0016 | 0.002 | 0.0041 | 0.0048 | 0.0055 |
| | Casting Alloy 6-12% Si | 738 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| | Casting Alloy > 6% Si | 517 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| Magnesium | Wrought Alloy | 492 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| | Casting Alloy | 418 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| Copper | Non-Alloy | 369 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| | Wrought Alloy Non-Hardened | 344 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| | Wrought Alloy Hardened | 271 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| | CuNi-Alloy | 320 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| | CuNiZn-Alloy Long-Chipping | 271 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| | CuNiZn-Alloy Short-Chipping | 320 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| CuZn (Brass) | Long-Chipping | 369 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| | Short-Chipping | 517 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| CuSn (Bronze) | Long-Chipping | 320 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| | Short-Chipping | 344 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| CuAlFe (Ampco) | Long-Chipping | 148 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |
| | Short-Chipping | 172 | 0.05xø | 1.4xø | 0.0006 | 0.0008 | 0.0012 | 0.0034 | 0.0041 | 0.0048 |

## Aluminum - 102 / 119

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium | Non-Alloy | 1230 | 1xø | 1xø | 0.001 | 0.0017 | 0.0028 | 0.0035 | 0.0047 | 0.0055 |
| | Wrought Alloy Non-Hardened | 1230 | 1xø | 1xø | 0.001 | 0.0017 | 0.0028 | 0.0035 | 0.0047 | 0.0055 |
| | Wrought Alloy Hardened | 1230 | 1xø | 1xø | 0.001 | 0.0017 | 0.0028 | 0.0035 | 0.0047 | 0.0055 |
| | Casting Alloy < 6% Si | 984 | 1xø | 1xø | 0.001 | 0.0017 | 0.0028 | 0.0035 | 0.0047 | 0.0055 |
| | Casting Alloy 6-12% Si | 738 | 1xø | 1xø | 0.0008 | 0.0014 | 0.0028 | 0.0047 | 0.0067 | 0.0083 |
| | Casting Alloy > 6% Si | 517 | 1xø | 1xø | 0.0008 | 0.0014 | 0.0028 | 0.0047 | 0.0067 | 0.0083 |
| Magnesium | Wrought Alloy | 492 | 1xø | 1xø | 0.0008 | 0.0014 | 0.0028 | 0.0047 | 0.0067 | 0.0083 |
| | Casting Alloy | 418 | 1xø | 1xø | 0.0008 | 0.0014 | 0.0028 | 0.0047 | 0.0067 | 0.0083 |
| Copper | Non-Alloy | 369 | 1xø | 1xø | 0.0006 | 0.0011 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Wrought Alloy Non-Hardened | 344 | 1xø | 1xø | 0.0006 | 0.0011 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Wrought Alloy Hardened | 271 | 1xø | 1xø | 0.0006 | 0.0011 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | CuNi-Alloy | 320 | 1xø | 1xø | 0.0006 | 0.0011 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | CuNiZn-Alloy Long-Chipping | 271 | 1xø | 1xø | 0.0006 | 0.0011 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | CuNiZn-Alloy Short-Chipping | 320 | 1xø | 1xø | 0.0006 | 0.0011 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| CuZn (Brass) | Long-Chipping | 369 | 1xø | 1xø | 0.0006 | 0.0011 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Short-Chipping | 517 | 1xø | 1xø | 0.0006 | 0.0011 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| CuSn (Bronze) | Long-Chipping | 320 | 1xø | 1xø | 0.0006 | 0.0011 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Short-Chipping | 344 | 1xø | 1xø | 0.0006 | 0.0011 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| CuAlFe (Ampco) | Long-Chipping | 148 | 1xø | 1xø | 0.0006 | 0.0011 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |
| | Short-Chipping | 172 | 1xø | 1xø | 0.0006 | 0.0011 | 0.0024 | 0.0031 | 0.0047 | 0.0055 |

*** Feeds and Speeds are starting points for Overall Lengths of 4" and shorter.**
**For End Mills with Overall Lengths over 4" decrease the Feeds and Speeds.**



PROMAX Premium

## Universal - 160 / 161

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 533 | 0.05xø | 1.4xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | > 500 N/mm² | 492 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Construction Steel | Non-Alloy < 500 N/mm² | 509 | 0.05xø | 1.4xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Non-Alloy > 500 N/mm² | 476 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy | 459 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Spring Steel | Annealed < 250 HB | 262 | 0.05xø | 1.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Natural Hardened 250-350 HB | 246 | 0.05xø | 1.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Spring Hardened 1200-1600 N/mm² | 230 | 0.05xø | 1.4xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| Cementation Steel | < 150 HB | 427 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | 150-200 HB | 410 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 200 HB | 377 | 0.05xø | 1.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Nitriding Steel | < 1000 N/mm² | 377 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 1000 N/mm² | 344 | 0.05xø | 1.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 410 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Non-Alloy 800-1000 N/mm² | 377 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy < 800 N/mm² | 377 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy 800-1000 N/mm² | 361 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy 1000-1300 N/mm² | 344 | 0.05xø | 1.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Alloy 1300-1600 N/mm² | 312 | 0.05xø | 1.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Non-Alloy Tool Steel | General | 377 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 361 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low Alloy < 1200 N/mm² | 344 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low Alloy < 1500 N/mm² | 303 | 0.05xø | 1.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | High Alloy Annealed < 1000 N/mm² | 328 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy Hardened < 1300 N/mm² | 287 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Tool Steel for Warm Processing | Low Alloy < 1200 N/mm² | 336 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low Alloy < 1500 N/mm² | 303 | 0.05xø | 1.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | High Alloy Annealed < 1000 N/mm² | 303 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy Hardened < 1300 N/mm² | 287 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy Hardened < 1600 N/mm² | 262 | 0.05xø | 1.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Stainless Steel | Ferric | 197 | 0.05xø | 1.4xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Martensitic | 164 | 0.05xø | 1.4xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic A5 < 40% | 197 | 0.05xø | 1.4xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic A5 > 40% | 197 | 0.05xø | 1.4xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Sulphured | 213 | 0.05xø | 1.4xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| High Temperature Alloy | Fe-Alloy | 66 | 0.05xø | 1.4xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Ni-Alloy not hardened | 66 | 0.05xø | 1.4xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Ni-Alloy hardened | 66 | 0.05xø | 1.4xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Co-Alloy | 66 | 0.05xø | 1.4xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| Cast Iron | Non-Alloy | 410 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low-Alloy | 328 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High-Alloy | 246 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Stainless Cast Steel | Ferric/Martensitic | 197 | 0.05xø | 1.4xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic | 197 | 0.05xø | 1.4xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 410 | 0.05xø | 1.4xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Non-Alloy > 180 HB | 361 | 0.05xø | 1.4xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Alloy | 328 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy | 246 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 377 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Non-Alloy > 180 HB | 344 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy | 303 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| White Malleable Cast Iron | < 180 HB | 361 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 180 HB | 328 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Black Malleable Cast Iron | < 180 HB | 361 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 180 HB | 328 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Titanium | Non-Alloy | 328 | 0.05xø | 1.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloyed-Annealed | 287 | 0.05xø | 1.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Alloyed-Hardened | 205 | 0.05xø | 1.4xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |

*** Feeds and Speeds are starting points for Overall Lengths of 4" and shorter.**
**For End Mills with Overall Lengths over 4" decrease the Feeds and Speeds.**

PROMAX Premium

## Universal - 112

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 427 | 1xø | 0.7xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | > 500 N/mm² | 394 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Construction Steel | Non-Alloy < 500 N/mm² | 410 | 1xø | 0.7xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Non-Alloy > 500 N/mm² | 377 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy | 361 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Cementation Steel | < 150 HB | 344 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | 150-200 HB | 328 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 200 HB | 312 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Nitriding Steel | < 1000 N/mm² | 312 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 1000 N/mm² | 279 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 328 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Non-Alloy 800-1000 N/mm² | 312 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy < 800 N/mm² | 312 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy 800-1000 N/mm² | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy 1000-1300 N/mm² | 279 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Alloy 1300-1600 N/mm² | 246 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Non-Alloy Tool Steel | General | 303 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low Alloy < 1200 N/mm² | 279 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low Alloy < 1500 N/mm² | 246 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | High Alloy Annealed < 1000 N/mm² | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy Hardened < 1300 N/mm² | 230 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Tool Steel for Warm Processing | Low Alloy < 1200 N/mm² | 328 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low Alloy < 1500 N/mm² | 295 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | High Alloy Annealed < 1000 N/mm² | 246 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy Hardened < 1300 N/mm² | 230 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy Hardened < 1600 N/mm² | 213 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Stainless Steel | Ferric | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Martensitic | 131 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic A5 < 40% | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic A5 > 40% | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Sulphured | 180 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| High Temperature Alloy | Fe-Alloy | 90 | 0.5xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy not hardened | 90 | 0.5xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy hardened | 90 | 0.5xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Co-Alloy | 90 | 0.5xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Cast Iron | Non-Alloy | 328 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low-Alloy | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High-Alloy | 197 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Stainless Cast Steel | Ferric/Martensitic | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 328 | 1xø | 0.7xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Non-Alloy > 180 HB | 295 | 1xø | 0.7xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Alloy | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy | 197 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 312 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Non-Alloy > 180 HB | 279 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy | 246 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| White Malleable Cast Iron | < 180 HB | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 180 HB | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Black Malleable Cast Iron | < 180 HB | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 180 HB | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Titanium | Non-Alloy | 197 | 0.5xø | 0.7xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Alloyed-Annealed | 164 | 0.5xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloyed-Hardened | 131 | 0.5xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |

*** Feeds and Speeds are starting points for Overall Lengths of 4" and shorter.**
**For End Mills with Overall Lengths over 4" decrease the Feeds and Speeds.**



PROMAX Premium

## Universal - 158 / 159

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip load per tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 427 | 1xø | 0.7xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | > 500 N/mm² | 394 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Construction Steel | Non-Alloy < 500 N/mm² | 410 | 1xø | 0.7xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Non-Alloy > 500 N/mm² | 377 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy | 361 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Cementation Steel | < 150 HB | 344 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | 150-200 HB | 328 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 200 HB | 312 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Nitriding Steel | < 1000 N/mm² | 312 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 1000 N/mm² | 279 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 328 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Non-Alloy 800-1000 N/mm² | 312 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy < 800 N/mm² | 312 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy 800-1000 N/mm² | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy 1000-1300 N/mm² | 279 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Alloy 1300-1600 N/mm² | 246 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Non-Alloy Tool Steel | General | 303 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low Alloy < 1200 N/mm² | 279 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low Alloy < 1500 N/mm² | 246 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | High Alloy Annealed < 1000 N/mm² | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy Hardened < 1300 N/mm² | 230 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Tool Steel for Warm Processing | Low Alloy < 1200 N/mm² | 328 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low Alloy < 1500 N/mm² | 295 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | High Alloy Annealed < 1000 N/mm² | 246 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy Hardened < 1300 N/mm² | 230 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy Hardened < 1600 N/mm² | 213 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Stainless Steel | Ferric | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Martensitic | 131 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic A5 < 40% | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic A5 > 40% | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Sulphured | 180 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| High Temperature Alloy | Fe-Alloy | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy not hardened | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy hardened | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Co-Alloy | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Cast Iron | Non-Alloy | 328 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low-Alloy | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High-Alloy | 197 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Stainless Cast Steel | Ferric/Martensitic | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 328 | 1xø | 0.7xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Non-Alloy > 180 HB | 295 | 1xø | 0.7xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Alloy | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy | 197 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 312 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Non-Alloy > 180 HB | 279 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy | 246 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| White Malleable Cast Iron | < 180 HB | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 180 HB | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Black Malleable Cast Iron | < 180 HB | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 180 HB | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Titanium | Non-Alloy | 197 | 1xø | 0.4xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Alloyed-Annealed | 164 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloyed-Hardened | 131 | 1xø | 0.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |

*** Feeds and Speeds are starting points for Overall Lengths of 4" and shorter.**
**For End Mills with Overall Lengths over 4" decrease the Feeds and Speeds.**

PROMAX Premium

## Universal - 121

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 287 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | > 500 N/mm² | 246 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Construction Steel | Non-Alloy < 500 N/mm² | 287 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Non-Alloy > 500 N/mm² | 246 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Alloy | 246 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Spring Steel | Annealed < 250 HB | 246 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Cementation Steel | < 150 HB | 287 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | 150-200 HB | 246 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | > 200 HB | 246 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Nitriding Steel | < 1000 N/mm² | 246 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | > 1000 N/mm² | 230 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 246 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Non-Alloy 800-1000 N/mm² | 246 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy < 800 N/mm² | 246 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy 800-1000 N/mm² | 246 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy 1000-1300 N/mm² | 230 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Non-Alloy Tool Steel | General | 246 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 230 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Low Alloy < 1200 N/mm² | 230 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | High Alloy Annealed < 1000 N/mm² | 230 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Tool Steel for Warm Processing | High Alloy Annealed < 1000 N/mm² | 230 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |

## Universal - 111

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 427 | 1xø | 1.1xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | > 500 N/mm² | 394 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Construction Steel | Non-Alloy < 500 N/mm² | 410 | 1xø | 1.1xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Non-Alloy > 500 N/mm² | 377 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy | 361 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Spring Steel | Annealed < 250 HB | 213 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Natural Hardened 250-350 HB | 197 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Spring Hardened 1200-1600 N/mm² | 180 | 1xø | 1.1xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| Cementation Steel | < 150 HB | 344 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | 150-200 HB | 328 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 200 HB | 312 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Nitriding Steel | < 1000 N/mm² | 312 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 1000 N/mm² | 279 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 328 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Non-Alloy 800-1000 N/mm² | 312 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy < 800 N/mm² | 312 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy 800-1000 N/mm² | 295 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy 1000-1300 N/mm² | 279 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Alloy 1300-1600 N/mm² | 246 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Non-Alloy Tool Steel | General | 303 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Stainless Steel | Ferric | 164 | 0.8xø | 0.7xø | 0.0004 | 0.0006 | 0.0008 | 0.0014 | 0.0017 | 0.0019 |
| | Martensitic | 131 | 0.8xø | 0.7xø | 0.0004 | 0.0006 | 0.0008 | 0.0014 | 0.0017 | 0.0019 |
| | Austenitic A5 < 40% | 164 | 0.8xø | 0.7xø | 0.0004 | 0.0006 | 0.0008 | 0.0014 | 0.0017 | 0.0019 |
| | Austenitic A5 > 40% | 164 | 0.8xø | 0.7xø | 0.0004 | 0.0006 | 0.0008 | 0.0014 | 0.0017 | 0.0019 |
| | Sulphured | 180 | 0.8xø | 0.7xø | 0.0004 | 0.0006 | 0.0008 | 0.0014 | 0.0017 | 0.0019 |
| High Temperature Alloy | Fe-Alloy | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy not hardened | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy hardened | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Co-Alloy | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Cast Iron | Non-Alloy | 328 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low-Alloy | 262 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High-Alloy | 197 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Stainless Cast Steel | Ferric/Martensitic | 197 | 1xø | 1.1xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic | 197 | 1xø | 1.1xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |

*** Feeds and Speeds are starting points for Overall Lengths of 4" and shorter.**
**For End Mills with Overall Lengths over 4" decrease the Feeds and Speeds.**



PROMAX Premium

## Universal - 111 (Continued)

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 328 | 1xø | 1.1xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Non-Alloy > 180 HB | 295 | 1xø | 1.1xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Alloy | 262 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy | 197 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 312 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Non-Alloy > 180 HB | 279 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy | 246 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| White Malleable Cast Iron | < 180 HB | 295 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 180 HB | 262 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Black Malleable Cast Iron | < 180 HB | 295 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 180 HB | 262 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Titanium | Non-Alloy | 197 | 1xø | 0.4xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Alloyed-Annealed | 164 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloyed-Hardened | 131 | 1xø | 0.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |

## Universal - 155 / 156

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 427 | 1xø | 1.1xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | > 500 N/mm² | 394 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Construction Steel | Non-Alloy < 500 N/mm² | 410 | 1xø | 1.1xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Non-Alloy > 500 N/mm² | 377 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy | 361 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Spring Steel | Annealed < 250 HB | 213 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Natural Hardened 250-350 HB | 197 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Spring Hardened 1200-1600 N/mm² | 180 | 1xø | 1.1xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| Cementation Steel | < 150 HB | 344 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | 150-200 HB | 328 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 200 HB | 312 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Nitriding Steel | < 1000 N/mm² | 312 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 1000 N/mm² | 279 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 328 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Non-Alloy 800-1000 N/mm² | 312 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy < 800 N/mm² | 312 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy 800-1000 N/mm² | 295 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy 1000-1300 N/mm² | 279 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Alloy 1300-1600 N/mm² | 246 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Non-Alloy Tool Steel | General | 303 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 295 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low Alloy < 1200 N/mm² | 279 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low Alloy < 1500 N/mm² | 246 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | High Alloy Annealed < 1000 N/mm² | 262 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy Hardened < 1300 N/mm² | 230 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Tool Steel for Warm Processing | Low Alloy < 1200 N/mm² | 328 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low Alloy < 1500 N/mm² | 295 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | High Alloy Annealed < 1000 N/mm² | 246 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy Hardened < 1300 N/mm² | 230 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy Hardened < 1600 N/mm² | 213 | 1xø | 1.1xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Stainless Steel | Ferric | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Martensitic | 131 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic A5 < 40% | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic A5 > 40% | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Sulphured | 180 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| High Temperature Alloy | Fe-Alloy | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy not hardened | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy hardened | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Co-Alloy | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Cast Iron | Non-Alloy | 328 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low-Alloy | 262 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High-Alloy | 197 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |

*** Feeds and Speeds are starting points for Overall Lengths of 4" and shorter.**
**For End Mills with Overall Lengths over 4" decrease the Feeds and Speeds.**

PROMAX Premium

## Universal - 155 / 156 (Continued)

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Stainless Cast Steel | Ferric/Martensitic | 197 | 1xø | 1.1xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic | 197 | 1xø | 1.1xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 328 | 1xø | 1.1xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Non-Alloy > 180 HB | 295 | 1xø | 1.1xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Alloy | 262 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy | 197 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 312 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Non-Alloy > 180 HB | 279 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy | 246 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| White Malleable Cast Iron | < 180 HB | 295 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 180 HB | 262 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Black Malleable Cast Iron | < 180 HB | 295 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 180 HB | 262 | 1xø | 1.1xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Titanium | Non-Alloy | 197 | 1xø | 0.4xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Alloyed-Annealed | 164 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloyed-Hardened | 131 | 1xø | 0.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |

## Universal - 157

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load Per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 968 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | > 500 N/mm² | 755 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| Construction Steel | Non-Alloy < 500 N/mm² | 968 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Non-Alloy > 500 N/mm² | 755 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Alloy | 640 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| Spring Steel | Annealed < 250 HB | 853 | 0.04xø | 0.05xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Natural Hardened 250-350 HB | 755 | 0.04xø | 0.05xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | Spring Hardened 1200-1600 N/mm² | 509 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| Cementation Steel | < 150 HB | 919 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | 150-200 HB | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | > 200 HB | 656 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| Nitriding Steel | < 1000 N/mm² | 771 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | > 1000 N/mm² | 574 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Non-Alloy 800-1000 N/mm² | 689 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Alloy < 800 N/mm² | 574 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Alloy 800-1000 N/mm² | 640 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Alloy 1000-1300 N/mm² | 574 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | Alloy 1300-1600 N/mm² | 476 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| Non-Alloy Tool Steel | General | 755 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 640 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Low Alloy < 1200 N/mm² | 541 | 0.04xø | 0.05xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | Low Alloy < 1500 N/mm² | 427 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | High Alloy Annealed < 1000 N/mm² | 541 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | High Alloy Hardened < 1300 N/mm² | 377 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| Tool Steel for Warm Processing | Low Alloy < 1200 N/mm² | 543 | 0.04xø | 0.05xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Low Alloy < 1500 N/mm² | 427 | 0.04xø | 0.05xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | High Alloy Annealed < 1000 N/mm² | 541 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | High Alloy Hardened < 1300 N/mm² | 377 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | High Alloy Hardened < 1600 N/mm² | 344 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| Stainless Steel | Ferric | 82 | 0.05xø | 0.08xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Martensitic | 66 | 0.05xø | 0.08xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Austenitic A5 < 40% | 82 | 0.05xø | 0.08xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Austenitic A5 > 40% | 66 | 0.05xø | 0.08xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Sulphured | 98 | 0.05xø | 0.08xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| High Temperature Alloy | Fe-Alloy | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy not hardened | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy hardened | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Co-Alloy | 9 0 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |

*** Feeds and Speeds are starting points for Overall Lengths of 4" and shorter.**
**For End Mills with Overall Lengths over 4" decrease the Feeds and Speeds.**



PROMAX Premium

## Universal - 157 (Continued)

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Cast Iron | Non-Alloy | 755 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Low-Alloy | 541 | 0.04xø | 0.05xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | High-Alloy | 377 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 1001 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Non-Alloy > 180 HB | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Alloy | 755 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | High Alloy | 541 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 1001 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Non-Alloy > 180 HB | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | Alloy | 705 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| White Malleable Cast Iron | < 180 HB | 1001 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | > 180 HB | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| Black Malleable Cast Iron | < 180 HB | 1001 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | > 180 HB | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| Copper | Non-Alloy | 1394 | 0.1xø | 0.15xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | Wrought Alloy Non-Hardened | 1181 | 0.1xø | 0.15xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | Wrought Alloy Hardened | 968 | 0.1xø | 0.15xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |

## Universal - 190 / 191

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Nitriding Steel | < 1000 N/mm² | 98 | 0.5xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | > 1000 N/mm² | 74 | 0.5xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 115 | 0.5xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Non-Alloy 800-1000 N/mm² | 98 | 0.5xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy < 800 N/mm² | 98 | 0.5xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy 800-1000 N/mm² | 82 | 0.5xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy 1000-1300 N/mm² | 74 | 0.5xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy 1300-1600 N/mm² | 66 | 0.5xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Stainless Steel | Ferric | 82 | 0.5xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Martensitic | 66 | 0.5xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Austenitic A5 < 40% | 57 | 0.5xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Austenitic A5 > 40% | 82 | 0.5xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Sulphured | 98 | 0.5xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| High Temperature Alloy | Fe-Alloy | 49 | 1xø | 0.4xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Ni-Alloy not hardened | 49 | 1xø | 0.4xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Ni-Alloy hardened | 49 | 1xø | 0.4xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Co-Alloy | 49 | 1xø | 0.4xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| Cast Iron | Non-Alloy | 328 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low-Alloy | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High-Alloy | 197 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Stainless Cast Steel | Ferric/Martensitic | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | Austenitic | 164 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 328 | 1xø | 0.7xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Non-Alloy > 180 HB | 295 | 1xø | 0.7xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Alloy | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High Alloy | 197 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 312 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Non-Alloy > 180 HB | 279 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloy | 246 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| White Malleable Cast Iron | < 180 HB | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 180 HB | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Black Malleable Cast Iron | < 180 HB | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | > 180 HB | 262 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Titanium | Non-Alloy | 148 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloyed-Annealed | 131 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Alloyed-Hardened | 82 | 1xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |

*** Feeds and Speeds are starting points for Overall Lengths of 4" and shorter.**
**For End Mills with Overall Lengths over 4" decrease the Feeds and Speeds.**

PROMAX Premium

## Universal - 120

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | > 500 N/mm² | 213 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Construction Steel | Non-Alloy < 500 N/mm² | 295 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Non-Alloy > 500 N/mm² | 213 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Alloy | 180 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Spring Steel | Annealed < 250 HB | 180 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Cementation Steel | < 150 HB | 279 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | 150-200 HB | 230 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | > 200 HB | 180 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Nitriding Steel | < 1000 N/mm² | 213 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | > 1000 N/mm² | 164 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 230 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Non-Alloy 800-1000 N/mm² | 213 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy < 800 N/mm² | 213 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy 800-1000 N/mm² | 180 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy 1000-1300 N/mm² | 148 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Non-Alloy Tool Steel | General | 180 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 164 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Low Alloy < 1200 N/mm² | 131 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | High Alloy Annealed < 1000 N/mm² | 131 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Tool Steel for Warm Processing | High Alloy Annealed < 1000 N/mm² | 131 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Stainless Steel | Ferric | 164 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Martensitic | 131 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Austenitic A5 < 40% | 164 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Austenitic A5 > 40% | 164 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Sulphured | 180 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| High Temperature Alloy | Fe-Alloy | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy not hardened | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy hardened | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Co-Alloy | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Cast Iron | Non-Alloy | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Low-Alloy | 213 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Stainless Cast Steel | Ferric/Martensitic | 131 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Austenitic | 164 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 361 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | Non-Alloy > 180 HB | 312 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | Alloy | 262 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | High Alloy | 213 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 361 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Non-Alloy > 180 HB | 312 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Alloy | 262 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| White Malleable Cast Iron | < 180 HB | 361 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | > 180 HB | 312 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| Black Malleable Cast Iron | < 180 HB | 361 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | > 180 HB | 312 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| Titanium | Non-Alloy | 197 | 1xø | 0.4xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Alloyed-Annealed | 164 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloyed-Hardened | 131 | 1xø | 0.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |

## Universal - 100

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | > 500 N/mm² | 213 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Construction Steel | Non-Alloy < 500 N/mm² | 295 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Non-Alloy > 500 N/mm² | 213 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Alloy | 180 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Spring Steel | Annealed < 250 HB | 180 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Cementation Steel | < 150 HB | 279 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | 150-200 HB | 230 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | > 200 HB | 180 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Nitriding Steel | < 1000 N/mm² | 213 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | > 1000 N/mm² | 164 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |

*** Feeds and Speeds are starting points for Overall Lengths of 4" and shorter.**
**For End Mills with Overall Lengths over 4" decrease the Feeds and Speeds.**

## Universal - 100 (Continued)

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 230 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Non-Alloy 800-1000 N/mm² | 213 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy < 800 N/mm² | 213 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy 800-1000 N/mm² | 180 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy 1000-1300 N/mm² | 148 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Non-Alloy Tool Steel | General | 180 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 164 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Low Alloy < 1200 N/mm² | 131 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | High Alloy Annealed < 1000 N/mm² | 131 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Tool Steel for Warm Processing | High Alloy Annealed < 1000 N/mm² | 131 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Stainless Steel | Ferric | 164 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Martensitic | 131 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Austenitic A5 < 40% | 164 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Austenitic A5 > 40% | 164 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Sulphured | 180 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| Cast Iron | Non-Alloy | 295 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Low-Alloy | 213 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Stainless Cast Steel | Ferric/Martensitic | 131 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Austenitic | 164 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 361 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | Non-Alloy > 180 HB | 312 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | Alloy | 262 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | High Alloy | 213 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 361 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Non-Alloy > 180 HB | 312 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Alloy | 262 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| White Malleable Cast Iron | < 180 HB | 361 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | > 180 HB | 312 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| Black Malleable Cast Iron | < 180 HB | 361 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | > 180 HB | 312 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |

## Universal - 106

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 230 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | > 500 N/mm² | 164 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Construction Steel | Non-Alloy < 500 N/mm² | 230 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Non-Alloy > 500 N/mm² | 164 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Alloy | 131 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Cementation Steel | < 150 HB | 180 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | 150-200 HB | 148 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | > 200 HB | 115 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Nitriding Steel | < 1000 N/mm² | 131 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | > 1000 N/mm² | 90 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 148 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Non-Alloy 800-1000 N/mm² | 131 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy < 800 N/mm² | 131 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy 800-1000 N/mm² | 115 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy 1000-1300 N/mm² | 90 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Cast Iron | Non-Alloy | 197 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Low-Alloy | 148 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | High-Alloy | 115 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| Stainless Cast Steel | Ferric/Martensitic | 98 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| | Austenitic | 98 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 213 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | Non-Alloy > 180 HB | 197 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | Alloy | 148 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | High Alloy | 131 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 213 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Non-Alloy > 180 HB | 197 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Alloy | 148 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| White Malleable Cast Iron | < 180 HB | 213 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | > 180 HB | 197 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| Black Malleable Cast Iron | < 180 HB | 213 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | > 180 HB | 197 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |

*** Feeds and Speeds are starting points for Overall Lengths of 4" and shorter.**
**For End Mills with Overall Lengths over 4" decrease the Feeds and Speeds.**

PROMAX Premium

## Universal - 113

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 968 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | > 500 N/mm² | 755 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| Construction Steel | Non-Alloy < 500 N/mm² | 968 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Non-Alloy > 500 N/mm² | 755 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Alloy | 640 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| Spring Steel | Annealed < 250 HB | 853 | 0.04xø | 0.05xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Natural Hardened 250-350 HB | 755 | 0.04xø | 0.05xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | Spring Hardened 1200-1600 N/mm² | 509 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| Cementation Steel | < 150 HB | 919 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | 150-200 HB | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | > 200 HB | 656 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| Nitriding Steel | < 1000 N/mm² | 771 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | > 1000 N/mm² | 574 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Non-Alloy 800-1000 N/mm² | 689 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Alloy < 800 N/mm² | 574 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Alloy 800-1000 N/mm² | 640 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Alloy 1000-1300 N/mm² | 574 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | Alloy 1300-1600 N/mm² | 476 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| Cast Iron | Non-Alloy | 755 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Low-Alloy | 541 | 0.04xø | 0.05xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | High-Alloy | 377 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 1001 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Non-Alloy > 180 HB | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Alloy | 755 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | High Alloy | 541 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 1001 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | Non-Alloy > 180 HB | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| | Alloy | 705 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| White Malleable Cast Iron | < 180 HB | 1001 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | > 180 HB | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |
| Black Malleable Cast Iron | < 180 HB | 1001 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 | 0.0069 | 0.0083 |
| | > 180 HB | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 | 0.0055 | 0.0062 |

## Universal - 117

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 164 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | > 500 N/mm² | 115 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Construction Steel | Non-Alloy < 500 N/mm² | 164 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Non-Alloy > 500 N/mm² | 115 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Alloy | 98 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Spring Steel | Annealed < 250 HB | 98 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Cementation Steel | < 150 HB | 156 | 1xø | 0.7xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | 150-200 HB | 123 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | > 200 HB | 98 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Nitriding Steel | < 1000 N/mm² | 115 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | > 1000 N/mm² | 90 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 131 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Non-Alloy 800-1000 N/mm² | 115 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy < 800 N/mm² | 115 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy 800-1000 N/mm² | 98 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | Alloy 1000-1300 N/mm² | 90 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Cast Iron | Non-Alloy | 328 | 0.8xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Low-Alloy | 262 | 0.8xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | High-Alloy | 197 | 0.8xø | 0.7xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| Cast Iron with Lamellar Graphite | Non-Alloy < 180 HB | 197 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | Non-Alloy > 180 HB | 164 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | Alloy | 131 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| | High Alloy | 115 | 1xø | 0.7xø | 0.0004 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 |
| Spheroidal Cast Iron | Non-Alloy < 180 HB | 197 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Non-Alloy > 180 HB | 164 | 1xø | 0.7xø | 0.0008 | 0.0012 | 0.0014 | 0.0019 | 0.0022 | 0.0025 |
| | Alloy | 131 | 1xø | 0.7xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 |
| White Malleable Cast Iron | < 180 HB | 197 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | > 180 HB | 164 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| Black Malleable Cast Iron | < 180 HB | 197 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |
| | > 180 HB | 164 | 1xø | 0.7xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 | 0.0033 | 0.0039 |

*** Feeds and Speeds are starting points for Overall Lengths of 4" and shorter.**
**For End Mills with Overall Lengths over 4" decrease the Feeds and Speeds.**

## Titanium - 101

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" 5/16" | 3/8" 7/16" | 1/2" 5/8" | 3/4" | 1" |
|---|---|---|---|---|---|---|---|---|---|---|
| Non-Alloy Tool Steel | General | 303 | 0.8xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 295 | 0.8xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Low Alloy < 1200 N/mm² | 279 | 0.8xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Low Alloy < 1500 N/mm² | 246 | 0.8xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | High Alloy Annealed < 1000 N/mm² | 262 | 0.8xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | High Alloy Hardened < 1300 N/mm² | 230 | 0.8xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| Tool Steel for Warm Processing | Low Alloy < 1200 N/mm² | 328 | 0.8xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | Low Alloy < 1500 N/mm² | 295 | 0.8xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| | High Alloy Annealed < 1000 N/mm² | 246 | 0.8xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | High Alloy Hardened < 1300 N/mm² | 230 | 0.8xø | 0.7xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |
| | High Alloy Hardened < 1600 N/mm² | 213 | 0.8xø | 0.7xø | 0.0003 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0025 |
| Stainless Steel | Ferric | 164 | 0.8xø | 0.7xø | 0.0004 | 0.0006 | 0.0008 | 0.0014 | 0.0017 | 0.0019 |
| | Martensitic | 131 | 0.8xø | 0.7xø | 0.0004 | 0.0006 | 0.0008 | 0.0014 | 0.0017 | 0.0019 |
| | Austenitic A5 < 40% | 164 | 0.8xø | 0.7xø | 0.0004 | 0.0006 | 0.0008 | 0.0014 | 0.0017 | 0.0019 |
| | Austenitic A5 > 40% | 164 | 0.8xø | 0.7xø | 0.0004 | 0.0006 | 0.0008 | 0.0014 | 0.0017 | 0.0019 |
| | Sulphured | 180 | 0.8xø | 0.7xø | 0.0004 | 0.0006 | 0.0008 | 0.0014 | 0.0017 | 0.0019 |
| High Temperature Alloy | Fe-Alloy | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy not hardened | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Ni-Alloy hardened | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| | Co-Alloy | 90 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 |
| Titanium | Non-Alloy | 197 | 1xø | 0.4xø | 0.0007 | 0.0012 | 0.0019 | 0.0028 | 0.0033 | 0.0039 |
| | Alloyed-Annealed | 164 | 1xø | 0.4xø | 0.0006 | 0.0011 | 0.0017 | 0.0022 | 0.0028 | 0.0033 |
| | Alloyed-Hardened | 131 | 1xø | 0.4xø | 0.0004 | 0.0008 | 0.0014 | 0.0017 | 0.0022 | 0.0028 |

## Steel - 250

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/8" | 3/16" 1/4" | 3/8" | 1/2" |
|---|---|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 968 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| | > 500 N/mm² | 755 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| Construction Steel | Non-Alloy < 500 N/mm² | 968 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| | Non-Alloy > 500 N/mm² | 755 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| | Alloy | 640 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 |
| Spring Steel | Annealed < 250 HB | 853 | 0.04xø | 0.05xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| | Natural Hardened 250-350 HB | 755 | 0.04xø | 0.05xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 |
| | Spring Hardened 1200-1600 N/mm² | 509 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 |
| Cementation Steel | < 150 HB | 919 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| | 150-200 HB | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| | > 200 HB | 656 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| Nitriding Steel | < 1000 N/mm² | 771 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| | > 1000 N/mm² | 574 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 853 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| | Non-Alloy 800-1000 N/mm² | 689 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| | Alloy < 800 N/mm² | 574 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| | Alloy 800-1000 N/mm² | 640 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| | Alloy 1000-1300 N/mm² | 574 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 |
| | Alloy 1300-1600 N/mm² | 476 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 |
| Non-Alloy Tool Steel | General | 755 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 640 | 0.05xø | 0.08xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| | Low Alloy < 1200 N/mm² | 541 | 0.04xø | 0.05xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 |
| | Low Alloy < 1500 N/mm² | 427 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 |
| | High Alloy Annealed < 1000 N/mm² | 541 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 |
| | High Alloy Hardened < 1300 N/mm² | 377 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 |
| Tool Steel for Warm Processing | Low Alloy < 1200 N/mm² | 541 | 0.04xø | 0.05xø | 0.0011 | 0.0022 | 0.0033 | 0.0055 |
| | Low Alloy < 1500 N/mm² | 427 | 0.04xø | 0.05xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 |
| | High Alloy Annealed < 1000 N/mm² | 541 | 0.05xø | 0.08xø | 0.0011 | 0.0017 | 0.0022 | 0.0041 |
| | High Alloy Hardened < 1300 N/mm² | 377 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 |
| | High Alloy Hardened < 1600 N/mm² | 344 | 0.04xø | 0.05xø | 0.0010 | 0.0017 | 0.0019 | 0.0025 |
| Stainless Steel | Ferric | 82 | 0.05xø | 0.08xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 |
| | Martensitic | 66 | 0.05xø | 0.08xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 |
| | Austenitic A5 < 40% | 82 | 0.05xø | 0.08xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 |
| | Austenitic A5 > 40% | 66 | 0.05xø | 0.08xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 |
| | Sulphured | 98 | 0.05xø | 0.08xø | 0.0003 | 0.0006 | 0.0008 | 0.0011 |

*** Feeds and Speeds are starting points for Overall Lengths of 4" and shorter.**
**For End Mills with Overall Lengths over 4" decrease the Feeds and Speeds.**

PROMAX Premium

## Steel - 251 / 252 / 253 / 254

| Material Designation | | SFM [ft/min] | ae max. [inch] | ap max [inch] | Chip Load per Tooth [inch] 1/32" 3/32" 1/8" | Chip Load per Tooth [inch] 3/16" |
|---|---|---|---|---|---|---|
| Machining Steel | < 500 N/mm² | 213 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | > 500 N/mm² | 189 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| Construction Steel | Non-Alloy < 500 N/mm² | 213 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | Non-Alloy > 500 N/mm² | 189 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | Alloy | 148 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| Spring Steel | Annealed < 250 HB | 189 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | Natural Hardened 250-350 HB | 148 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | Spring Hardened 1200-1600 N/mm² | 115 | 1xø | 0.03xø | 0.0010 | 0.0017 |
| Cementation Steel | < 150 HB | 213 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | 150-200 HB | 189 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | > 200 HB | 148 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| Nitriding Steel | < 1000 N/mm² | 148 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | > 1000 N/mm² | 148 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| Quenched & Tempered Steel | Non-Alloy < 800 N/mm² | 189 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | Non-Alloy 800-1000 N/mm² | 148 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | Alloy < 800 N/mm² | 189 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | Alloy 800-1000 N/mm² | 148 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | Alloy 1000-1300 N/mm² | 115 | 1xø | 0.03xø | 0.0010 | 0.0017 |
| | Alloy 1300-1600 N/mm² | 98 | 1xø | 0.03xø | 0.0010 | 0.0017 |
| Non-Alloy Tool Steel | General | 148 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| Tool Steel for Cold Processing | Low Alloy < 1000 N/mm² | 148 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | Low Alloy < 1200 N/mm² | 115 | 1xø | 0.03xø | 0.0010 | 0.0017 |
| | Low Alloy < 1500 N/mm² | 98 | 1xø | 0.03xø | 0.0010 | 0.0017 |
| | High Alloy Annealed < 1000 N/mm² | 148 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | High Alloy Hardened < 1300 N/mm² | 115 | 1xø | 0.03xø | 0.0010 | 0.0017 |
| Tool Steel for Warm Processing | Low Alloy < 1200 N/mm² | 115 | 1xø | 0.03xø | 0.0010 | 0.0017 |
| | Low Alloy < 1500 N/mm² | 98 | 1xø | 0.03xø | 0.0010 | 0.0017 |
| | High Alloy Annealed < 1000 N/mm² | 148 | 1xø | 0.04xø | 0.0011 | 0.0017 |
| | High Alloy Hardened < 1300 N/mm² | 115 | 1xø | 0.03xø | 0.0010 | 0.0017 |
| | High Alloy Hardened < 1600 N/mm² | 98 | 1xø | 0.03xø | 0.0010 | 0.0017 |
| Stainless Steel | Ferric | 82 | 0.05xø | 0.08xø | 0.0003 | 0.0006 |
| | Martensitic | 66 | 0.05xø | 0.08xø | 0.0003 | 0.0006 |
| | Austenitic A5 < 40% | 82 | 0.05xø | 0.08xø | 0.0003 | 0.0006 |
| | Austenitic A5 > 40% | 66 | 0.05xø | 0.08xø | 0.0003 | 0.0006 |
| | Sulphured | 98 | 0.05xø | 0.08xø | 0.0003 | 0.0006 |

*** Feeds and Speeds are starting points for Overall Lengths of 4" and shorter.**
**For End Mills with Overall Lengths over 4" decrease the Feeds and Speeds.**



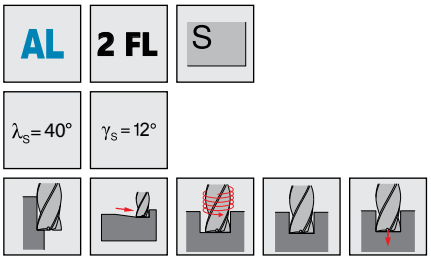
PROMAX Premium

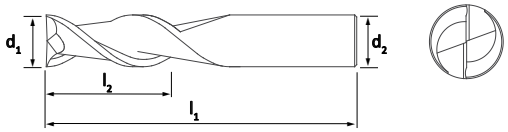
# Tooling You Know and Trust

# PROMAX Premium & Design-Rite XL

# Series D142

## 2 Flute Aluminum






**Tolerances**

Shank: 1/8" - 1" = +.0001/-.0004
Cutting Dia: 1/8" - 1" = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | ZrN |
|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | 2 | D1422120 | D1422126 |
| 1/8 | 1/8 | 3/8 | 1-1/2 | 2 | D1421120 | D1421126 |
| 5/32 | 3/16 | 5/16 | 2 | 2 | D1422150 | D1422156 |
| 5/32 | 3/16 | 9/16 | 2 | 2 | D1421150 | D1421156 |
| 3/16 | 3/16 | 5/16 | 2 | 2 | D1422180 | D1422186 |
| 3/16 | 3/16 | 9/16 | 2 | 2 | D1421180 | D1421186 |
| 7/32 | 1/4 | 3/8 | 2 | 2 | D1422210 | D1422216 |
| 1/4 | 1/4 | 3/8 | 2 | 2 | D1422250 | D1422256 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 2 | D1421250 | D1421256 |
| 1/4 | 1/4 | 1-1/4 | 3-1/2 | 2 | D1423250 | D1423256 |
| 9/32 | 5/16 | 13/16 | 2-1/2 | 2 | D1421280 | D1421286 |
| 5/16 | 5/16 | 13/16 | 2-1/2 | 2 | D1421310 | D1421316 |
| 5/16 | 5/16 | 1-1/4 | 4 | 2 | D1423310 | D1423316 |
| 5/16 | 5/16 | 2-1/8 | 4 | 2 | D1424310 | D1424316 |
| 11/32 | 3/8 | 1 | 2-1/2 | 2 | D1421340 | D1421346 |
| 3/8 | 3/8 | 1/2 | 2-1/2 | 2 | D1422370 | D1422376 |
| 3/8 | 3/8 | 1 | 2-1/2 | 2 | D1421370 | D1421376 |
| 3/8 | 3/8 | 1-1/2 | 4 | 2 | D1423370 | D1423376 |
| 3/8 | 3/8 | 2-1/2 | 6 | 2 | D1424370 | D1424376 |
| 13/32 | 7/16 | 1 | 2-3/4 | 2 | D1421400 | D1421406 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 2 | D1422500 | D1422506 |
| 1/2 | 1/2 | 1-1/4 | 3 | 2 | D1421500 | D1421506 |
| 1/2 | 1/2 | 2 | 4 | 2 | D1423500 | D1423506 |
| 1/2 | 1/2 | 3 | 6 | 2 | D1424500 | D1424506 |
| 5/8 | 5/8 | 1-5/8 | 3-1/2 | 2 | D1421620 | D1421626 |
| 3/4 | 3/4 | 1 | 4 | 2 | D1422750 | D1422756 |
| 3/4 | 3/4 | 1-5/8 | 4 | 2 | D1421750 | D1421756 |
| 3/4 | 3/4 | 3 | 6 | 2 | D1423750 | D1423756 |
| 3/4 | 3/4 | 4 | 7 | 2 | D1424750 | D1424756 |
| 1 | 1 | 2 | 5 | 2 | D1421100 | D1421106 |
| 1 | 1 | 3 | 6 | 2 | D1423100 | D1423106 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ● | ● | ● | |

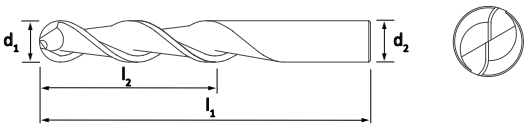
Feeds & Speeds Available on Page 146

# Series D162

## 3 Flute Aluminum Ball

AL | 2 FL | R

$\lambda_S = 40°$ | $\gamma_S = 12°$




**Tolerances**

| | |
|---|---|
| Shank: | 1/4” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/4” - 1” = +.000/-.002 |
| Ball: | 1/4” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | ZrN |
|---|---|---|---|---|---|---|
| 1/4 | 1/4 | 3/8 | 2 | 2 | D1622250 | D1622256 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 2 | D1621250 | D1621256 |
| 1/4 | 1/4 | 1-1/4 | 3-1/2 | 2 | D1623250 | D1623256 |
| 5/16 | 5/16 | 7/16 | 2-1/2 | 2 | D1622310 | D1622316 |
| 5/16 | 5/16 | 13/16 | 2-1/2 | 2 | D1621310 | D1621316 |
| 5/16 | 5/16 | 1-1/4 | 4 | 2 | D1623310 | D1623316 |
| 3/8 | 3/8 | 1/2 | 2-1/2 | 2 | D1622370 | D1622376 |
| 3/8 | 3/8 | 1 | 2-1/2 | 2 | D1621370 | D1621376 |
| 3/8 | 3/8 | 1-1/2 | 4 | 2 | D1623370 | D1623376 |
| 7/16 | 7/16 | 9/16 | 2-3/4 | 2 | D1622430 | D1622436 |
| 7/16 | 7/16 | 1 | 2-3/4 | 2 | D1621430 | D1621436 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 2 | D1622500 | D1622506 |
| 1/2 | 1/2 | 1-1/4 | 3 | 2 | D1621500 | D1621506 |
| 1/2 | 1/2 | 2 | 4 | 2 | D1623500 | D1623506 |
| 5/8 | 5/8 | 3/4 | 3 | 2 | D1622620 | D1622626 |
| 5/8 | 5/8 | 1-5/8 | 3-1/2 | 2 | D1621620 | D1621626 |
| 3/4 | 3/4 | 1 | 4 | 2 | D1622750 | D1622756 |
| 3/4 | 3/4 | 1-5/8 | 4 | 2 | D1621750 | D1621756 |
| 1 | 1 | 1-1/4 | 4 | 2 | D1622100 | D1622106 |
| 1 | 1 | 3 | 6 | 2 | D1623100 | D1623106 |

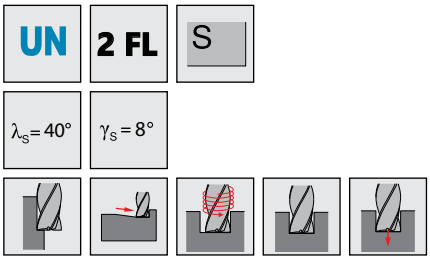
Application Range:

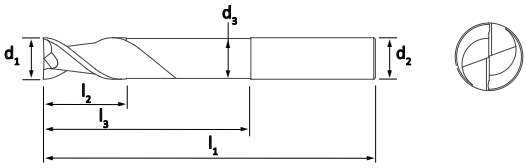
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ● | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D442

## 2 Flute Universal






**Tolerances**

Shank: 1/8" - 1" = -.0001/-.0004
Cutting Dia: 1/8" - 1" = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | $l_3$ LOR | $d_3$ Neck Dia | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/2 | 3 | 2 | 0.120 | 2 | D4424120 | D4424122 | D4424124 |
| 3/16 | 3/16 | 1/2 | 3 | 2 | 0.180 | 2 | D4424180 | D4424182 | D4424184 |
| 1/4 | 1/4 | 3/4 | 4 | 2 | 0.240 | 2 | D4424250 | D4424252 | D4424254 |
| 5/16 | 5/16 | 3/4 | 4 | 2 | 0.300 | 2 | D4424310 | D4424312 | D4424314 |
| 3/8 | 3/8 | 3/4 | 4 | 2 1/2 | 0.360 | 2 | D4424370 | D4424372 | D4424374 |
| 1/2 | 1/2 | 1 | 4 | 2 1/2 | 0.480 | 2 | D4423500 | D4423502 | D4423504 |
| 1/2 | 1/2 | 1-1/8 | 6 | 2 1/2 | 0.480 | 2 | D4424500 | D4424502 | D4424504 |
| 5/8 | 5/8 | 1-1/4 | 6 | 4 1/8 | 0.600 | 2 | D4424620 | D4424622 | D4424624 |
| 3/4 | 3/4 | 1-1/2 | 6 | 4 1/8 | 0.720 | 2 | D4424750 | D4424752 | D4424754 |
| 1 | 1 | 1-1/2 | 6 | 4 1/8 | 0.960 | 2 | D4424100 | D4424102 | D4424104 |

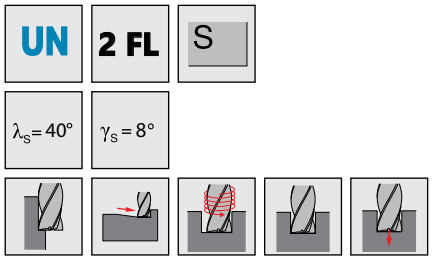
Application Range:

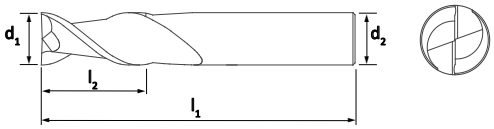
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | ● | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D642

## 2 Flute Universal






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/32 | 1/8 | 3/32 | 1-1/2 | 2 | D6421030 | D6421032 | D6421034 |
| 3/64 | 1/8 | 9/64 | 1-1/2 | 2 | D6421040 | D6421042 | D6421044 |
| 1/16 | 1/8 | 1/8 | 1-1/2 | 2 | D6422060 | D6422062 | D6422064 |
| 1/16 | 1/8 | 3/16 | 1-1/2 | 2 | D6421060 | D6421062 | D6421064 |
| 5/64 | 1/8 | 1/4 | 1-1/2 | 2 | D6421070 | D6421072 | D6421074 |
| 3/32 | 1/8 | 3/16 | 1-1/2 | 2 | D6422090 | D6422092 | D6422094 |
| 3/32 | 1/8 | 9/32 | 1-1/2 | 2 | D6421090 | D6421092 | D6421094 |
| 7/64 | 1/8 | 3/16 | 1-1/2 | 2 | D6422190 | D6422192 | D6422194 |
| 7/64 | 1/8 | 3/8 | 1-1/2 | 2 | D6421190 | D6421192 | D6421194 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 2 | D6422120 | D6422122 | D6422124 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 2 | D6421120 | D6421122 | D6421124 |
| 1/8 | 1/8 | 3/4 | 2-1/4 | 2 | D6423120 | D6423122 | D6423124 |
| 1/8 | 1/8 | 3/4 | 3 | 2 | D6426120 | D6426122 | D6426124 |
| 1/8 | 1/8 | 1 | 3 | 2 | D6424120 | D6424122 | D6424124 |
| 9/64 | 3/16 | 3/8 | 2 | 2 | D6422140 | D6422142 | D6422144 |
| 9/64 | 3/16 | 1/2 | 2 | 2 | D6421140 | D6421142 | D6421144 |
| 5/32 | 3/16 | 3/8 | 2 | 2 | D6422150 | D6422152 | D6422154 |
| 5/32 | 3/16 | 1/2 | 2 | 2 | D6421150 | D6421152 | D6421154 |
| 5/32 | 3/16 | 3/4 | 2-1/2 | 2 | D6425150 | D6425152 | D6425154 |
| 11/64 | 3/16 | 3/8 | 2 | 2 | D6422170 | D6422172 | D6422174 |
| 11/64 | 3/16 | 5/8 | 2 | 2 | D6421170 | D6421172 | D6421174 |
| 3/16 | 3/16 | 3/8 | 2 | 2 | D6422180 | D6422182 | D6422184 |
| 3/16 | 3/16 | 5/8 | 2 | 2 | D6421180 | D6421182 | D6421184 |
| 3/16 | 3/16 | 3/4 | 2-1/2 | 2 | D6423180 | D6423182 | D6423184 |
| 3/16 | 3/16 | 1 | 2-1/2 | 2 | D6425180 | D6425182 | D6425184 |
| 3/16 | 3/16 | 1 | 4 | 2 | D6426180 | D6426182 | D6426184 |
| 3/16 | 3/16 | 1-1/8 | 3 | 2 | D6424180 | D6424182 | D6424184 |
| 13/64 | 1/4 | 3/8 | 2 | 2 | D6422200 | D6422202 | D6422204 |
| 13/64 | 1/4 | 5/8 | 2-1/2 | 2 | D6421200 | D6421202 | D6421204 |
| 7/32 | 1/4 | 3/8 | 2 | 2 | D6422210 | D6422212 | D6422214 |
| 7/32 | 1/4 | 5/8 | 2-1/2 | 2 | D6421210 | D6421212 | D6421214 |
| 7/32 | 1/4 | 1 | 3 | 2 | D6425210 | D6425212 | D6425214 |
| 15/64 | 1/4 | 3/8 | 2 | 2 | D6422230 | D6422232 | D6422234 |
| 15/64 | 1/4 | 3/4 | 2-1/2 | 2 | D6421230 | D6421232 | D6421234 |

**Additional Sizes On Pages 100, 101 & 102**

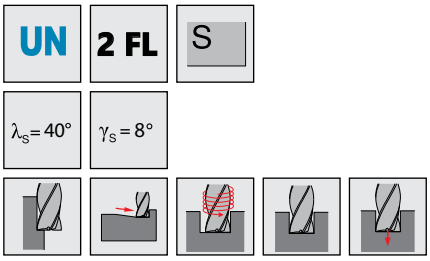
Application Range:

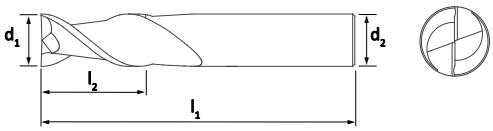
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D642

## 2 Flute Universal






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/4 | 1/4 | 3/8 | 2 | 2 | D6422250 | D6422252 | D6422254 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 2 | D6421250 | D6421252 | D6421254 |
| 1/4 | 1/4 | 1 | 4 | 2 | D6426250 | D6426252 | D6426254 |
| 1/4 | 1/4 | 1-1/8 | 3 | 2 | D6423250 | D6423252 | D6423254 |
| 1/4 | 1/4 | 1-1/4 | 3 | 2 | D6425250 | D6425252 | D6425254 |
| 1/4 | 1/4 | 1-1/2 | 4 | 2 | D6424250 | D6424252 | D6424254 |
| 1/4 | 1/4 | 1-1/2 | 6 | 2 | D6427250 | D6427252 | D6427254 |
| 17/64 | 5/16 | 1/2 | 2 | 2 | D6422260 | D6422262 | D6422264 |
| 17/64 | 5/16 | 3/4 | 2-1/2 | 2 | D6421260 | D6421262 | D6421264 |
| 9/32 | 5/16 | 1/2 | 2 | 2 | D6422280 | D6422282 | D6422284 |
| 9/32 | 5/16 | 3/4 | 2-1/2 | 2 | D6421280 | D6421282 | D6421284 |
| 9/32 | 5/16 | 1-1/4 | 3 | 2 | D6425280 | D6425282 | D6425284 |
| 19/64 | 5/16 | 1/2 | 2 | 2 | D6422290 | D6422292 | D6422294 |
| 19/64 | 5/16 | 3/4 | 2-1/2 | 2 | D6421290 | D6421292 | D6421294 |
| 5/16 | 5/16 | 1/2 | 2 | 2 | D6422310 | D6422312 | D6422314 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 2 | D6421310 | D6421312 | D6421314 |
| 5/16 | 5/16 | 1 | 4 | 2 | D6426310 | D6426312 | D6426314 |
| 5/16 | 5/16 | 1-1/8 | 3 | 2 | D6423310 | D6423312 | D6423314 |
| 5/16 | 5/16 | 1-3/8 | 3 | 2 | D6425310 | D6425312 | D6425314 |
| 5/16 | 5/16 | 1-1/2 | 6 | 2 | D6427310 | D6427312 | D6427314 |
| 5/16 | 5/16 | 1-5/8 | 4 | 2 | D6424310 | D6424312 | D6424314 |
| 21/64 | 3/8 | 5/8 | 2 | 2 | D6422320 | D6422322 | D6422324 |
| 21/64 | 3/8 | 7/8 | 2-1/2 | 2 | D6421320 | D6421322 | D6421324 |
| 11/32 | 3/8 | 5/8 | 2 | 2 | D6422340 | D6422342 | D6422344 |
| 11/32 | 3/8 | 7/8 | 2-1/2 | 2 | D6421340 | D6421342 | D6421344 |
| 23/64 | 3/8 | 5/8 | 2 | 2 | D6422350 | D6422352 | D6422354 |
| 23/64 | 3/8 | 7/8 | 2-1/2 | 2 | D6421350 | D6421352 | D6421354 |
| 3/8 | 3/8 | 5/8 | 2 | 2 | D6422370 | D6422372 | D6422374 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 2 | D6421370 | D6421372 | D6421374 |
| 3/8 | 3/8 | 1 | 4 | 2 | D6426370 | D6426372 | D6426374 |
| 3/8 | 3/8 | 1-1/8 | 3 | 2 | D6423370 | D6423372 | D6423374 |
| 3/8 | 3/8 | 1-3/8 | 3 | 2 | D6425370 | D6425372 | D6425374 |
| 3/8 | 3/8 | 1-1/2 | 6 | 2 | D6427370 | D6427372 | D6427374 |
| 3/8 | 3/8 | 1-3/4 | 4 | 2 | D6424370 | D6424372 | D6424374 |
| 3/8 | 3/8 | 3 | 6 | 2 | D6428370 | D6428372 | D6428374 |

**Additional Sizes On Pages 99, 101 & 102**

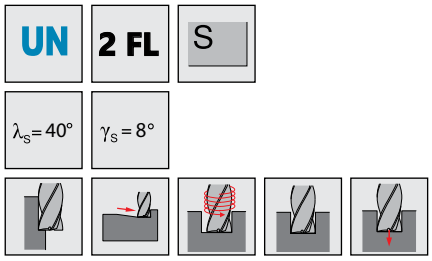
Application Range:

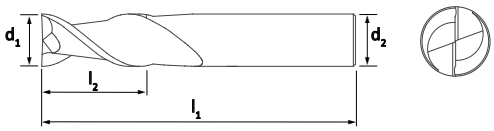
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D642

## 2 Flute Universal






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 25/64 | 7/16 | 5/8 | 2 | 2 | D6422390 | D6422392 | D6422394 |
| 25/64 | 7/16 | 1 | 2-3/4 | 2 | D6421390 | D6421392 | D6421394 |
| 13/32 | 7/16 | 5/8 | 2 | 2 | D6422400 | D6422402 | D6422404 |
| 13/32 | 7/16 | 1 | 2-3/4 | 2 | D6421400 | D6421402 | D6421404 |
| 27/64 | 7/16 | 5/8 | 2 | 2 | D6422420 | D6422422 | D6422424 |
| 27/64 | 7/16 | 1 | 2-3/4 | 2 | D6421420 | D6421422 | D6421424 |
| 7/16 | 7/16 | 5/8 | 2 | 2 | D6422430 | D6422432 | D6422434 |
| 7/16 | 7/16 | 1 | 2-3/4 | 2 | D6421430 | D6421432 | D6421434 |
| 7/16 | 7/16 | 1 | 4 | 2 | D6426430 | D6426432 | D6426434 |
| 7/16 | 7/16 | 1-3/8 | 4 | 2 | D6425430 | D6425432 | D6425434 |
| 7/16 | 7/16 | 1-1/2 | 6 | 2 | D6427430 | D6427432 | D6427434 |
| 7/16 | 7/16 | 2 | 4 | 2 | D6423430 | D6423432 | D6423434 |
| 7/16 | 7/16 | 3 | 6 | 2 | D6424430 | D6424432 | D6424434 |
| 29/64 | 1/2 | 5/8 | 2-1/2 | 2 | D6422450 | D6422452 | D6422454 |
| 29/64 | 1/2 | 1 | 3 | 2 | D6421450 | D6421452 | D6421454 |
| 15/32 | 1/2 | 5/8 | 2-1/2 | 2 | D6422460 | D6422462 | D6422464 |
| 15/32 | 1/2 | 1 | 3 | 2 | D6421460 | D6421462 | D6421464 |
| 31/64 | 1/2 | 5/8 | 2-1/2 | 2 | D6422480 | D6422482 | D6422484 |
| 31/64 | 1/2 | 1 | 3 | 2 | D6421480 | D6421482 | D6421484 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 2 | D6422500 | D6422502 | D6422504 |
| 1/2 | 1/2 | 1 | 3 | 2 | D6421500 | D6421502 | D6421504 |
| 1/2 | 1/2 | 1 | 4 | 2 | D6426500 | D6426502 | D6426504 |
| 1/2 | 1/2 | 1-1/2 | 3-1/2 | 2 | D6425500 | D6425502 | D6425504 |
| 1/2 | 1/2 | 1-1/2 | 6 | 2 | D6427500 | D6427502 | D6427504 |
| 1/2 | 1/2 | 2 | 4 | 2 | D6423500 | D6423502 | D6423504 |
| 1/2 | 1/2 | 3 | 6 | 2 | D6424500 | D6424502 | D6424504 |
| 9/16 | 9/16 | 7/8 | 3 | 2 | D6422560 | D6422562 | D6422564 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | 2 | D6421560 | D6421562 | D6421564 |
| 9/16 | 9/16 | 2 | 6 | 2 | D6426560 | D6426562 | D6426564 |
| 9/16 | 9/16 | 3 | 6 | 2 | D6424560 | D6424562 | D6424564 |
| 5/8 | 5/8 | 7/8 | 3 | 2 | D6422620 | D6422622 | D6422624 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 2 | D6421620 | D6421622 | D6421624 |
| 5/8 | 5/8 | 2 | 6 | 2 | D6426620 | D6426622 | D6426624 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 2 | D6423620 | D6423622 | D6423624 |
| 5/8 | 5/8 | 3 | 6 | 2 | D6424620 | D6424622 | D6424624 |

**Additional Sizes On Pages 99, 100 & 102**

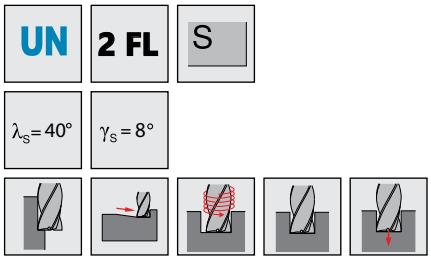
Application Range:

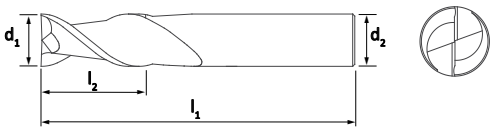
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D642

## 2 Flute Universal






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 11/16 | 3/4 | 1 | 3 | 2 | D6422680 | D6422682 | D6422684 |
| 11/16 | 3/4 | 1-1/2 | 4 | 2 | D6421680 | D6421682 | D6421684 |
| 3/4 | 3/4 | 1 | 3 | 2 | D6422750 | D6422752 | D6422754 |
| 3/4 | 3/4 | 1-1/2 | 4 | 2 | D6421750 | D6421752 | D6421754 |
| 3/4 | 3/4 | 2 | 6 | 2 | D6426750 | D6426752 | D6426754 |
| 3/4 | 3/4 | 2-1/4 | 5 | 2 | D6423750 | D6423752 | D6423754 |
| 3/4 | 3/4 | 3 | 6 | 2 | D6424750 | D6424752 | D6424754 |
| 7/8 | 7/8 | 1-3/4 | 4 | 2 | D6421870 | D6421872 | D6421874 |
| 1 | 1 | 1-3/4 | 4 | 2 | D6421100 | D6421102 | D6421104 |
| 1 | 1 | 2 | 6 | 2 | D6426100 | D6426102 | D6426104 |
| 1 | 1 | 2-1/4 | 5 | 2 | D6423100 | D6423102 | D6423104 |
| 1 | 1 | 3 | 6 | 2 | D6424100 | D6424102 | D6424104 |

**Additional Sizes On Pages 99, 100, & 101**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | ● | ● | |

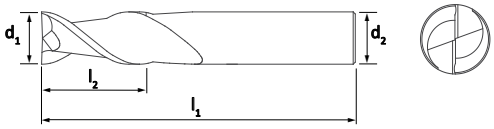
Feeds & Speeds Available on Page 146

# Series D642M

## 2 Flute Universal

UN | 2 FL | S

$\lambda_S = 40°$ | $\gamma_S = 8°$




**Tolerances**

| | |
|---|---|
| Shank: | 1mm - 25mm = -.0025/-.0102 |
| Cutting Dia: | 1mm - 2.5mm = +/-.0127 |
| Chamfer: | 3mm - 25mm = +.000/-.0508 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1.0mm | 3.0mm | 2.0mm | 38.0mm | 2 | D64220390 | D64220392 | D64220394 |
| 1.0mm | 3.0mm | 4.0mm | 38.0mm | 2 | D64210390 | D64210392 | D64210394 |
| 1.5mm | 3.0mm | 3.0mm | 38.0mm | 2 | D64220590 | D64220592 | D64220594 |
| 1.5mm | 3.0mm | 5.0mm | 38.0mm | 2 | D64210590 | D64210592 | D64210594 |
| 2.0mm | 3.0mm | 4.0mm | 38.0mm | 2 | D64220780 | D64220782 | D64220784 |
| 2.0mm | 3.0mm | 8.0mm | 38.0mm | 2 | D64210780 | D64210782 | D64210784 |
| 2.5mm | 3.0mm | 5.0mm | 38.0mm | 2 | D64220980 | D64220982 | D64220984 |
| 2.5mm | 3.0mm | 9.5mm | 38.0mm | 2 | D64210980 | D64210982 | D64210984 |
| 3.0mm | 3.0mm | 6.0mm | 38.0mm | 2 | D64221180 | D64221182 | D64221184 |
| 3.0mm | 3.0mm | 12.0mm | 38.0mm | 2 | D64211180 | D64211182 | D64211184 |
| 3.5mm | 4.0mm | 7.0mm | 50.0mm | 2 | D64221370 | D64221372 | D64221374 |
| 3.5mm | 4.0mm | 12.0mm | 50.0mm | 2 | D64211370 | D64211372 | D64211374 |
| 4.0mm | 4.0mm | 8.0mm | 50.0mm | 2 | D64221570 | D64221572 | D64221574 |
| 4.0mm | 4.0mm | 14.0mm | 50.0mm | 2 | D64211570 | D64211572 | D64211574 |
| 4.5mm | 6.0mm | 9.5mm | 63.0mm | 2 | D64221770 | D64221772 | D64221774 |
| 4.5mm | 6.0mm | 16.0mm | 63.0mm | 2 | D64211770 | D64211772 | D64211774 |
| 5.0mm | 6.0mm | 10.0mm | 63.0mm | 2 | D64221960 | D64221962 | D64221964 |
| 5.0mm | 6.0mm | 16.0mm | 63.0mm | 2 | D64211960 | D64211962 | D64211964 |
| 6.0mm | 6.0mm | 12.0mm | 63.0mm | 2 | D64222360 | D64222362 | D64222364 |
| 6.0mm | 6.0mm | 19.0mm | 63.0mm | 2 | D64212360 | D64212362 | D64212364 |
| 7.0mm | 8.0mm | 12.0mm | 63.0mm | 2 | D64222750 | D64222752 | D64222754 |
| 7.0mm | 8.0mm | 19.0mm | 63.0mm | 2 | D64212750 | D64212752 | D64212754 |
| 8.0mm | 8.0mm | 12.0mm | 63.0mm | 2 | D64223150 | D64223152 | D64223154 |
| 8.0mm | 8.0mm | 20.0mm | 63.0mm | 2 | D64213150 | D64213152 | D64213154 |
| 9.0mm | 10.0mm | 14.0mm | 70.0mm | 2 | D64223540 | D64223542 | D64223544 |
| 9.0mm | 10.0mm | 25.0mm | 70.0mm | 2 | D64213540 | D64213542 | D64213544 |
| 10.0mm | 10.0mm | 14.0mm | 70.0mm | 2 | D64223930 | D64223932 | D64223934 |
| 10.0mm | 10.0mm | 25.0mm | 70.0mm | 2 | D64213930 | D64213932 | D64213934 |
| 11.0mm | 12.0mm | 14.0mm | 76.0mm | 2 | D64224330 | D64224332 | D64224334 |
| 11.0mm | 12.0mm | 25.0mm | 76.0mm | 2 | D64214330 | D64214332 | D64214334 |
| 12.0mm | 12.0mm | 16.0mm | 76.0mm | 2 | D64224720 | D64224722 | D64224724 |
| 12.0mm | 12.0mm | 25.0mm | 76.0mm | 2 | D64214720 | D64214722 | D64214724 |
| 14.0mm | 14.0mm | 32.0mm | 89.0mm | 2 | D64215510 | D64215512 | D64215514 |
| 16.0mm | 16.0mm | 32.0mm | 89.0mm | 2 | D64216290 | D64216292 | D64216294 |
| 18.0mm | 18.0mm | 38.0mm | 100.0mm | 2 | D64217080 | D64217082 | D64217084 |
| 20.0mm | 20.0mm | 38.0mm | 100.0mm | 2 | D64217870 | D64217872 | D64217874 |
| 25.0mm | 25.0mm | 38.0mm | 100.0mm | 2 | D64219840 | D64219842 | D64219844 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | ● | ● | |

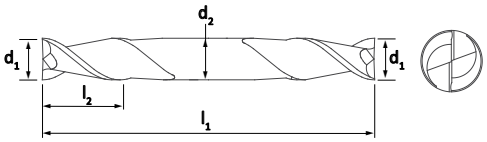
Feeds & Speeds Available on Page 146

# Series D842

## 2 Flute Universal

UN | 2 FL | S

$\lambda_S = 40°$ | $\gamma_S = 8°$




**Tolerances**

Shank: 1/32” - 1/2” = -.0001/-.0004
Cutting Dia: 1/32” - 7/64” = +/-.0005
Cutting Dia: 1/8” - 1/2” = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/32 | 1/8 | 1/16 | 1-1/2 | 2 | D8422030 | D8422032 | D8422034 |
| 3/64 | 1/8 | 3/32 | 1-1/2 | 2 | D8422040 | D8422042 | D8422044 |
| 1/16 | 1/8 | 1/8 | 1-1/2 | 2 | D8422060 | D8422062 | D8422064 |
| 5/64 | 1/8 | 5/32 | 1-1/2 | 2 | D8422070 | D8422072 | D8422074 |
| 3/32 | 1/8 | 3/16 | 1-1/2 | 2 | D8422090 | D8422092 | D8422094 |
| 7/64 | 1/8 | 3/16 | 1-1/2 | 2 | D8422190 | D8422192 | D8422194 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 2 | D8422120 | D8422122 | D8422124 |
| 1/8 | 3/8 | 3/8 | 3 | 2 | D8421120 | D8421122 | D8421124 |
| 9/64 | 3/16 | 5/16 | 2 | 2 | D8422140 | D8422142 | D8422144 |
| 5/32 | 3/16 | 5/16 | 2 | 2 | D8422150 | D8422152 | D8422154 |
| 5/32 | 3/8 | 7/16 | 3 | 2 | D8421150 | D8421152 | D8421154 |
| 11/64 | 3/16 | 5/16 | 2 | 2 | D8422170 | D8422172 | D8422174 |
| 3/16 | 3/16 | 3/8 | 2 | 2 | D8422180 | D8422182 | D8422184 |
| 3/16 | 3/8 | 1/2 | 3 | 2 | D8421180 | D8421182 | D8421184 |
| 13/64 | 1/4 | 1/2 | 2-1/2 | 2 | D8422200 | D8422202 | D8422204 |
| 7/32 | 1/4 | 7/16 | 2-1/2 | 2 | D8422210 | D8422212 | D8422214 |
| 7/32 | 3/8 | 9/16 | 3 | 2 | D8421210 | D8421212 | D8421214 |
| 15/64 | 1/4 | 1/2 | 2-1/2 | 2 | D8422230 | D8422232 | D8422234 |
| 1/4 | 1/4 | 1/2 | 2-1/2 | 2 | D8422250 | D8422252 | D8422254 |
| 1/4 | 3/8 | 5/8 | 3 | 2 | D8421250 | D8421252 | D8421254 |
| 9/32 | 5/16 | 1/2 | 2-1/2 | 2 | D8422280 | D8422282 | D8422284 |
| 9/32 | 3/8 | 11/16 | 3-1/2 | 2 | D8421280 | D8421282 | D8421284 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | 2 | D8422310 | D8422312 | D8422314 |
| 5/16 | 3/8 | 3/4 | 3-1/2 | 2 | D8421310 | D8421312 | D8421314 |
| 11/32 | 3/8 | 3/4 | 3-1/2 | 2 | D8421340 | D8421342 | D8421344 |
| 3/8 | 3/8 | 1/2 | 2-1/2 | 2 | D8422370 | D8422372 | D8422374 |
| 3/8 | 3/8 | 3/4 | 3-1/2 | 2 | D8421370 | D8421372 | D8421374 |
| 7/16 | 7/16 | 9/16 | 2-3/4 | 2 | D8422430 | D8422432 | D8422434 |
| 7/16 | 1/2 | 7/8 | 4 | 2 | D8421430 | D8421432 | D8421434 |
| 1/2 | 1/2 | 5/8 | 3 | 2 | D8422500 | D8422502 | D8422504 |
| 1/2 | 1/2 | 1 | 4 | 2 | D8421500 | D8421502 | D8421504 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | ● | ● | |

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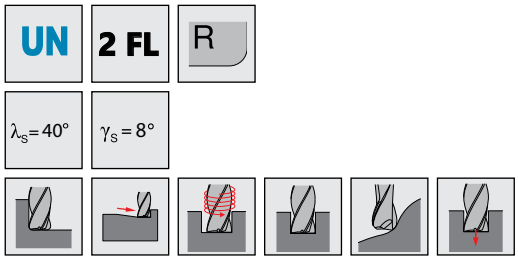
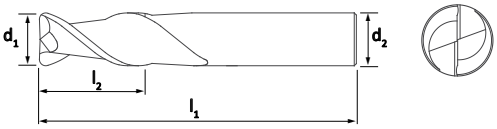
# Series D642CR

## 3 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 3/4” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 3/4” = +.000/-.002 |
| Radius: | 1/8” - 3/4” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.010 | 2 | D6421120/10 | D6421122/10 | D6421124/10 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.015 | 2 | D6421120/15 | D6421122/15 | D6421124/15 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.020 | 2 | D6421120/20 | D6421122/20 | D6421124/20 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.030 | 2 | D6421120/30 | D6421122/30 | D6421124/30 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.045 | 2 | D6421120/45 | D6421122/45 | D6421124/45 |
| 3/16 | 3/16 | 5/8 | 2 | 0.010 | 2 | D6421180/10 | D6421182/10 | D6421184/10 |
| 3/16 | 3/16 | 5/8 | 2 | 0.015 | 2 | D6421180/15 | D6421182/15 | D6421184/15 |
| 3/16 | 3/16 | 5/8 | 2 | 0.020 | 2 | D6421180/20 | D6421182/20 | D6421184/20 |
| 3/16 | 3/16 | 5/8 | 2 | 0.030 | 2 | D6421180/30 | D6421182/30 | D6421184/30 |
| 3/16 | 3/16 | 5/8 | 2 | 0.045 | 2 | D6421180/45 | D6421182/45 | D6421184/45 |
| 3/16 | 3/16 | 5/8 | 2 | 0.060 | 2 | D6421180/60 | D6421182/60 | D6421184/60 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.010 | 2 | D6421250/10 | D6421252/10 | D6421254/10 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.015 | 2 | D6421250/15 | D6421252/15 | D6421254/15 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.020 | 2 | D6421250/20 | D6421252/20 | D6421254/20 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.030 | 2 | D6421250/30 | D6421252/30 | D6421254/30 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.045 | 2 | D6421250/45 | D6421252/45 | D6421254/45 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.060 | 2 | D6421250/60 | D6421252/60 | D6421254/60 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.090 | 2 | D6421250/90 | D6421252/90 | D6421254/90 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.010 | 2 | D6421310/10 | D6421312/10 | D6421314/10 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.015 | 2 | D6421310/15 | D6421312/15 | D6421314/15 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.020 | 2 | D6421310/20 | D6421312/20 | D6421314/20 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.030 | 2 | D6421310/30 | D6421312/30 | D6421314/30 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.045 | 2 | D6421310/45 | D6421312/45 | D6421314/45 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.060 | 2 | D6421310/60 | D6421312/60 | D6421314/60 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.090 | 2 | D6421310/90 | D6421312/90 | D6421314/90 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.010 | 2 | D6421370/10 | D6421372/10 | D6421374/10 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.015 | 2 | D6421370/15 | D6421372/15 | D6421374/15 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.020 | 2 | D6421370/20 | D6421372/20 | D6421374/20 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.030 | 2 | D6421370/30 | D6421372/30 | D6421374/30 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.045 | 2 | D6421370/45 | D6421372/45 | D6421374/45 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.060 | 2 | D6421370/60 | D6421372/60 | D6421374/60 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.090 | 2 | D6421370/90 | D6421372/90 | D6421374/90 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.125 | 2 | D6421370/12 | D6421372/12 | D6421374/12 |
| 1/2 | 1/2 | 1 | 3 | 0.010 | 2 | D6421500/10 | D6421502/10 | D6421504/10 |
| 1/2 | 1/2 | 1 | 3 | 0.015 | 2 | D6421500/15 | D6421502/15 | D6421504/15 |
| 1/2 | 1/2 | 1 | 3 | 0.020 | 2 | D6421500/20 | D6421502/20 | D6421504/20 |
| 1/2 | 1/2 | 1 | 3 | 0.030 | 2 | D6421500/30 | D6421502/30 | D6421504/30 |

**Additional Sizes On Pages 106**

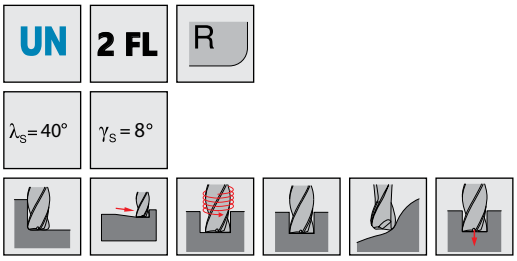
Application Range:

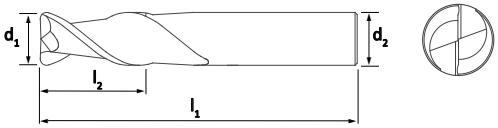
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D642CR

## 2 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 3/4” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 3/4” = +.000/-.002 |
| Radius: | 1/8” - 3/4” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 1/2 | 1/2 | 1 | 3 | 0.045 | 2 | D6421500/45 | D6421502/45 | D6421504/45 |
| 1/2 | 1/2 | 1 | 3 | 0.060 | 2 | D6421500/60 | D6421502/60 | D6421504/60 |
| 1/2 | 1/2 | 1 | 3 | 0.090 | 2 | D6421500/90 | D6421502/90 | D6421504/90 |
| 1/2 | 1/2 | 1 | 3 | 0.125 | 2 | D6421500/12 | D6421502/12 | D6421504/12 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.010 | 2 | D6421620/10 | D6421622/10 | D6421624/10 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.015 | 2 | D6421620/15 | D6421622/15 | D6421624/15 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.020 | 2 | D6421620/20 | D6421622/20 | D6421624/20 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.030 | 2 | D6421620/30 | D6421622/30 | D6421624/30 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.045 | 2 | D6421620/45 | D6421622/45 | D6421624/45 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.060 | 2 | D6421620/60 | D6421622/60 | D6421624/60 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.090 | 2 | D6421620/90 | D6421622/90 | D6421624/90 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.125 | 2 | D6421620/12 | D6421622/12 | D6421624/12 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.010 | 2 | D6421750/10 | D6421752/10 | D6421754/10 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.015 | 2 | D6421750/15 | D6421752/15 | D6421754/15 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.020 | 2 | D6421750/20 | D6421752/20 | D6421754/20 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.030 | 2 | D6421750/30 | D6421752/30 | D6421754/30 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.045 | 2 | D6421750/45 | D6421752/45 | D6421754/45 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.060 | 2 | D6421750/60 | D6421752/60 | D6421754/60 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.090 | 2 | D6421750/90 | D6421752/90 | D6421754/90 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.125 | 2 | D6421750/12 | D6421752/12 | D6421754/12 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.015 | 2 | D6421620/15 | D6421622/15 | D6421624/15 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.020 | 2 | D6421620/20 | D6421622/20 | D6421624/20 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.030 | 2 | D6421620/30 | D6421622/30 | D6421624/30 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.045 | 2 | D6421620/45 | D6421622/45 | D6421624/45 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.060 | 2 | D6421620/60 | D6421622/60 | D6421624/60 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.090 | 2 | D6421620/90 | D6421622/90 | D6421624/90 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.125 | 2 | D6421620/12 | D6421622/12 | D6421624/12 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.010 | 2 | D6421750/10 | D6421752/10 | D6421754/10 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.015 | 2 | D6421750/15 | D6421752/15 | D6421754/15 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.020 | 2 | D6421750/20 | D6421752/20 | D6421754/20 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.030 | 2 | D6421750/30 | D6421752/30 | D6421754/30 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.045 | 2 | D6421750/45 | D6421752/45 | D6421754/45 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.060 | 2 | D6421750/60 | D6421752/60 | D6421754/60 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.090 | 2 | D6421750/90 | D6421752/90 | D6421754/90 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.125 | 2 | D6421750/12 | D6421752/12 | D6421754/12 |

Additional Sizes On Pages 105

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | ● | ● | |

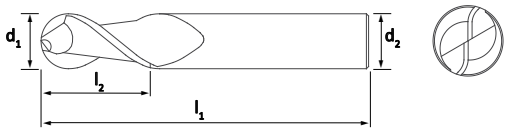
Feeds & Speeds Available on Page 146

# Series D662

## 2 Flute Universal Ball

UN | 2 FL | R

$\lambda_S = 40°$ | $\gamma_S = 8°$




**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +/-.002 |
| Ball: | 1/32” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/32 | 1/8 | 3/32 | 1-1/2 | 2 | D6621030 | D6621032 | D6621034 |
| 3/64 | 1/8 | 9/64 | 1-1/2 | 2 | D6621040 | D6621042 | D6621044 |
| 1/16 | 1/8 | 1/8 | 1-1/2 | 2 | D6622060 | D6622062 | D6622064 |
| 1/16 | 1/8 | 3/16 | 1-1/2 | 2 | D6621060 | D6621062 | D6621064 |
| 5/64 | 1/8 | 1/4 | 1-1/2 | 2 | D6621070 | D6621072 | D6621074 |
| 3/32 | 1/8 | 3/16 | 1-1/2 | 2 | D6622090 | D6622092 | D6622094 |
| 3/32 | 1/8 | 9/32 | 1-1/2 | 2 | D6621090 | D6621092 | D6621094 |
| 7/64 | 1/8 | 3/16 | 1-1/2 | 2 | D6622190 | D6622192 | D6622194 |
| 7/64 | 1/8 | 3/8 | 1-1/2 | 2 | D6621190 | D6621192 | D6621194 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 2 | D6622120 | D6622122 | D6622124 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 2 | D6621120 | D6621122 | D6621124 |
| 1/8 | 1/8 | 3/4 | 2-1/4 | 2 | D6623120 | D6623122 | D6623124 |
| 1/8 | 1/8 | 3/4 | 3 | 2 | D6626120 | D6626122 | D6626124 |
| 1/8 | 1/8 | 1 | 3 | 2 | D6624120 | D6624122 | D6624124 |
| 9/64 | 3/16 | 3/8 | 2 | 2 | D6622140 | D6622142 | D6622144 |
| 9/64 | 3/16 | 1/2 | 2 | 2 | D6621140 | D6621142 | D6621144 |
| 5/32 | 3/16 | 3/8 | 2 | 2 | D6622150 | D6622152 | D6622154 |
| 5/32 | 3/16 | 1/2 | 2 | 2 | D6621150 | D6621152 | D6621154 |
| 11/64 | 3/16 | 3/8 | 2 | 2 | D6622170 | D6622172 | D6622174 |
| 11/64 | 3/16 | 5/8 | 2 | 2 | D6621170 | D6621172 | D6621174 |
| 3/16 | 3/16 | 3/8 | 2 | 2 | D6622180 | D6622182 | D6622184 |
| 3/16 | 3/16 | 5/8 | 2 | 2 | D6621180 | D6621182 | D6621184 |
| 3/16 | 3/16 | 3/4 | 2-1/2 | 2 | D6623180 | D6623182 | D6623184 |
| 3/16 | 3/16 | 1 | 4 | 2 | D6626180 | D6626182 | D6626184 |
| 3/16 | 3/16 | 1-1/8 | 3 | 2 | D6624180 | D6624182 | D6624184 |
| 13/64 | 1/4 | 3/8 | 2 | 2 | D6622200 | D6622202 | D6622204 |
| 13/64 | 1/4 | 5/8 | 2-1/2 | 2 | D6621200 | D6621202 | D6621204 |
| 7/32 | 1/4 | 3/8 | 2 | 2 | D6622210 | D6622212 | D6622214 |
| 7/32 | 1/4 | 5/8 | 2-1/2 | 2 | D6621210 | D6621212 | D6621214 |
| 15/64 | 1/4 | 3/8 | 2 | 2 | D6622230 | D6622232 | D6622234 |
| 15/64 | 1/4 | 3/4 | 2-1/2 | 2 | D6621230 | D6621232 | D6621234 |
| 1/4 | 1/4 | 3/8 | 2 | 2 | D6622250 | D6622252 | D6622254 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 2 | D6621250 | D6621252 | D6621254 |
| 1/4 | 1/4 | 1 | 4 | 2 | D6626250 | D6626252 | D6626254 |
| 1/4 | 1/4 | 1-1/8 | 3 | 2 | D6623250 | D6623252 | D6623254 |
| 1/4 | 1/4 | 1-1/2 | 4 | 2 | D6624250 | D6624252 | D6624254 |
| **1/4** | **1/4** | **1-1/2** | **6** | **2** | **D6627250** | **D6627252** | **D6627254** |

Additional Sizes On Pages 108, 109 & 110

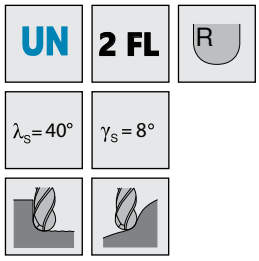
Application Range:

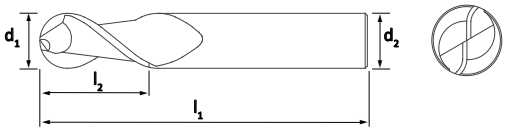
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D662

## 2 Flute Universal Ball






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +/-.002 |
| Ball: | 1/32” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 17/64 | 5/16 | 1/2 | 2 | 2 | D6622260 | D6622262 | D6622264 |
| 17/64 | 5/16 | 3/4 | 2-1/2 | 2 | D6621260 | D6621262 | D6621264 |
| 9/32 | 5/16 | 1/2 | 2 | 2 | D6622280 | D6622282 | D6622284 |
| 9/32 | 5/16 | 3/4 | 2-1/2 | 2 | D6621280 | D6621282 | D6621284 |
| 19/64 | 5/16 | 1/2 | 2 | 2 | D6622290 | D6622292 | D6622294 |
| 19/64 | 5/16 | 3/4 | 2-1/2 | 2 | D6621290 | D6621292 | D6621294 |
| 5/16 | 5/16 | 1/2 | 2 | 2 | D6622310 | D6622312 | D6622314 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 2 | D6621310 | D6621312 | D6621314 |
| 5/16 | 5/16 | 1 | 4 | 2 | D6626310 | D6626312 | D6626314 |
| 5/16 | 5/16 | 1-1/8 | 3 | 2 | D6623310 | D6623312 | D6623314 |
| 5/16 | 5/16 | 1-1/2 | 6 | 2 | D6627310 | D6627312 | D6627314 |
| 5/16 | 5/16 | 1-5/8 | 4 | 2 | D6624310 | D6624312 | D6624314 |
| 21/64 | 3/8 | 5/8 | 2 | 2 | D6622320 | D6622322 | D6622324 |
| 21/64 | 3/8 | 7/8 | 2-1/2 | 2 | D6621320 | D6621322 | D6621324 |
| 11/32 | 3/8 | 5/8 | 2 | 2 | D6622340 | D6622342 | D6622344 |
| 11/32 | 3/8 | 7/8 | 2-1/2 | 2 | D6621340 | D6621342 | D6621344 |
| 23/64 | 3/8 | 5/8 | 2 | 2 | D6622350 | D6622352 | D6622354 |
| 23/64 | 3/8 | 7/8 | 2-1/2 | 2 | D6621350 | D6621352 | D6621354 |
| 3/8 | 3/8 | 5/8 | 2 | 2 | D6622370 | D6622372 | D6622374 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 2 | D6621370 | D6621372 | D6621374 |
| 3/8 | 3/8 | 1 | 4 | 2 | D6626370 | D6626372 | D6626374 |
| 3/8 | 3/8 | 1-1/8 | 3 | 2 | D6623370 | D6623372 | D6623374 |
| 3/8 | 3/8 | 1-1/2 | 6 | 2 | D6627370 | D6627372 | D6627374 |
| 3/8 | 3/8 | 1-3/4 | 4 | 2 | D6624370 | D6624372 | D6624374 |
| 3/8 | 3/8 | 3 | 6 | 2 | D6628370 | D6628372 | D6628374 |
| 25/64 | 7/16 | 5/8 | 2 | 2 | D6622390 | D6622392 | D6622394 |
| 25/64 | 7/16 | 1 | 2-3/4 | 2 | D6621390 | D6621392 | D6621394 |
| 13/32 | 7/16 | 5/8 | 2 | 2 | D6622400 | D6622402 | D6622404 |
| 13/32 | 7/16 | 1 | 2-3/4 | 2 | D6621400 | D6621402 | D6621404 |
| 27/64 | 7/16 | 5/8 | 2 | 2 | D6622420 | D6622422 | D6622424 |
| 27/64 | 7/16 | 1 | 2-3/4 | 2 | D6621420 | D6621422 | D6621424 |
| 7/16 | 7/16 | 5/8 | 2 | 2 | D6622430 | D6622432 | D6622434 |
| 7/16 | 7/16 | 1 | 2-3/4 | 2 | D6621430 | D6621432 | D6621434 |
| 7/16 | 7/16 | 1 | 4 | 2 | D6626430 | D6626432 | D6626434 |
| 7/16 | 7/16 | 1-1/2 | 6 | 2 | D6627430 | D6627432 | D6627434 |
| 7/16 | 7/16 | 2 | 4 | 2 | D6623430 | D6623432 | D6623434 |
| 7/16 | 7/16 | 3 | 6 | 2 | D6624430 | D6624432 | D6624434 |

**Additional Sizes On Pages 107, 109 & 110**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | ● | ● | |

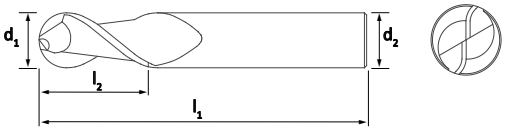
Feeds & Speeds Available on Page 146

# Series D662

## 2 Flute Universal Ball

UN | 2 FL | R

$\lambda_S = 40°$ | $\gamma_S = 8°$




**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +/-.002 |
| Ball: | 1/32” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 29/64 | 1/2 | 5/8 | 2-1/2 | 2 | D6622450 | D6622452 | D6622454 |
| 29/64 | 1/2 | 1 | 3 | 2 | D6621450 | D6621452 | D6621454 |
| 15/32 | 1/2 | 5/8 | 2-1/2 | 2 | D6622460 | D6622462 | D6622464 |
| 15/32 | 1/2 | 1 | 3 | 2 | D6621460 | D6621462 | D6621464 |
| 31/64 | 1/2 | 5/8 | 2-1/2 | 2 | D6622480 | D6622482 | D6622484 |
| 31/64 | 1/2 | 1 | 3 | 2 | D6621480 | D6621482 | D6621484 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 2 | D6622500 | D6622502 | D6622504 |
| 1/2 | 1/2 | 1 | 3 | 2 | D6621500 | D6621502 | D6621504 |
| 1/2 | 1/2 | 1 | 4 | 2 | D6626500 | D6626502 | D6626504 |
| 1/2 | 1/2 | 1-1/2 | 6 | 2 | D6627500 | D6627502 | D6627504 |
| 19/64 | 5/16 | 3/4 | 2-1/2 | 2 | D6621290 | D6621292 | D6621294 |
| 5/16 | 5/16 | 1/2 | 2 | 2 | D6622310 | D6622312 | D6622314 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 2 | D6621310 | D6621312 | D6621314 |
| 5/16 | 5/16 | 1 | 4 | 2 | D6626310 | D6626312 | D6626314 |
| 5/16 | 5/16 | 1-1/8 | 3 | 2 | D6623310 | D6623312 | D6623314 |
| 5/16 | 5/16 | 1-1/2 | 6 | 2 | D6627310 | D6627312 | D6627314 |
| 5/16 | 5/16 | 1-5/8 | 4 | 2 | D6624310 | D6624312 | D6624314 |
| 21/64 | 3/8 | 5/8 | 2 | 2 | D6622320 | D6622322 | D6622324 |
| 21/64 | 3/8 | 7/8 | 2-1/2 | 2 | D6621320 | D6621322 | D6621324 |
| 11/32 | 3/8 | 5/8 | 2 | 2 | D6622340 | D6622342 | D6622344 |
| 11/32 | 3/8 | 7/8 | 2-1/2 | 2 | D6621340 | D6621342 | D6621344 |
| 23/64 | 3/8 | 5/8 | 2 | 2 | D6622350 | D6622352 | D6622354 |
| 23/64 | 3/8 | 7/8 | 2-1/2 | 2 | D6621350 | D6621352 | D6621354 |
| 3/8 | 3/8 | 5/8 | 2 | 2 | D6622370 | D6622372 | D6622374 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 2 | D6621370 | D6621372 | D6621374 |
| 3/8 | 3/8 | 1 | 4 | 2 | D6626370 | D6626372 | D6626374 |
| 3/8 | 3/8 | 1-1/8 | 3 | 2 | D6623370 | D6623372 | D6623374 |
| 3/8 | 3/8 | 1-1/2 | 6 | 2 | D6627370 | D6627372 | D6627374 |
| 3/8 | 3/8 | 1-3/4 | 4 | 2 | D6624370 | D6624372 | D6624374 |
| 3/8 | 3/8 | 3 | 6 | 2 | D6628370 | D6628372 | D6628374 |
| 25/64 | 7/16 | 5/8 | 2 | 2 | D6622390 | D6622392 | D6622394 |
| 25/64 | 7/16 | 1 | 2-3/4 | 2 | D6621390 | D6621392 | D6621394 |
| 13/32 | 7/16 | 5/8 | 2 | 2 | D6622400 | D6622402 | D6622404 |
| 13/32 | 7/16 | 1 | 2-3/4 | 2 | D6621400 | D6621402 | D6621404 |
| 27/64 | 7/16 | 5/8 | 2 | 2 | D6622420 | D6622422 | D6622424 |
| 27/64 | 7/16 | 1 | 2-3/4 | 2 | D6621420 | D6621422 | D6621424 |
| 7/16 | 7/16 | 5/8 | 2 | 2 | D6622430 | D6622432 | D6622434 |

**Additional Sizes On Pages 107, 108, & 110**

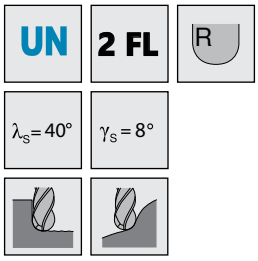
Application Range:

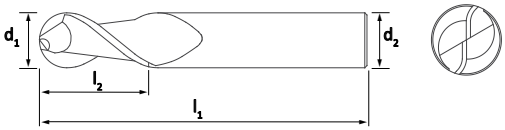
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D662

## 2 Flute Universal Ball






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +/-.002 |
| Ball: | 1/32” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 7/16 | 7/16 | 1 | 2-3/4 | 2 | D6621430 | D6621432 | D6621434 |
| 7/16 | 7/16 | 1 | 4 | 2 | D6626430 | D6626432 | D6626434 |
| 7/16 | 7/16 | 1-1/2 | 6 | 2 | D6627430 | D6627432 | D6627434 |
| 7/16 | 7/16 | 2 | 4 | 2 | D6623430 | D6623432 | D6623434 |
| 7/16 | 7/16 | 3 | 6 | 2 | D6624430 | D6624432 | D6624434 |
| 29/64 | 1/2 | 5/8 | 2-1/2 | 2 | D6622450 | D6622452 | D6622454 |
| 29/64 | 1/2 | 1 | 3 | 2 | D6621450 | D6621452 | D6621454 |
| 15/32 | 1/2 | 5/8 | 2-1/2 | 2 | D6622460 | D6622462 | D6622464 |
| 15/32 | 1/2 | 1 | 3 | 2 | D6621460 | D6621462 | D6621464 |
| 31/64 | 1/2 | 5/8 | 2-1/2 | 2 | D6622480 | D6622482 | D6622484 |
| 31/64 | 1/2 | 1 | 3 | 2 | D6621480 | D6621482 | D6621484 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 2 | D6622500 | D6622502 | D6622504 |
| 1/2 | 1/2 | 1 | 3 | 2 | D6621500 | D6621502 | D6621504 |
| 1/2 | 1/2 | 1 | 4 | 2 | D6626500 | D6626502 | D6626504 |
| 1/2 | 1/2 | 1-1/2 | 6 | 2 | D6627500 | D6627502 | D6627504 |
| 1/2 | 1/2 | 2 | 4 | 2 | D6623500 | D6623502 | D6623504 |
| 1/2 | 1/2 | 3 | 6 | 2 | D6624500 | D6624502 | D6624504 |
| 9/16 | 9/16 | 7/8 | 3 | 2 | D6622560 | D6622562 | D6622564 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | 2 | D6621560 | D6621562 | D6621564 |
| 9/16 | 9/16 | 2 | 6 | 2 | D6626560 | D6626562 | D6626564 |
| 9/16 | 9/16 | 3 | 6 | 2 | D6624560 | D6624562 | D6624564 |
| 5/8 | 5/8 | 7/8 | 3 | 2 | D6622620 | D6622622 | D6622624 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 2 | D6621620 | D6621622 | D6621624 |
| 5/8 | 5/8 | 2 | 6 | 2 | D6626620 | D6626622 | D6626624 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 2 | D6623620 | D6623622 | D6623624 |
| 5/8 | 5/8 | 3 | 6 | 2 | D6624620 | D6624622 | D6624624 |
| 11/16 | 3/4 | 1 | 3 | 2 | D6622680 | D6622682 | D6622684 |
| 11/16 | 3/4 | 1-1/2 | 4 | 2 | D6621680 | D6621682 | D6621684 |
| 3/4 | 3/4 | 1 | 3 | 2 | D6622750 | D6622752 | D6622754 |
| 3/4 | 3/4 | 1-1/2 | 4 | 2 | D6621750 | D6621752 | D6621754 |
| 3/4 | 3/4 | 2 | 6 | 2 | D6626750 | D6626752 | D6626754 |
| 3/4 | 3/4 | 2-1/4 | 5 | 2 | D6623750 | D6623752 | D6623754 |
| 3/4 | 3/4 | 3 | 6 | 2 | D6624750 | D6624752 | D6624754 |
| 7/8 | 7/8 | 1-3/4 | 4 | 2 | D6621870 | D6621872 | D6621874 |
| 1 | 1 | 1-3/4 | 4 | 2 | D6621100 | D6621102 | D6621104 |
| 1 | 1 | 2 | 6 | 2 | D6626100 | D6626102 | D6626104 |
| 1 | 1 | 2-1/4 | 5 | 2 | D6623100 | D6623102 | D6623104 |
| 1 | 1 | 3 | 6 | 2 | D6624100 | D6624102 | D6624104 |

**Additional Sizes On Pages 107, 108, & 109**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | ● | ● | |

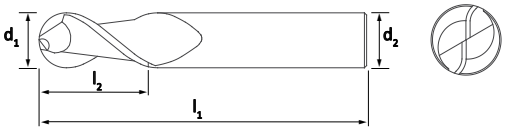
Feeds & Speeds Available on Page 146

# Series D662M

## 2 Flute Universal Ball

UN | 2 FL | R

$\lambda_S = 40°$ | $\gamma_S = 8°$




**Tolerances**

| | |
|---|---|
| Shank: | 1mm - 25mm = -.0025/-.0102 |
| Cutting Dia: | 1mm - 2.5mm = +/-.0127 |
| Cutting Dia: | 3mm - 25mm = +.000/-.0508 |
| Ball: | 1mm - 25mm = +/-.0254 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1.0mm | 3.0mm | 2.0mm | 38.0mm | 2 | D66220390 | D66220392 | D66220394 |
| 1.0mm | 3.0mm | 4.0mm | 38.0mm | 2 | D66210390 | D66210392 | D66210394 |
| 1.5mm | 3.0mm | 3.0mm | 38.0mm | 2 | D66220590 | D66220592 | D66220594 |
| 1.5mm | 3.0mm | 6.0mm | 38.0mm | 2 | D66210590 | D66210592 | D66210594 |
| 2.0mm | 3.0mm | 4.0mm | 38.0mm | 2 | D66220780 | D66220782 | D66220784 |
| 2.0mm | 3.0mm | 8.0mm | 38.0mm | 2 | D66210780 | D66210782 | D66210784 |
| 2.5mm | 3.0mm | 10.0mm | 38.0mm | 2 | D66210980 | D66210982 | D66210984 |
| 2.5mm | 3.0mm | 5.0mm | 38.0mm | 2 | D66220980 | D66220982 | D66220984 |
| 3.0mm | 3.0mm | 6.0mm | 38.0mm | 2 | D66221180 | D66221182 | D66221184 |
| 3.0mm | 3.0mm | 12.0mm | 38.0mm | 2 | D66211180 | D66211182 | D66211184 |
| 3.5mm | 4.0mm | 7.0mm | 50.0mm | 2 | D66221370 | D66221372 | D66221374 |
| 3.5mm | 4.0mm | 12.0mm | 50.0mm | 2 | D66211370 | D66211372 | D66211374 |
| 4.0mm | 4.0mm | 8.0mm | 50.0mm | 2 | D66221570 | D66221572 | D66221574 |
| 4.0mm | 4.0mm | 14.0mm | 50.0mm | 2 | D66211570 | D66211572 | D66211574 |
| 4.5mm | 6.0mm | 9.5mm | 63.0mm | 2 | D66221770 | D66221772 | D66221774 |
| 4.5mm | 6.0mm | 16.0mm | 63.0mm | 2 | D66211770 | D66211772 | D66211774 |
| 5.0mm | 6.0mm | 10.0mm | 63.0mm | 2 | D66221960 | D66221962 | D66221964 |
| 5.0mm | 6.0mm | 16.0mm | 63.0mm | 2 | D66211960 | D66211962 | D66211964 |
| 6.0mm | 6.0mm | 12.0mm | 63.0mm | 2 | D66222360 | D66222362 | D66222364 |
| 6.0mm | 6.0mm | 19.0mm | 63.0mm | 2 | D66212360 | D66212362 | D66212364 |
| 7.0mm | 8.0mm | 12.0mm | 63.0mm | 2 | D66222750 | D66222752 | D66222754 |
| 7.0mm | 8.0mm | 19.0mm | 63.0mm | 2 | D66212750 | D66212752 | D66212754 |
| 8.0mm | 8.0mm | 12.0mm | 63.0mm | 2 | D66223150 | D66223152 | D66223154 |
| 8.0mm | 8.0mm | 20.0mm | 63.0mm | 2 | D66213150 | D66213152 | D66213154 |
| 9.0mm | 10.0mm | 14.0mm | 70.0mm | 2 | D66223540 | D66223542 | D66223544 |
| 9.0mm | 10.0mm | 25.0mm | 70.0mm | 2 | D66213540 | D66213542 | D66213544 |
| 10.0mm | 10.0mm | 14.0mm | 70.0mm | 2 | D66223930 | D66223932 | D66223934 |
| 10.0mm | 10.0mm | 25.0mm | 70.0mm | 2 | D66213930 | D66213932 | D66213934 |
| 11.0mm | 12.0mm | 14.0mm | 76.0mm | 2 | D66224330 | D66224332 | D66224334 |
| 11.0mm | 12.0mm | 25.0mm | 76.0mm | 2 | D66214330 | D66214332 | D66214334 |
| 12.0mm | 12.0mm | 16.0mm | 76.0mm | 2 | D66224720 | D66224722 | D66224724 |
| 12.0mm | 12.0mm | 25.0mm | 76.0mm | 2 | D66214720 | D66214722 | D66214724 |
| 14.0mm | 14.0mm | 32.0mm | 89.0mm | 2 | D66215510 | D66215512 | D66215514 |
| 16.0mm | 16.0mm | 32.0mm | 89.0mm | 2 | D66216290 | D66216292 | D66216294 |
| 18.0mm | 18.0mm | 38.0mm | 100.0mm | 2 | D66217080 | D66217082 | D66217084 |
| 20.0mm | 20.0mm | 38.0mm | 100.0mm | 2 | D66217870 | D66217872 | D66217874 |
| 25.0mm | 25.0mm | 38.0mm | 100.0mm | 2 | D66219840 | D66219842 | D66219844 |

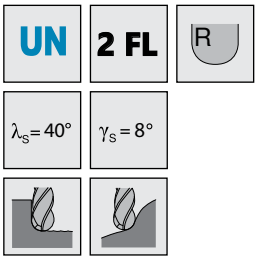
Application Range:

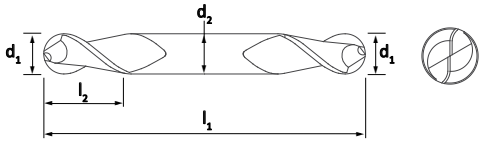
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D862

## 2 Flute Universal Ball






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 3/8” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 3/32” = +/-.0005 |
| Ball: | 1/8” - 3/8” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/32 | 1/8 | 1/16 | 1-1/2 | 2 | D8622030 | D8622032 | D8622034 |
| 3/64 | 1/8 | 3/32 | 1-1/2 | 2 | D8622040 | D8622042 | D8622044 |
| 1/16 | 1/8 | 1/8 | 1-1/2 | 2 | D8622060 | D8622062 | D8622064 |
| 5/64 | 1/8 | 5/32 | 1-1/2 | 2 | D8622070 | D8622072 | D8622074 |
| 3/32 | 1/8 | 3/16 | 1-1/2 | 2 | D8622090 | D8622092 | D8622094 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 2 | D8622120 | D8622122 | D8622124 |
| 5/32 | 3/16 | 5/16 | 2 | 2 | D8622150 | D8622152 | D8622154 |
| 3/16 | 3/16 | 3/8 | 2 | 2 | D8622180 | D8622182 | D8622184 |
| 7/32 | 1/4 | 7/16 | 2-1/2 | 2 | D8622210 | D8622212 | D8622214 |
| 1/4 | 1/4 | 1/2 | 2-1/2 | 2 | D8622250 | D8622252 | D8622254 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | 2 | D8622310 | D8622312 | D8622314 |
| 3/8 | 3/8 | 1/2 | 2-1/2 | 2 | D8622370 | D8622372 | D8622374 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ● | ● | ● | |

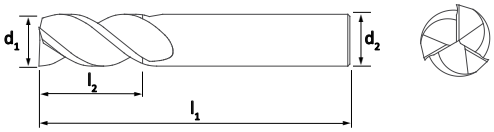
Feeds & Speeds Available on Page 146

# Series D643

## 3 Flute Universal

UN | 3 FL | S

$\lambda_S = 40°$ | $\gamma_S = 8°$




**Tolerances**

| | |
|---|---|
| Shank: | 1/16” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/16” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/16 | 1/8 | 1/8 | 1-1/2 | 3 | D6432060 | D6432062 | D6432064 |
| 1/16 | 1/8 | 3/16 | 1-1/2 | 3 | D6431060 | D6431062 | D6431064 |
| 5/64 | 1/8 | 1/4 | 1-1/2 | 3 | D6431070 | D6431072 | D6431074 |
| 3/32 | 1/8 | 3/16 | 1-1/2 | 3 | D6432090 | D6432092 | D6432094 |
| 3/32 | 1/8 | 9/32 | 1-1/2 | 3 | D6431090 | D6431092 | D6431094 |
| 7/64 | 1/8 | 3/8 | 1-1/2 | 3 | D6431190 | D6431192 | D6431194 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 3 | D6432120 | D6432122 | D6432124 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 3 | D6431120 | D6431122 | D6431124 |
| 1/8 | 1/8 | 3/4 | 2-1/4 | 3 | D6433120 | D6433122 | D6433124 |
| 1/8 | 1/8 | 3/4 | 3 | 3 | D6436120 | D6436122 | D6436124 |
| 1/8 | 1/8 | 1 | 3 | 3 | D6434120 | D6434122 | D6434124 |
| 9/64 | 3/16 | 1/2 | 2 | 3 | D6431140 | D6431142 | D6431144 |
| 5/32 | 3/16 | 3/8 | 2 | 3 | D6432150 | D6432152 | D6432154 |
| 5/32 | 3/16 | 1/2 | 2 | 3 | D6431150 | D6431152 | D6431154 |
| 11/64 | 3/16 | 5/8 | 2 | 3 | D6431170 | D6431172 | D6431174 |
| 3/16 | 3/16 | 3/8 | 2 | 3 | D6432180 | D6432182 | D6432184 |
| 3/16 | 3/16 | 5/8 | 2 | 3 | D6431180 | D6431182 | D6431184 |
| 3/16 | 3/16 | 3/4 | 2-1/2 | 3 | D6433180 | D6433182 | D6433184 |
| 3/16 | 3/16 | 1 | 2-1/2 | 3 | D6435180 | D6435182 | D6435184 |
| 3/16 | 3/16 | 1 | 4 | 3 | D6436180 | D6436182 | D6436184 |
| 3/16 | 3/16 | 1-1/8 | 3 | 3 | D6434180 | D6434182 | D6434184 |
| 13/64 | 1/4 | 5/8 | 2-1/2 | 3 | D6431200 | D6431202 | D6431204 |
| 7/32 | 1/4 | 3/8 | 2 | 3 | D6432210 | D6432212 | D6432214 |
| 7/32 | 1/4 | 5/8 | 2-1/2 | 3 | D6431210 | D6431212 | D6431214 |
| 15/64 | 1/4 | 3/4 | 2-1/2 | 3 | D6431230 | D6431232 | D6431234 |
| 1/4 | 1/4 | 3/8 | 2 | 3 | D6432250 | D6432252 | D6432254 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 3 | D6431250 | D6431252 | D6431254 |
| 1/4 | 1/4 | 1 | 4 | 3 | D6436250 | D6436252 | D6436254 |
| 1/4 | 1/4 | 1-1/8 | 3 | 3 | D6433250 | D6433252 | D6433254 |
| 1/4 | 1/4 | 1-1/2 | 4 | 3 | D6434250 | D6434252 | D6434254 |
| 1/4 | 1/4 | 1-1/2 | 6 | 3 | D6437250 | D6437252 | D6437254 |
| 17/64 | 5/16 | 3/4 | 2-1/2 | 3 | D6431260 | D6431262 | D6431264 |
| 9/32 | 5/16 | 1/2 | 2 | 3 | D6432280 | D6432282 | D6432284 |
| 9/32 | 5/16 | 3/4 | 2-1/2 | 3 | D6431280 | D6431282 | D6431284 |
| 19/64 | 5/16 | 3/4 | 2-1/2 | 3 | D6431290 | D6431292 | D6431294 |

**Additional Sizes On Pages 114 & 115**

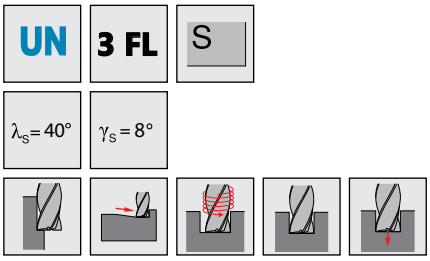
Application Range:

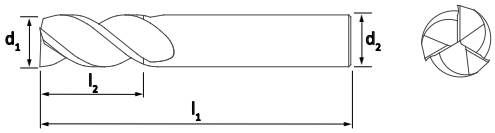
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | ● | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D643

## 3 Flute Universal






**Tolerances**

| | |
|---|---|
| Shank: | 1/16” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/16” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 5/16 | 5/16 | 1/2 | 2 | 3 | D6432310 | D6432312 | D6432314 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 3 | D6431310 | D6431312 | D6431314 |
| 5/16 | 5/16 | 1 | 4 | 3 | D6436310 | D6436312 | D6436314 |
| 5/16 | 5/16 | 1-1/8 | 3 | 3 | D6433310 | D6433312 | D6433314 |
| 5/16 | 5/16 | 1-1/2 | 6 | 3 | D6437310 | D6437312 | D6437314 |
| 5/16 | 5/16 | 1-5/8 | 4 | 3 | D6434310 | D6434312 | D6434314 |
| 21/64 | 3/8 | 7/8 | 2-1/2 | 3 | D6431320 | D6431322 | D6431324 |
| 11/32 | 3/8 | 5/8 | 2 | 3 | D6432340 | D6432342 | D6432344 |
| 11/32 | 3/8 | 7/8 | 2-1/2 | 3 | D6431340 | D6431342 | D6431344 |
| 23/64 | 3/8 | 7/8 | 2-1/2 | 3 | D6431350 | D6431352 | D6431354 |
| 3/8 | 3/8 | 5/8 | 2 | 3 | D6432370 | D6432372 | D6432374 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 3 | D6431370 | D6431372 | D6431374 |
| 3/8 | 3/8 | 1 | 4 | 3 | D6436370 | D6436372 | D6436374 |
| 3/8 | 3/8 | 1-1/8 | 3 | 3 | D6433370 | D6433372 | D6433374 |
| 3/8 | 3/8 | 1-1/2 | 6 | 3 | D6437370 | D6437372 | D6437374 |
| 3/8 | 3/8 | 1-3/4 | 4 | 3 | D6434370 | D6434372 | D6434374 |
| 3/8 | 3/8 | 3 | 6 | 3 | D6438370 | D6438372 | D6438374 |
| 25/64 | 7/16 | 1 | 2-3/4 | 3 | D6431390 | D6431392 | D6431394 |
| 13/32 | 7/16 | 1 | 2-3/4 | 3 | D6431400 | D6431402 | D6431404 |
| 27/64 | 7/16 | 1 | 2-3/4 | 3 | D6431420 | D6431422 | D6431424 |
| 7/16 | 7/16 | 5/8 | 2 | 3 | D6432430 | D6432432 | D6432434 |
| 7/16 | 7/16 | 1 | 2-3/4 | 3 | D6431430 | D6431432 | D6431434 |
| 7/16 | 7/16 | 1 | 4 | 3 | D6436430 | D6436432 | D6436434 |
| 7/16 | 7/16 | 1-1/2 | 6 | 3 | D6437430 | D6437432 | D6437434 |
| 7/16 | 7/16 | 2 | 4 | 3 | D6433430 | D6433432 | D6433434 |
| 7/16 | 7/16 | 3 | 6 | 3 | D6434430 | D6434432 | D6434434 |
| 29/64 | 1/2 | 1 | 3 | 3 | D6431450 | D6431452 | D6431454 |
| 15/32 | 1/2 | 1 | 3 | 3 | D6431460 | D6431462 | D6431464 |
| 31/64 | 1/2 | 1 | 3 | 3 | D6431480 | D6431482 | D6431484 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 3 | D6432500 | D6432502 | D6432504 |
| 1/2 | 1/2 | 1 | 3 | 3 | D6431500 | D6431502 | D6431504 |
| 1/2 | 1/2 | 1 | 4 | 3 | D6436500 | D6436502 | D6436504 |
| 1/2 | 1/2 | 1-1/2 | 6 | 3 | D6437500 | D6437502 | D6437504 |
| 1/2 | 1/2 | 2 | 4 | 3 | D6433500 | D6433502 | D6433504 |
| 1/2 | 1/2 | 3 | 6 | 3 | D6434500 | D6434502 | D6434504 |

**Additional Sizes On Pages 113 & 115**

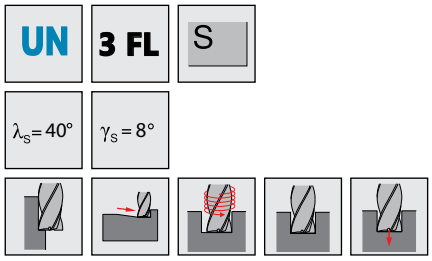
Application Range:

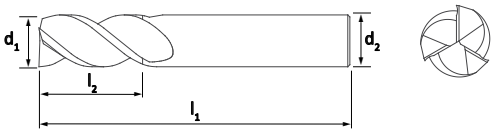
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | ● | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D643

## 3 Flute Universal






**Tolerances**

| | |
|---|---|
| Shank: | 1/16” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/16” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 9/16 | 9/16 | 7/8 | 3 | 3 | D6432560 | D6432562 | D6432564 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | 3 | D6431560 | D6431562 | D6431564 |
| 9/16 | 9/16 | 2 | 6 | 3 | D6436560 | D6436562 | D6436564 |
| 9/16 | 9/16 | 3 | 6 | 3 | D6434560 | D6434562 | D6434564 |
| 5/8 | 5/8 | 7/8 | 3 | 3 | D6432620 | D6432622 | D6432624 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 3 | D6431620 | D6431622 | D6431624 |
| 5/8 | 5/8 | 2 | 6 | 3 | D6436620 | D6436622 | D6436624 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 3 | D6433620 | D6433622 | D6433624 |
| 5/8 | 5/8 | 3 | 6 | 3 | D6434620 | D6434622 | D6434624 |
| 11/16 | 3/4 | 1 | 3 | 3 | D6432680 | D6432682 | D6432684 |
| 11/16 | 3/4 | 1-1/2 | 4 | 3 | D6431680 | D6431682 | D6431684 |
| 3/4 | 3/4 | 1 | 3 | 3 | D6432750 | D6432752 | D6432754 |
| 3/4 | 3/4 | 1-1/2 | 4 | 3 | D6431750 | D6431752 | D6431754 |
| 3/4 | 3/4 | 2 | 6 | 3 | D6436750 | D6436752 | D6436754 |
| 3/4 | 3/4 | 2-1/4 | 5 | 3 | D6433750 | D6433752 | D6433754 |
| 3/4 | 3/4 | 3 | 6 | 3 | D6434750 | D6434752 | D6434754 |
| 7/8 | 7/8 | 1-3/4 | 4 | 3 | D6431870 | D6431872 | D6431874 |
| 1 | 1 | 1-3/4 | 4 | 3 | D6431100 | D6431102 | D6431104 |
| 1 | 1 | 2 | 6 | 3 | D6436100 | D6436102 | D6436104 |
| 1 | 1 | 2-1/4 | 5 | 3 | D6433100 | D6433102 | D6433104 |
| 1 | 1 | 3 | 6 | 3 | D6434100 | D6434102 | D6434104 |

**Additional Sizes On Pages 113 & 114**

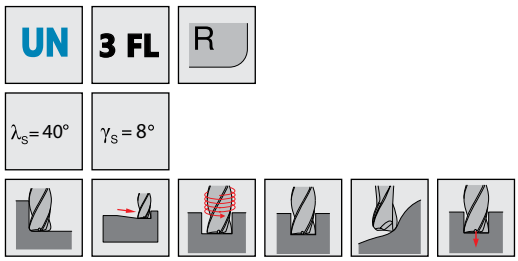
Application Range:

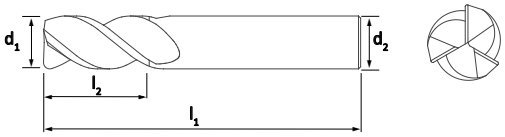
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | ● | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D643CR

## 3 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.010 | 3 | D6431120/10 | D6431122/10 | D6431124/10 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.015 | 3 | D6431120/15 | D6431122/15 | D6431124/15 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.020 | 3 | D6431120/20 | D6431122/20 | D6431124/20 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.030 | 3 | D6431120/30 | D6431122/30 | D6431124/30 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.045 | 3 | D6431120/45 | D6431122/45 | D6431124/45 |
| 3/16 | 3/16 | 5/8 | 2 | 0.010 | 3 | D6431180/10 | D6431182/10 | D6431184/10 |
| 3/16 | 3/16 | 5/8 | 2 | 0.015 | 3 | D6431180/15 | D6431182/15 | D6431184/15 |
| 3/16 | 3/16 | 5/8 | 2 | 0.020 | 3 | D6431180/20 | D6431182/20 | D6431184/20 |
| 3/16 | 3/16 | 5/8 | 2 | 0.030 | 3 | D6431180/30 | D6431182/30 | D6431184/30 |
| 3/16 | 3/16 | 5/8 | 2 | 0.045 | 3 | D6431180/45 | D6431182/45 | D6431184/45 |
| 3/16 | 3/16 | 5/8 | 2 | 0.060 | 3 | D6431180/60 | D6431182/60 | D6431184/60 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.010 | 3 | D6431250/10 | D6431252/10 | D6431254/10 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.015 | 3 | D6431250/15 | D6431252/15 | D6431254/15 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.020 | 3 | D6431250/20 | D6431252/20 | D6431254/20 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.030 | 3 | D6431250/30 | D6431252/30 | D6431254/30 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.045 | 3 | D6431250/45 | D6431252/45 | D6431254/45 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.060 | 3 | D6431250/60 | D6431252/60 | D6431254/60 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.090 | 3 | D6431250/90 | D6431252/90 | D6431254/90 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.010 | 3 | D6431310/10 | D6431312/10 | D6431314/10 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.015 | 3 | D6431310/15 | D6431312/15 | D6431314/15 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.020 | 3 | D6431310/20 | D6431312/20 | D6431314/20 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.030 | 3 | D6431310/30 | D6431312/30 | D6431314/30 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.045 | 3 | D6431310/45 | D6431312/45 | D6431314/45 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.060 | 3 | D6431310/60 | D6431312/60 | D6431314/60 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.090 | 3 | D6431310/90 | D6431312/90 | D6431314/90 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.010 | 3 | D6431370/10 | D6431372/10 | D6431374/10 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.015 | 3 | D6431370/15 | D6431372/15 | D6431374/15 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.020 | 3 | D6431370/20 | D6431372/20 | D6431374/20 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.030 | 3 | D6431370/30 | D6431372/30 | D6431374/30 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.045 | 3 | D6431370/45 | D6431372/45 | D6431374/45 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.060 | 3 | D6431370/60 | D6431372/60 | D6431374/60 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.090 | 3 | D6431370/90 | D6431372/90 | D6431374/90 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.125 | 3 | D6431370/12 | D6431372/12 | D6431374/12 |

**Additional Sizes On Pages 117**

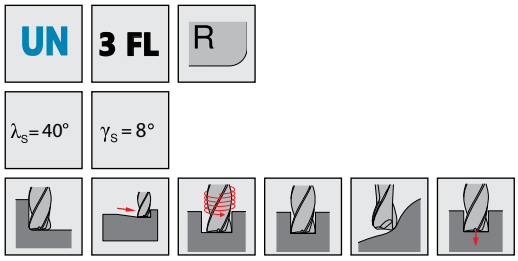
Application Range:

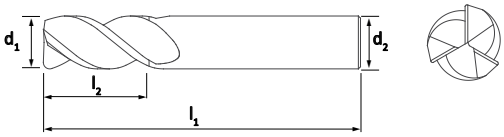
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ● | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D643CR

## 3 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 1/2 | 1/2 | 1 | 3 | 0.010 | 3 | D6431500/10 | D6431502/10 | D6431504/10 |
| 1/2 | 1/2 | 1 | 3 | 0.015 | 3 | D6431500/15 | D6431502/15 | D6431504/15 |
| 1/2 | 1/2 | 1 | 3 | 0.020 | 3 | D6431500/20 | D6431502/20 | D6431504/20 |
| 1/2 | 1/2 | 1 | 3 | 0.030 | 3 | D6431500/30 | D6431502/30 | D6431504/30 |
| 1/2 | 1/2 | 1 | 3 | 0.045 | 3 | D6431500/45 | D6431502/45 | D6431504/45 |
| 1/2 | 1/2 | 1 | 3 | 0.060 | 3 | D6431500/60 | D6431502/60 | D6431504/60 |
| 1/2 | 1/2 | 1 | 3 | 0.090 | 3 | D6431500/90 | D6431502/90 | D6431504/90 |
| 1/2 | 1/2 | 1 | 3 | 0.125 | 3 | D6431500/12 | D6431502/12 | D6431504/12 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.010 | 3 | D6431620/10 | D6431622/10 | D6431624/10 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.015 | 3 | D6431620/15 | D6431622/15 | D6431624/15 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.020 | 3 | D6431620/20 | D6431622/20 | D6431624/20 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.030 | 3 | D6431620/30 | D6431622/30 | D6431624/30 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.045 | 3 | D6431620/45 | D6431622/45 | D6431624/45 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.060 | 3 | D6431620/60 | D6431622/60 | D6431624/60 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.090 | 3 | D6431620/90 | D6431622/90 | D6431624/90 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.125 | 3 | D6431620/12 | D6431622/12 | D6431624/12 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.010 | 3 | D6431750/10 | D6431752/10 | D6431754/10 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.015 | 3 | D6431750/15 | D6431752/15 | D6431754/15 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.020 | 3 | D6431750/20 | D6431752/20 | D6431754/20 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.030 | 3 | D6431750/30 | D6431752/30 | D6431754/30 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.045 | 3 | D6431750/45 | D6431752/45 | D6431754/45 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.060 | 3 | D6431750/60 | D6431752/60 | D6431754/60 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.090 | 3 | D6431750/90 | D6431752/90 | D6431754/90 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.125 | 3 | D6431750/12 | D6431752/12 | D6431754/12 |
| 1 | 1 | 1-3/4 | 4 | 0.010 | 3 | D6431100/10 | D6431102/10 | D6431104/10 |
| 1 | 1 | 1-3/4 | 4 | 0.015 | 3 | D6431100/15 | D6431102/15 | D6431104/15 |
| 1 | 1 | 1-3/4 | 4 | 0.020 | 3 | D6431100/20 | D6431102/20 | D6431104/20 |
| 1 | 1 | 1-3/4 | 4 | 0.030 | 3 | D6431100/30 | D6431102/30 | D6431104/30 |
| 1 | 1 | 1-3/4 | 4 | 0.045 | 3 | D6431100/45 | D6431102/45 | D6431104/45 |
| 1 | 1 | 1-3/4 | 4 | 0.060 | 3 | D6431100/60 | D6431102/60 | D6431104/60 |
| 1 | 1 | 1-3/4 | 4 | 0.090 | 3 | D6431100/90 | D6431102/90 | D6431104/90 |
| 1 | 1 | 1-3/4 | 4 | 0.125 | 3 | D6431100/12 | D6431102/12 | D6431104/12 |

**Additional Sizes On Pages 116**

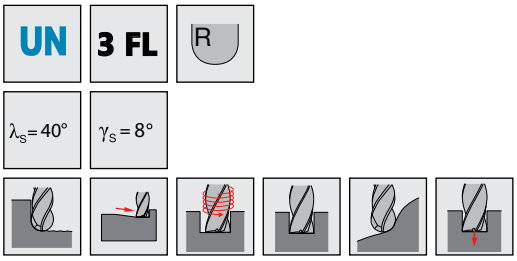
Application Range:

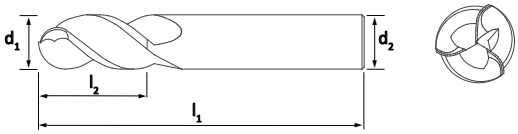
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ● | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D663

## 3 Flute Universal Ball






**Tolerances**

| | |
|---|---|
| Shank: | 1/8" - 1" = -.0001/-.0004 |
| Cutting Dia: | 1/8" - 1" = +.000/-.002 |
| Radius: | 1/8" - 1" = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | 3 | D6632120 | D6632122 | D6632124 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 3 | D6631120 | D6631122 | D6631124 |
| 1/8 | 1/8 | 3/4 | 2-1/4 | 3 | D6633120 | D6633122 | D6633124 |
| 1/8 | 1/8 | 3/4 | 3 | 3 | D6636120 | D6636122 | D6636124 |
| 1/8 | 1/8 | 1 | 3 | 3 | D6634120 | D6634122 | D6634124 |
| 9/64 | 3/16 | 1/2 | 2 | 3 | D6631140 | D6631142 | D6631144 |
| 5/32 | 3/16 | 1/2 | 2 | 3 | D6631150 | D6631152 | D6631154 |
| 11/64 | 3/16 | 5/8 | 2 | 3 | D6631170 | D6631172 | D6631174 |
| 3/16 | 3/16 | 3/8 | 2 | 3 | D6632180 | D6632182 | D6632184 |
| 3/16 | 3/16 | 5/8 | 2 | 3 | D6631180 | D6631182 | D6631184 |
| 3/16 | 3/16 | 3/4 | 2-1/2 | 3 | D6633180 | D6633182 | D6633184 |
| 3/16 | 3/16 | 1 | 2-1/2 | 3 | D6635180 | D6635182 | D6635184 |
| 3/16 | 3/16 | 1 | 4 | 3 | D6636180 | D6636182 | D6636184 |
| 3/16 | 3/16 | 1-1/8 | 3 | 3 | D6634180 | D6634182 | D6634184 |
| 13/64 | 1/4 | 5/8 | 2-1/2 | 3 | D6631200 | D6631202 | D6631204 |
| 7/32 | 1/4 | 5/8 | 2-1/2 | 3 | D6631210 | D6631212 | D6631214 |
| 15/64 | 1/4 | 3/4 | 2-1/2 | 3 | D6631230 | D6631232 | D6631234 |
| 1/4 | 1/4 | 3/8 | 2 | 3 | D6632250 | D6632252 | D6632254 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 3 | D6631250 | D6631252 | D6631254 |
| 1/4 | 1/4 | 1 | 4 | 3 | D6636250 | D6636252 | D6636254 |
| 1/4 | 1/4 | 1-1/8 | 3 | 3 | D6633250 | D6633252 | D6633254 |
| 1/4 | 1/4 | 1-1/2 | 4 | 3 | D6634250 | D6634252 | D6634254 |
| 1/4 | 1/4 | 1-1/2 | 6 | 3 | D6637250 | D6637252 | D6637254 |
| 17/64 | 5/16 | 3/4 | 2-1/2 | 3 | D6631260 | D6631262 | D6631264 |
| 9/32 | 5/16 | 3/4 | 2-1/2 | 3 | D6631280 | D6631282 | D6631284 |
| 19/64 | 5/16 | 3/4 | 2-1/2 | 3 | D6631290 | D6631292 | D6631294 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 3 | D6631310 | D6631312 | D6631314 |
| 5/16 | 5/16 | 1 | 4 | 3 | D6636310 | D6636312 | D6636314 |
| 5/16 | 5/16 | 1-1/2 | 6 | 3 | D6637310 | D6637312 | D6637314 |
| 21/64 | 3/8 | 7/8 | 2-1/2 | 3 | D6631320 | D6631322 | D6631324 |
| 11/32 | 3/8 | 7/8 | 2-1/2 | 3 | D6631340 | D6631342 | D6631344 |
| 23/64 | 3/8 | 7/8 | 2-1/2 | 3 | D6631350 | D6631352 | D6631354 |
| 3/8 | 3/8 | 5/8 | 2 | 3 | D6632370 | D6632372 | D6632374 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 3 | D6631370 | D6631372 | D6631374 |
| 3/8 | 3/8 | 1 | 4 | 3 | D6636370 | D6636372 | D6636374 |
| 3/8 | 3/8 | 1-1/8 | 3 | 3 | D6633370 | D6633372 | D6633374 |
| 3/8 | 3/8 | 1-1/2 | 6 | 3 | D6637370 | D6637372 | D6637374 |

**Additional Sizes On Pages 119**

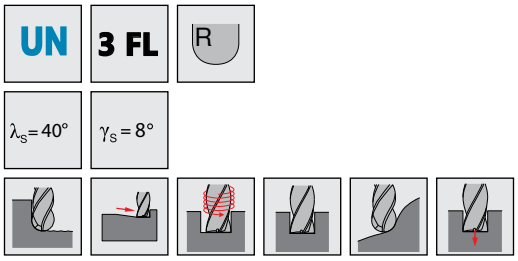
Application Range:

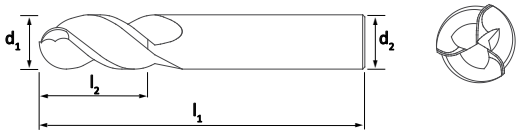
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | ● | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D663

## 3 Flute Universal Ball






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 3/8 | 3/8 | 1-3/4 | 4 | 3 | D6634370 | D6634372 | D6634374 |
| 3/8 | 3/8 | 3 | 6 | 3 | D6638370 | D6638372 | D6638374 |
| 25/64 | 7/16 | 1 | 2-3/4 | 3 | D6631390 | D6631392 | D6631394 |
| 13/32 | 7/16 | 1 | 2-3/4 | 3 | D6631400 | D6631402 | D6631404 |
| 27/64 | 7/16 | 1 | 2-3/4 | 3 | D6631420 | D6631422 | D6631424 |
| 7/16 | 7/16 | 1 | 2-3/4 | 3 | D6631430 | D6631432 | D6631434 |
| 7/16 | 7/16 | 1 | 4 | 3 | D6636430 | D6636432 | D6636434 |
| 7/16 | 7/16 | 1-1/2 | 6 | 3 | D6637430 | D6637432 | D6637434 |
| 7/16 | 7/16 | 2 | 4 | 3 | D6633430 | D6633432 | D6633434 |
| 7/16 | 7/16 | 3 | 6 | 3 | D6634430 | D6634432 | D6634434 |
| 29/64 | 1/2 | 1 | 3 | 3 | D6631450 | D6631452 | D6631454 |
| 15/32 | 1/2 | 1 | 3 | 3 | D6631460 | D6631462 | D6631464 |
| 31/64 | 1/2 | 1 | 3 | 3 | D6631480 | D6631482 | D6631484 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 3 | D6632500 | D6632502 | D6632504 |
| 1/2 | 1/2 | 1 | 3 | 3 | D6631500 | D6631502 | D6631504 |
| 1/2 | 1/2 | 1 | 4 | 3 | D6636500 | D6636502 | D6636504 |
| 1/2 | 1/2 | 1-1/2 | 6 | 3 | D6637500 | D6637502 | D6637504 |
| 1/2 | 1/2 | 2 | 4 | 3 | D6633500 | D6633502 | D6633504 |
| 1/2 | 1/2 | 3 | 6 | 3 | D6634500 | D6634502 | D6634504 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | 3 | D6631560 | D6631562 | D6631564 |
| 9/16 | 9/16 | 2 | 6 | 3 | D6636560 | D6636562 | D6636564 |
| 9/16 | 9/16 | 3 | 6 | 3 | D6634560 | D6634562 | D6634564 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 3 | D6631620 | D6631622 | D6631624 |
| 5/8 | 5/8 | 2 | 6 | 3 | D6636620 | D6636622 | D6636624 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 3 | D6633620 | D6633622 | D6633624 |
| 5/8 | 5/8 | 3 | 6 | 3 | D6634620 | D6634622 | D6634624 |
| 11/16 | 3/4 | 1-1/2 | 4 | 3 | D6631680 | D6631682 | D6631684 |
| 3/4 | 3/4 | 1-1/2 | 4 | 3 | D6631750 | D6631752 | D6631754 |
| 3/4 | 3/4 | 2 | 6 | 3 | D6636750 | D6636752 | D6636754 |
| 3/4 | 3/4 | 2-1/4 | 5 | 3 | D6633750 | D6633752 | D6633754 |
| 3/4 | 3/4 | 3 | 6 | 3 | D6634750 | D6634752 | D6634754 |
| 7/8 | 7/8 | 1-3/4 | 4 | 3 | D6631870 | D6631872 | D6631874 |
| 1 | 1 | 1-3/4 | 4 | 3 | D6631100 | D6631102 | D6631104 |
| 1 | 1 | 2 | 6 | 3 | D6636100 | D6636102 | D6636104 |
| 1 | 1 | 2-1/4 | 5 | 3 | D6633100 | D6633102 | D6633104 |
| 1 | 1 | 3 | 6 | 3 | D6634100 | D6634102 | D6634104 |

**Additional Sizes On Pages 118**

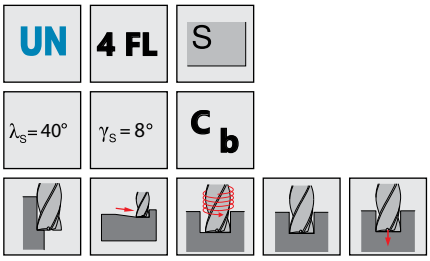
Application Range:

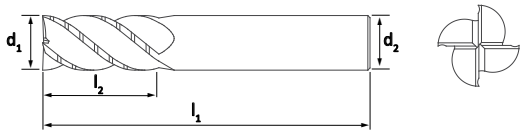
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | | | | | | ● | ● | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D701

## 4 Flute Universal Rougher-Finisher






**Tolerances**

Shank: 1/8" - 1" = -.0001/-.0004
Cutting Dia: 1/8" - 1" = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | AlTiN |
|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | 4 | D70100824 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 4 | D70100814 |
| 1/8 | 1/8 | 3/4 | 2-1/4 | 4 | D70100834 |
| 3/16 | 3/16 | 3/8 | 2 | 4 | D70101224 |
| 3/16 | 3/16 | 5/8 | 2 | 4 | D70101214 |
| 3/16 | 3/16 | 3/4 | 2-1/2 | 4 | D70101234 |
| 3/16 | 3/16 | 1-1/8 | 3 | 4 | D70101244 |
| 1/4 | 1/4 | 3/8 | 2 | 4 | D70101624 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 4 | D70101614 |
| 1/4 | 1/4 | 1-1/8 | 3 | 4 | D70101634 |
| 5/16 | 5/16 | 1/2 | 2 | 4 | D70102024 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 4 | D70102014 |
| 5/16 | 5/16 | 1-1/8 | 3 | 4 | D70102034 |
| 3/8 | 3/8 | 5/8 | 2 | 4 | D70102424 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 4 | D70102414 |
| 3/8 | 3/8 | 1-1/8 | 3 | 4 | D70102434 |
| 3/8 | 3/8 | 1-3/4 | 4 | 4 | D70102444 |
| 7/16 | 7/16 | 1 | 2-3/4 | 4 | D70102814 |
| 7/16 | 7/16 | 2 | 4 | 4 | D70102834 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 4 | D70103224 |
| 1/2 | 1/2 | 1 | 3 | 4 | D70103214 |
| 1/2 | 1/2 | 2 | 4 | 4 | D70103234 |
| 5/8 | 5/8 | 7/8 | 3 | 4 | D70104024 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 4 | D70104014 |
| 3/4 | 3/4 | 1-1/2 | 4 | 4 | D70104814 |
| 3/4 | 3/4 | 2-1/4 | 5 | 4 | D70104834 |
| 3/4 | 3/4 | 3 | 6 | 4 | D70104844 |
| 1 | 1 | 1-3/4 | 4 | 4 | D70106414 |
| 1 | 1 | 2-1/4 | 5 | 4 | D70106434 |

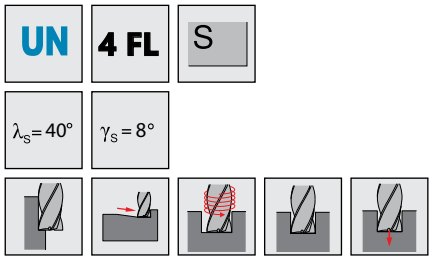
Application Range:

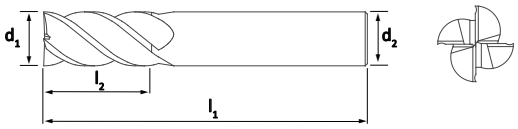
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | | |

Feeds & Speeds Available on Page 146

# Series D644

## 4 Flute Universal






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/32 | 1/8 | 1/16 | 1-1/2 | 4 | D6442030 | D6442032 | D6442034 |
| 1/32 | 1/8 | 3/32 | 1-1/2 | 4 | D6441030 | D6441032 | D6441034 |
| 3/64 | 1/8 | 3/32 | 1-1/2 | 4 | D6442040 | D6442042 | D6442044 |
| 3/64 | 1/8 | 9/64 | 1-1/2 | 4 | D6441040 | D6441042 | D6441044 |
| 1/16 | 1/8 | 1/8 | 1-1/2 | 4 | D6442060 | D6442062 | D6442064 |
| 1/16 | 1/8 | 3/16 | 1-1/2 | 4 | D6441060 | D6441062 | D6441064 |
| 5/64 | 1/8 | 1/4 | 1-1/2 | 4 | D6441070 | D6441072 | D6441074 |
| 3/32 | 1/8 | 3/16 | 1-1/2 | 4 | D6442090 | D6442092 | D6442094 |
| 3/32 | 1/8 | 9/32 | 1-1/2 | 4 | D6441090 | D6441092 | D6441094 |
| 7/64 | 1/8 | 3/16 | 1-1/2 | 4 | D6442190 | D6442192 | D6442194 |
| 7/64 | 1/8 | 3/8 | 1-1/2 | 4 | D6441190 | D6441192 | D6441194 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 4 | D6442120 | D6442122 | D6442124 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 4 | D6441120 | D6441122 | D6441124 |
| 1/8 | 1/8 | 3/4 | 2-1/4 | 4 | D6445120 | D6445122 | D6445124 |
| 1/8 | 1/8 | 3/4 | 3 | 4 | D6446120 | D6446122 | D6446124 |
| 1/8 | 1/8 | 1 | 3 | 4 | D6444120 | D6444122 | D6444124 |
| 9/64 | 3/16 | 3/8 | 2 | 4 | D6442140 | D6442142 | D6442144 |
| 9/64 | 3/16 | 1/2 | 2 | 4 | D6441140 | D6441142 | D6441144 |
| 5/32 | 3/16 | 3/8 | 2 | 4 | D6442150 | D6442152 | D6442154 |
| 5/32 | 3/16 | 1/2 | 2 | 4 | D6441150 | D6441152 | D6441154 |
| 5/32 | 3/16 | 3/4 | 2-1/2 | 4 | D6445150 | D6445152 | D6445154 |
| 11/64 | 3/16 | 3/8 | 2 | 4 | D6442170 | D6442172 | D6442174 |
| 11/64 | 3/16 | 5/8 | 2 | 4 | D6441170 | D6441172 | D6441174 |
| 3/16 | 3/16 | 3/8 | 2 | 4 | D6442180 | D6442182 | D6442184 |
| 3/16 | 3/16 | 5/8 | 2 | 4 | D6441180 | D6441182 | D6441184 |
| 3/16 | 3/16 | 3/4 | 2-1/2 | 4 | D6443180 | D6443182 | D6443184 |
| 3/16 | 3/16 | 1 | 2-1/2 | 4 | D6445180 | D6445182 | D6445184 |
| 3/16 | 3/16 | 1 | 4 | 4 | D6446180 | D6446182 | D6446184 |
| 3/16 | 3/16 | 1-1/8 | 3 | 4 | D6444180 | D6444182 | D6444184 |
| 13/64 | 1/4 | 3/8 | 2 | 4 | D6442200 | D6442202 | D6442204 |
| 13/64 | 1/4 | 5/8 | 2-1/2 | 4 | D6441200 | D6441202 | D6441204 |

**Additional Sizes On Pages 122, 123 & 124**

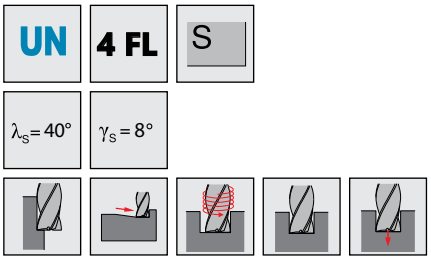
Application Range:

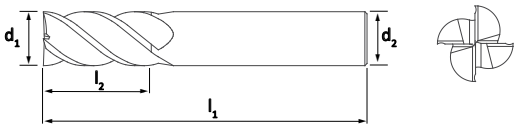
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D644

## 4 Flute Universal






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 7/32 | 1/4 | 3/8 | 2 | 4 | D6442210 | D6442212 | D6442214 |
| 7/32 | 1/4 | 5/8 | 2-1/2 | 4 | D6441210 | D6441212 | D6441214 |
| 7/32 | 1/4 | 1 | 3 | 4 | D6445210 | D6445212 | D6445214 |
| 15/64 | 1/4 | 3/8 | 2 | 4 | D6442230 | D6442232 | D6442234 |
| 15/64 | 1/4 | 3/4 | 2-1/2 | 4 | D6441230 | D6441232 | D6441234 |
| 1/4 | 1/4 | 3/8 | 2 | 4 | D6442250 | D6442252 | D6442254 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 4 | D6441250 | D6441252 | D6441254 |
| 1/4 | 1/4 | 1 | 4 | 4 | D6446250 | D6446252 | D6446254 |
| 1/4 | 1/4 | 1-1/8 | 3 | 4 | D6443250 | D6443252 | D6443254 |
| 1/4 | 1/4 | 1-1/4 | 3 | 4 | D6445250 | D6445252 | D6445254 |
| 1/4 | 1/4 | 1-1/2 | 4 | 4 | D6444250 | D6444252 | D6444254 |
| 1/4 | 1/4 | 1-1/2 | 6 | 4 | D6447250 | D6447252 | D6447254 |
| 17/64 | 5/16 | 1/2 | 2 | 4 | D6442260 | D6442262 | D6442264 |
| 17/64 | 5/16 | 3/4 | 2-1/2 | 4 | D6441260 | D6441262 | D6441264 |
| 9/32 | 5/16 | 1/2 | 2 | 4 | D6442280 | D6442282 | D6442284 |
| 9/32 | 5/16 | 3/4 | 2-1/2 | 4 | D6441280 | D6441282 | D6441284 |
| 9/32 | 5/16 | 1-1/4 | 3 | 4 | D6445280 | D6445282 | D6445284 |
| 19/64 | 5/16 | 1/2 | 2 | 4 | D6442290 | D6442292 | D6442294 |
| 19/64 | 5/16 | 3/4 | 2-1/2 | 4 | D6441290 | D6441292 | D6441294 |
| 5/16 | 5/16 | 1/2 | 2 | 4 | D6442310 | D6442312 | D6442314 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 4 | D6441310 | D6441312 | D6441314 |
| 5/16 | 5/16 | 1 | 4 | 4 | D6446310 | D6446312 | D6446314 |
| 5/16 | 5/16 | 1-1/8 | 3 | 4 | D6443310 | D6443312 | D6443314 |
| 5/16 | 5/16 | 1-3/8 | 3 | 4 | D6445310 | D6445312 | D6445314 |
| 5/16 | 5/16 | 1-1/2 | 6 | 4 | D6447310 | D6447312 | D6447314 |
| 5/16 | 5/16 | 1-5/8 | 4 | 4 | D6444310 | D6444312 | D6444314 |
| 21/64 | 3/8 | 5/8 | 2 | 4 | D6442320 | D6442322 | D6442324 |
| 21/64 | 3/8 | 7/8 | 2-1/2 | 4 | D6441320 | D6441322 | D6441324 |
| 11/32 | 3/8 | 5/8 | 2 | 4 | D6442340 | D6442342 | D6442344 |
| 11/32 | 3/8 | 7/8 | 2-1/2 | 4 | D6441340 | D6441342 | D6441344 |
| 23/64 | 3/8 | 5/8 | 2 | 4 | D6442350 | D6442352 | D6442354 |
| 23/64 | 3/8 | 7/8 | 2-1/2 | 4 | D6441350 | D6441352 | D6441354 |

**Additional Sizes On Pages 121, 123 & 124**

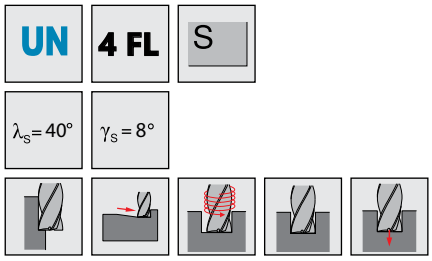
Application Range:

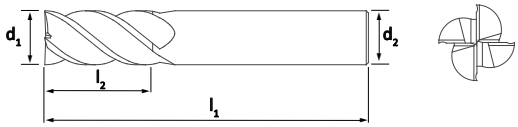
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D644

## 4 Flute Universal






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 3/8 | 3/8 | 5/8 | 2 | 4 | D6442370 | D6442372 | D6442374 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 4 | D6441370 | D6441372 | D6441374 |
| 3/8 | 3/8 | 1 | 4 | 4 | D6446370 | D6446372 | D6446374 |
| 3/8 | 3/8 | 1-1/8 | 3 | 4 | D6443370 | D6443372 | D6443374 |
| 3/8 | 3/8 | 1-3/8 | 3 | 4 | D6445370 | D6445372 | D6445374 |
| 3/8 | 3/8 | 1-1/2 | 6 | 4 | D6447370 | D6447372 | D6447374 |
| 3/8 | 3/8 | 1-3/4 | 4 | 4 | D6444370 | D6444372 | D6444374 |
| 3/8 | 3/8 | 3 | 6 | 4 | D6448370 | D6448372 | D6448374 |
| 25/64 | 7/16 | 5/8 | 2 | 4 | D6442390 | D6442392 | D6442394 |
| 25/64 | 7/16 | 1 | 2-3/4 | 4 | D6441390 | D6441392 | D6441394 |
| 13/32 | 7/16 | 5/8 | 2 | 4 | D6442400 | D6442402 | D6442404 |
| 13/32 | 7/16 | 1 | 2-3/4 | 4 | D6441400 | D6441402 | D6441404 |
| 27/64 | 7/16 | 5/8 | 2 | 4 | D6442420 | D6442422 | D6442424 |
| 27/64 | 7/16 | 1 | 2-3/4 | 4 | D6441420 | D6441422 | D6441424 |
| 7/16 | 7/16 | 5/8 | 2 | 4 | D6442430 | D6442432 | D6442434 |
| 7/16 | 7/16 | 1 | 2-3/4 | 4 | D6441430 | D6441432 | D6441434 |
| 7/16 | 7/16 | 1 | 4 | 4 | D6446430 | D6446432 | D6446434 |
| 7/16 | 7/16 | 1-3/8 | 4 | 4 | D6445430 | D6445432 | D6445434 |
| 7/16 | 7/16 | 1-1/2 | 6 | 4 | D6447430 | D6447432 | D6447434 |
| 7/16 | 7/16 | 2 | 4 | 4 | D6443430 | D6443432 | D6443434 |
| 7/16 | 7/16 | 3 | 6 | 4 | D6444430 | D6444432 | D6444434 |
| 29/64 | 1/2 | 5/8 | 2-1/2 | 4 | D6442450 | D6442452 | D6442454 |
| 29/64 | 1/2 | 1 | 3 | 4 | D6441450 | D6441452 | D6441454 |
| 15/32 | 1/2 | 5/8 | 2-1/2 | 4 | D6442460 | D6442462 | D6442464 |
| 15/32 | 1/2 | 1 | 3 | 4 | D6441460 | D6441462 | D6441464 |
| 31/64 | 1/2 | 5/8 | 2-1/2 | 4 | D6442480 | D6442482 | D6442484 |
| 31/64 | 1/2 | 1 | 3 | 4 | D6441480 | D6441482 | D6441484 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 4 | D6442500 | D6442502 | D6442504 |
| 1/2 | 1/2 | 1 | 3 | 4 | D6441500 | D6441502 | D6441504 |
| 1/2 | 1/2 | 1 | 4 | 4 | D6446500 | D6446502 | D6446504 |
| 1/2 | 1/2 | 1-1/2 | 3-1/2 | 4 | D6445500 | D6445502 | D6445504 |
| 1/2 | 1/2 | 1-1/2 | 6 | 4 | D6447500 | D6447502 | D6447504 |
| 1/2 | 1/2 | 2 | 4 | 4 | D6443500 | D6443502 | D6443504 |
| 1/2 | 1/2 | 3 | 6 | 4 | D6444500 | D6444502 | D6444504 |

**Additional Sizes On Pages 121, 122 & 124**

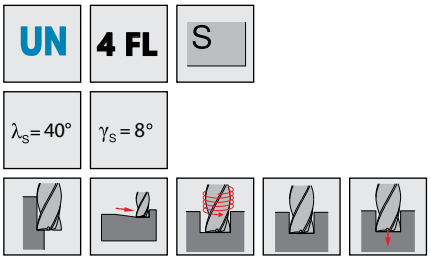
Application Range:

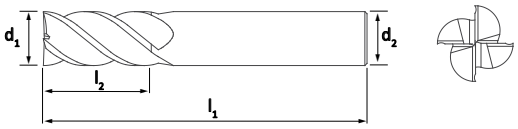
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D644

## 4 Flute Universal






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 9/16 | 9/16 | 7/8 | 3 | 4 | D6442560 | D6442562 | D6442564 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | 4 | D6441560 | D6441562 | D6441564 |
| 9/16 | 9/16 | 2 | 6 | 4 | D6446560 | D6446562 | D6446564 |
| 9/16 | 9/16 | 3 | 6 | 4 | D6444560 | D6444562 | D6444564 |
| 5/8 | 5/8 | 7/8 | 3 | 4 | D6442620 | D6442622 | D6442624 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 4 | D6441620 | D6441622 | D6441624 |
| 5/8 | 5/8 | 2 | 6 | 4 | D6446620 | D6446622 | D6446624 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 4 | D6443620 | D6443622 | D6443624 |
| 5/8 | 5/8 | 3 | 6 | 4 | D6444620 | D6444622 | D6444624 |
| 11/16 | 3/4 | 1 | 3 | 4 | D6442680 | D6442682 | D6442684 |
| 11/16 | 3/4 | 1-1/2 | 4 | 4 | D6441680 | D6441682 | D6441684 |
| 3/4 | 3/4 | 1 | 3 | 4 | D6442750 | D6442752 | D6442754 |
| 3/4 | 3/4 | 1-1/2 | 4 | 4 | D6441750 | D6441752 | D6441754 |
| 3/4 | 3/4 | 2 | 6 | 4 | D6446750 | D6446752 | D6446754 |
| 3/4 | 3/4 | 2-1/4 | 5 | 4 | D6443750 | D6443752 | D6443754 |
| 3/4 | 3/4 | 3 | 6 | 4 | D6444750 | D6444752 | D6444754 |
| 7/8 | 7/8 | 1-3/4 | 4 | 4 | D6441870 | D6441872 | D6441874 |
| 1 | 1 | 1-3/4 | 4 | 4 | D6441100 | D6441102 | D6441104 |
| 1 | 1 | 2 | 6 | 4 | D6446100 | D6446102 | D6446104 |
| 1 | 1 | 2-1/4 | 5 | 4 | D6443100 | D6443102 | D6443104 |
| 1 | 1 | 3 | 6 | 4 | D6444100 | D6444102 | D6444104 |

**Additional Sizes On Pages 121, 122 & 123**

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

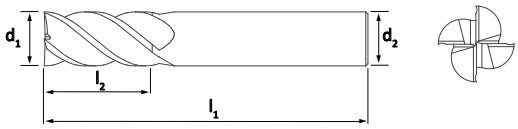
Feeds & Speeds Available on Page 146

# Series D644M

## 4 Flute Universal

UN | 4 FL | S

$\lambda_S = 40°$ | $\gamma_S = 8°$




**Tolerances**

| | |
|---|---|
| Shank: | 1mm - 25mm = -.0025/-.0102 |
| Cutting Dia: | 1mm - 2.5mm = +/-.0127 |
| Chamfer: | 3mm - 25mm = +.000/-.0508 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1.0mm | 3.0mm | 2.0mm | 38.0mm | 4 | D64420390 | D64420392 | D64420394 |
| 1.0mm | 3.0mm | 4.0mm | 38.0mm | 4 | D64410390 | D64410392 | D64410394 |
| 1.5mm | 3.0mm | 3.0mm | 38.0mm | 4 | D64420590 | D64420592 | D64420594 |
| 1.5mm | 3.0mm | 5.0mm | 38.0mm | 4 | D64410590 | D64410592 | D64410594 |
| 2.0mm | 3.0mm | 4.0mm | 38.0mm | 4 | D64420780 | D64420782 | D64420784 |
| 2.0mm | 3.0mm | 8.0mm | 38.0mm | 4 | D64410780 | D64410782 | D64410784 |
| 2.5mm | 3.0mm | 5.0mm | 38.0mm | 4 | D64420980 | D64420982 | D64420984 |
| 2.5mm | 3.0mm | 10.0mm | 38.0mm | 4 | D64410980 | D64410982 | D64410984 |
| 3.0mm | 3.0mm | 6.0mm | 38.0mm | 4 | D64421180 | D64421182 | D64421184 |
| 3.0mm | 3.0mm | 12.0mm | 38.0mm | 4 | D64411180 | D64411182 | D64411184 |
| 3.5mm | 4.0mm | 7.0mm | 50.0mm | 4 | D64421370 | D64421372 | D64421374 |
| 3.5mm | 4.0mm | 12.0mm | 50.0mm | 4 | D64411370 | D64411372 | D64411374 |
| 4.0mm | 4.0mm | 8.0mm | 50.0mm | 4 | D64421570 | D64421572 | D64421574 |
| 4.0mm | 4.0mm | 14.0mm | 50.0mm | 4 | D64411570 | D64411572 | D64411574 |
| 4.5mm | 6.0mm | 9.5mm | 63.0mm | 4 | D64421770 | D64421772 | D64421774 |
| 4.5mm | 6.0mm | 16.0mm | 63.0mm | 4 | D64411770 | D64411772 | D64411774 |
| 5.0mm | 6.0mm | 10.0mm | 63.0mm | 4 | D64421960 | D64421962 | D64421964 |
| 5.0mm | 6.0mm | 16.0mm | 63.0mm | 4 | D64411960 | D64411962 | D64411964 |
| 5.0mm | 6.0mm | 16.0mm | 63.0mm | 4 | D64412360 | D64412362 | D64412364 |
| 6.0mm | 6.0mm | 12.0mm | 63.0mm | 4 | D64422360 | D64422362 | D64422364 |
| 7.0mm | 8.0mm | 12.0mm | 63.0mm | 4 | D64422750 | D64422752 | D64422754 |
| 7.0mm | 8.0mm | 19.0mm | 63.0mm | 4 | D64412750 | D64412752 | D64412754 |
| 8.0mm | 8.0mm | 12.0mm | 63.0mm | 4 | D64423150 | D64423152 | D64423154 |
| 8.0mm | 8.0mm | 20.0mm | 63.0mm | 4 | D64413150 | D64413152 | D64413154 |
| 9.0mm | 10.0mm | 14.0mm | 70.0mm | 4 | D64423540 | D64423542 | D64423544 |
| 9.0mm | 10.0mm | 25.0mm | 70.0mm | 4 | D64413540 | D64413542 | D64413544 |
| 10.0mm | 10.0mm | 14.0mm | 70.0mm | 4 | D64423930 | D64423932 | D64423934 |
| 10.0mm | 10.0mm | 25.0mm | 70.0mm | 4 | D64413930 | D64413932 | D64413934 |
| 11.0mm | 12.0mm | 14.0mm | 76.0mm | 4 | D64424330 | D64424332 | D64424334 |
| 11.0mm | 12.0mm | 25.0mm | 76.0mm | 4 | D64414330 | D64414332 | D64414334 |
| 12.0mm | 12.0mm | 16.0mm | 76.0mm | 4 | D64424720 | D64424722 | D64424724 |
| 12.0mm | 12.0mm | 25.0mm | 76.0mm | 4 | D64414720 | D64414722 | D64414724 |
| 14mm | 14.0mm | 32.0mm | 89.0mm | 4 | D64415510 | D64415512 | D64415514 |
| 16.0mm | 16.0mm | 32.0mm | 89.0mm | 4 | D64416290 | D64416292 | D64416294 |
| 18.0mm | 18.0mm | 38.0mm | 100.0mm | 4 | D64417080 | D64417082 | D64417084 |
| 20.0mm | 20.0mm | 38.0mm | 100.0mm | 4 | D64417870 | D64417872 | D64417874 |
| 25.0mm | 25.0mm | 38.0mm | 100.0mm | 4 | D64419840 | D64419842 | D64419844 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

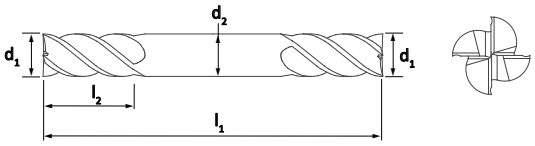
Feeds & Speeds Available on Page 146

# Series D844

## 4 Flute Universal

UN | 4 FL | S

$\lambda_S = 40°$ | $\gamma_S = 8°$




**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1/2” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Chamfer: | 1/8” - 1/2” = +.000/-.002 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/32 | 1/8 | 1/16 | 1-1/2 | 4 | D8442030 | D8442032 | D8442034 |
| 3/64 | 1/8 | 3/32 | 1-1/2 | 4 | D8442040 | D8442042 | D8442044 |
| 1/16 | 1/8 | 1/8 | 1-1/2 | 4 | D8442060 | D8442062 | D8442064 |
| 5/64 | 1/8 | 5/32 | 1-1/2 | 4 | D8442070 | D8442072 | D8442074 |
| 3/32 | 1/8 | 3/16 | 1-1/2 | 4 | D8442090 | D8442092 | D8442094 |
| 7/64 | 1/8 | 3/16 | 1-1/2 | 4 | D8442190 | D8442192 | D8442194 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 4 | D8442120 | D8442122 | D8442124 |
| 1/8 | 3/8 | 3/8 | 3 | 4 | D8441120 | D8441122 | D8441124 |
| 9/64 | 3/16 | 5/16 | 2 | 4 | D8442140 | D8442142 | D8442144 |
| 5/32 | 3/16 | 5/16 | 2 | 4 | D8442150 | D8442152 | D8442154 |
| 5/32 | 3/8 | 7/16 | 3 | 4 | D8441150 | D8441152 | D8441154 |
| 11/64 | 3/16 | 5/16 | 2 | 4 | D8442170 | D8442172 | D8442174 |
| 3/16 | 3/16 | 3/8 | 2 | 4 | D8442180 | D8442182 | D8442184 |
| 3/16 | 3/8 | 1/2 | 3 | 4 | D8441180 | D8441182 | D8441184 |
| 13/64 | 1/4 | 1/2 | 2-1/2 | 4 | D8442200 | D8442202 | D8442204 |
| 7/32 | 1/4 | 7/16 | 2-1/2 | 4 | D8442210 | D8442212 | D8442214 |
| 7/32 | 3/8 | 9/16 | 3 | 4 | D8441210 | D8441212 | D8441214 |
| 15/64 | 1/4 | 1/2 | 2-1/2 | 4 | D8442230 | D8442232 | D8442234 |
| 1/4 | 1/4 | 1/2 | 2-1/2 | 4 | D8442250 | D8442252 | D8442254 |
| 1/4 | 3/8 | 5/8 | 3 | 4 | D8441250 | D8441252 | D8441254 |
| 9/32 | 5/16 | 1/2 | 2-1/2 | 4 | D8442280 | D8442282 | D8442284 |
| 9/32 | 3/8 | 11/16 | 3-1/2 | 4 | D8441280 | D8441282 | D8441284 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | 4 | D8442310 | D8442312 | D8442314 |
| 5/16 | 3/8 | 3/4 | 3-1/2 | 4 | D8441310 | D8441312 | D8441314 |
| 11/32 | 3/8 | 3/4 | 3-1/2 | 4 | D8441340 | D8441342 | D8441344 |
| 3/8 | 3/8 | 1/2 | 2-1/2 | 4 | D8442370 | D8442372 | D8442374 |
| 3/8 | 3/8 | 3/4 | 3-1/2 | 4 | D8441370 | D8441372 | D8441374 |
| 7/16 | 7/16 | 9/16 | 2-3/4 | 4 | D8442430 | D8442432 | D8442434 |
| 7/16 | 1/2 | 7/8 | 4 | 4 | D8441430 | D8441432 | D8441434 |
| 1/2 | 1/2 | 5/8 | 3 | 4 | D8442500 | D8442502 | D8442504 |
| 1/2 | 1/2 | 1 | 4 | 4 | D8441500 | D8441502 | D8441504 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

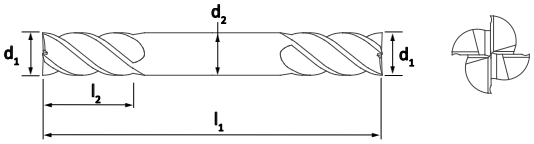
Feeds & Speeds Available on Page 146

# Series D844M

## 4 Flute Universal

UN | 4 FL | S

$\lambda_S = 40°$ | $\gamma_S = 8°$




**Tolerances**

| | |
|---|---|
| Shank: | 1mm - 12mm = -.0025/-.0102 |
| Cutting Dia: | 1mm - 2.5mm = +/-.0127 |
| Chamfer: | 3mm - 12mm = +.000/-.0508 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1.0mm | 3.0mm | 2.0mm | 38.0mm | 4 | D84420390 | D84420392 | D84420394 |
| 1.5mm | 3.0mm | 3.0mm | 38.0mm | 4 | D84420590 | D84420592 | D84420594 |
| 2.0mm | 3.0mm | 4.0mm | 38.0mm | 4 | D84420780 | D84420782 | D84420784 |
| 2.5mm | 3.0mm | 5.0mm | 38.0mm | 4 | D84420980 | D84420982 | D84420984 |
| 3.0mm | 3.0mm | 6.0mm | 38.0mm | 4 | D84421180 | D84421182 | D84421184 |
| 3.5mm | 4.0mm | 7.0mm | 38.0mm | 4 | D84421370 | D84421372 | D84421374 |
| 4.0mm | 4.0mm | 8.0mm | 50.0mm | 4 | D84421570 | D84421572 | D84421574 |
| 4.5mm | 6.0mm | 9.5mm | 63.0mm | 4 | D84421770 | D84421772 | D84421774 |
| 5.0mm | 6.0mm | 10.0mm | 63.0mm | 4 | D84421960 | D84421962 | D84421964 |
| 6.0mm | 6.0mm | 12.0mm | 63.0mm | 4 | D84422360 | D84422362 | D84422364 |
| 7.0mm | 8.0mm | 12.0mm | 63.0mm | 4 | D84422750 | D84422752 | D84422754 |
| 8.0mm | 8.0mm | 12.0mm | 63.0mm | 4 | D84423150 | D84423152 | D84423154 |
| 9.0mm | 10.0mm | 14.0mm | 70.0mm | 4 | D84423540 | D84423542 | D84423544 |
| 10.0mm | 10.0mm | 14.0mm | 70.0mm | 4 | D84423930 | D84423932 | D84423934 |
| 11.0mm | 12.0mm | 14.0mm | 76.0mm | 4 | D84424330 | D84424332 | D84424334 |
| 12.0mm | 12.0mm | 16.0mm | 76.0mm | 4 | D84424720 | D84424722 | D84424724 |

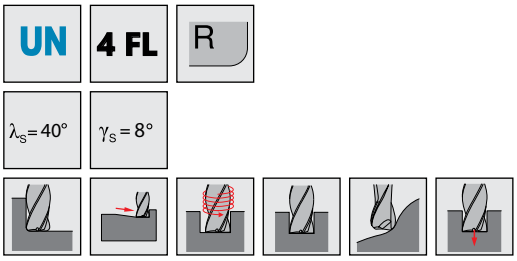
Application Range:

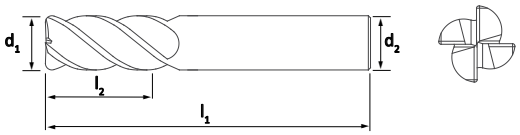
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D644CR

## 4 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8" - 1" = -.0001/-.0004 |
| Cutting Dia: | 1/8" - 1" = +.000/-.002 |
| Radius: | 1/8" - 1" = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | 0.010 | 4 | D6442120/10 | D6442122/10 | D6442124/10 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 0.015 | 4 | D6442120/15 | D6442122/15 | D6442124/15 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 0.020 | 4 | D6442120/20 | D6442122/20 | D6442124/20 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 0.030 | 4 | D6442120/30 | D6442122/30 | D6442124/30 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 0.045 | 4 | D6442120/45 | D6442122/45 | D6442124/45 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.010 | 4 | D6441120/10 | D6441122/10 | D6441124/10 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.015 | 4 | D6441120/15 | D6441122/15 | D6441124/15 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.020 | 4 | D6441120/20 | D6441122/20 | D6441124/20 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.030 | 4 | D6441120/30 | D6441122/30 | D6441124/30 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 0.045 | 4 | D6441120/45 | D6441122/45 | D6441124/45 |
| 1/8 | 1/8 | 1 | 3 | 0.010 | 4 | D6444120/10 | D6444122/10 | D6444124/10 |
| 1/8 | 1/8 | 1 | 3 | 0.015 | 4 | D6444120/15 | D6444122/15 | D6444124/15 |
| 1/8 | 1/8 | 1 | 3 | 0.020 | 4 | D6444120/20 | D6444122/20 | D6444124/20 |
| 1/8 | 1/8 | 1 | 3 | 0.030 | 4 | D6444120/30 | D6444122/30 | D6444124/30 |
| 1/8 | 1/8 | 1 | 3 | 0.045 | 4 | D6444120/45 | D6444122/45 | D6444124/45 |
| 3/16 | 3/16 | 3/8 | 2 | 0.010 | 4 | D6442180/10 | D6442182/10 | D6442184/10 |
| 3/16 | 3/16 | 3/8 | 2 | 0.015 | 4 | D6442180/15 | D6442182/15 | D6442184/15 |
| 3/16 | 3/16 | 3/8 | 2 | 0.020 | 4 | D6442180/20 | D6442182/20 | D6442184/20 |
| 3/16 | 3/16 | 3/8 | 2 | 0.030 | 4 | D6442180/30 | D6442182/30 | D6442184/30 |
| 3/16 | 3/16 | 3/8 | 2 | 0.045 | 4 | D6442180/45 | D6442182/45 | D6442184/45 |
| 3/16 | 3/16 | 3/8 | 2 | 0.060 | 4 | D6442180/60 | D6442182/60 | D6442184/60 |
| 3/16 | 3/16 | 5/8 | 2 | 0.010 | 4 | D6441180/10 | D6441182/10 | D6441184/10 |
| 3/16 | 3/16 | 5/8 | 2 | 0.015 | 4 | D6441180/15 | D6441182/15 | D6441184/15 |
| 3/16 | 3/16 | 5/8 | 2 | 0.020 | 4 | D6441180/20 | D6441182/20 | D6441184/20 |
| 3/16 | 3/16 | 5/8 | 2 | 0.030 | 4 | D6441180/30 | D6441182/30 | D6441184/30 |
| 3/16 | 3/16 | 5/8 | 2 | 0.045 | 4 | D6441180/45 | D6441182/45 | D6441184/45 |
| 3/16 | 3/16 | 5/8 | 2 | 0.060 | 4 | D6441180/60 | D6441182/60 | D6441184/60 |
| 3/16 | 3/16 | 1 | 4 | 0.010 | 4 | D6446180/10 | D6446182/10 | D6446184/10 |
| 3/16 | 3/16 | 1 | 4 | 0.015 | 4 | D6446180/15 | D6446182/15 | D6446184/15 |
| 3/16 | 3/16 | 1 | 4 | 0.020 | 4 | D6446180/20 | D6446182/20 | D6446184/20 |
| 3/16 | 3/16 | 1 | 4 | 0.030 | 4 | D6446180/30 | D6446182/30 | D6446184/30 |
| 3/16 | 3/16 | 1 | 4 | 0.045 | 4 | D6446180/45 | D6446182/45 | D6446184/45 |
| 3/16 | 3/16 | 1 | 4 | 0.060 | 4 | D6446180/60 | D6446182/60 | D6446184/60 |
| 3/16 | 3/16 | 1-1/8 | 3 | 0.010 | 4 | D6444180/10 | D6444182/10 | D6444184/10 |

**Additional Sizes On Pages 129 - 137**

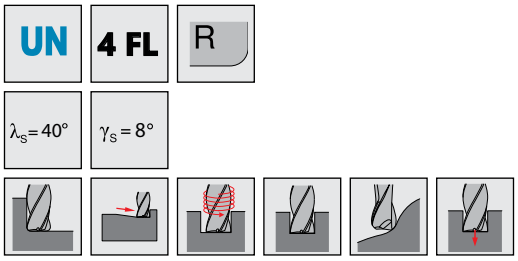
Application Range:

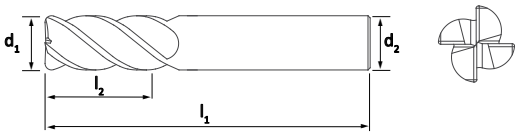
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D644CR

## 4 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 3/16 | 3/16 | 1-1/8 | 3 | 0.015 | 4 | D6444180/15 | D6444182/15 | D6444184/15 |
| 3/16 | 3/16 | 1-1/8 | 3 | 0.020 | 4 | D6444180/20 | D6444182/20 | D6444184/20 |
| 3/16 | 3/16 | 1-1/8 | 3 | 0.030 | 4 | D6444180/30 | D6444182/30 | D6444184/30 |
| 3/16 | 3/16 | 1-1/8 | 3 | 0.045 | 4 | D6444180/45 | D6444182/45 | D6444184/45 |
| 3/16 | 3/16 | 1-1/8 | 3 | 0.060 | 4 | D6444180/60 | D6444182/60 | D6444184/60 |
| 1/4 | 1/4 | 3/8 | 2 | 0.010 | 4 | D6442250/10 | D6442252/10 | D6442254/10 |
| 1/4 | 1/4 | 3/8 | 2 | 0.015 | 4 | D6442250/15 | D6442252/15 | D6442254/15 |
| 1/4 | 1/4 | 3/8 | 2 | 0.020 | 4 | D6442250/20 | D6442252/20 | D6442254/20 |
| 1/4 | 1/4 | 3/8 | 2 | 0.030 | 4 | D6442250/30 | D6442252/30 | D6442254/30 |
| 1/4 | 1/4 | 3/8 | 2 | 0.045 | 4 | D6442250/45 | D6442252/45 | D6442254/45 |
| 1/4 | 1/4 | 3/8 | 2 | 0.060 | 4 | D6442250/60 | D6442252/60 | D6442254/60 |
| 1/4 | 1/4 | 3/8 | 2 | 0.090 | 4 | D6442250/90 | D6442252/90 | D6442254/90 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.010 | 4 | D6441250/10 | D6441252/10 | D6441254/10 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.015 | 4 | D6441250/15 | D6441252/15 | D6441254/15 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.020 | 4 | D6441250/20 | D6441252/20 | D6441254/20 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.030 | 4 | D6441250/30 | D6441252/30 | D6441254/30 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.045 | 4 | D6441250/45 | D6441252/45 | D6441254/45 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.060 | 4 | D6441250/60 | D6441252/60 | D6441254/60 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 0.090 | 4 | D6441250/90 | D6441252/90 | D6441254/90 |
| 1/4 | 1/4 | 1 | 4 | 0.010 | 4 | D6446250/10 | D6446252/10 | D6446254/10 |
| 1/4 | 1/4 | 1 | 4 | 0.015 | 4 | D6446250/15 | D6446252/15 | D6446254/15 |
| 1/4 | 1/4 | 1 | 4 | 0.020 | 4 | D6446250/20 | D6446252/20 | D6446254/20 |
| 1/4 | 1/4 | 1 | 4 | 0.030 | 4 | D6446250/30 | D6446252/30 | D6446254/30 |
| 1/4 | 1/4 | 1 | 4 | 0.045 | 4 | D6446250/45 | D6446252/45 | D6446254/45 |
| 1/4 | 1/4 | 1 | 4 | 0.060 | 4 | D6446250/60 | D6446252/60 | D6446254/60 |
| 1/4 | 1/4 | 1 | 4 | 0.090 | 4 | D6446250/90 | D6446252/90 | D6446254/90 |
| 1/4 | 1/4 | 1-1/8 | 3 | 0.010 | 4 | D6443250/10 | D6443252/10 | D6443254/10 |
| 1/4 | 1/4 | 1-1/8 | 3 | 0.015 | 4 | D6443250/15 | D6443252/15 | D6443254/15 |
| 1/4 | 1/4 | 1-1/8 | 3 | 0.020 | 4 | D6443250/20 | D6443252/20 | D6443254/20 |
| 1/4 | 1/4 | 1-1/8 | 3 | 0.030 | 4 | D6443250/30 | D6443252/30 | D6443254/30 |
| 1/4 | 1/4 | 1-1/8 | 3 | 0.045 | 4 | D6443250/45 | D6443252/45 | D6443254/45 |
| 1/4 | 1/4 | 1-1/8 | 3 | 0.060 | 4 | D6443250/60 | D6443252/60 | D6443254/60 |
| 1/4 | 1/4 | 1-1/8 | 3 | 0.090 | 4 | D6443250/90 | D6443252/90 | D6443254/90 |
| 1/4 | 1/4 | 1-1/2 | 4 | 0.010 | 4 | D6444250/10 | D6444252/10 | D6444254/10 |

**Additional Sizes On Pages 128 & 130 - 137**

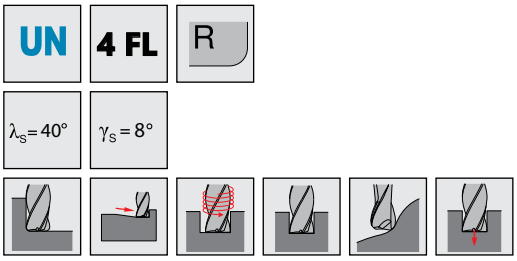
Application Range:

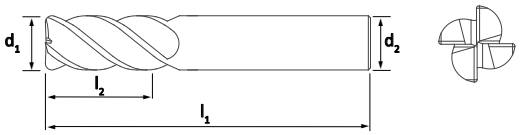
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D644CR

## 4 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8" - 1" = -.0001/-.0004 |
| Cutting Dia: | 1/8" - 1" = +.000/-.002 |
| Radius: | 1/8" - 1" = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 1/4 | 1/4 | 1-1/2 | 6 | 0.010 | 4 | D6447250/10 | D6447252/10 | D6447254/10 |
| 1/4 | 1/4 | 1-1/2 | 4 | 0.015 | 4 | D6444250/15 | D6444252/15 | D6444254/15 |
| 1/4 | 1/4 | 1-1/2 | 6 | 0.015 | 4 | D6447250/15 | D6447252/15 | D6447254/15 |
| 1/4 | 1/4 | 1-1/2 | 4 | 0.020 | 4 | D6444250/20 | D6444252/20 | D6444254/20 |
| 1/4 | 1/4 | 1-1/2 | 6 | 0.020 | 4 | D6447250/20 | D6447252/20 | D6447254/20 |
| 1/4 | 1/4 | 1-1/2 | 4 | 0.030 | 4 | D6444250/30 | D6444252/30 | D6444254/30 |
| 1/4 | 1/4 | 1-1/2 | 6 | 0.030 | 4 | D6447250/30 | D6447252/30 | D6447254/30 |
| 1/4 | 1/4 | 1-1/2 | 4 | 0.045 | 4 | D6444250/45 | D6444252/45 | D6444254/45 |
| 1/4 | 1/4 | 1-1/2 | 6 | 0.045 | 4 | D6447250/45 | D6447252/45 | D6447254/45 |
| 1/4 | 1/4 | 1-1/2 | 4 | 0.060 | 4 | D6444250/60 | D6444252/60 | D6444254/60 |
| 1/4 | 1/4 | 1-1/2 | 6 | 0.060 | 4 | D6447250/60 | D6447252/60 | D6447254/60 |
| 1/4 | 1/4 | 1-1/2 | 4 | 0.090 | 4 | D6444250/90 | D6444252/90 | D6444254/90 |
| 1/4 | 1/4 | 1-1/2 | 6 | 0.090 | 4 | D6447250/90 | D6447252/90 | D6447254/90 |
| 5/16 | 5/16 | 1/2 | 2 | 0.010 | 4 | D6442310/10 | D6442312/10 | D6442314/10 |
| 5/16 | 5/16 | 1/2 | 2 | 0.015 | 4 | D6442310/15 | D6442312/15 | D6442314/15 |
| 5/16 | 5/16 | 1/2 | 2 | 0.020 | 4 | D6442310/20 | D6442312/20 | D6442314/20 |
| 5/16 | 5/16 | 1/2 | 2 | 0.030 | 4 | D6442310/30 | D6442312/30 | D6442314/30 |
| 5/16 | 5/16 | 1/2 | 2 | 0.045 | 4 | D6442310/45 | D6442312/45 | D6442314/45 |
| 5/16 | 5/16 | 1/2 | 2 | 0.060 | 4 | D6442310/60 | D6442312/60 | D6442314/60 |
| 5/16 | 5/16 | 1/2 | 2 | 0.090 | 4 | D6442310/90 | D6442312/90 | D6442314/90 |
| 5/16 | 5/16 | 1/2 | 2 | 0.125 | 4 | D6442310/12 | D6442312/12 | D6442314/12 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.010 | 4 | D6441310/10 | D6441312/10 | D6441314/10 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.015 | 4 | D6441310/15 | D6441312/15 | D6441314/15 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.020 | 4 | D6441310/20 | D6441312/20 | D6441314/20 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.030 | 4 | D6441310/30 | D6441312/30 | D6441314/30 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.045 | 4 | D6441310/45 | D6441312/45 | D6441314/45 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.060 | 4 | D6441310/60 | D6441312/60 | D6441314/60 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.090 | 4 | D6441310/90 | D6441312/90 | D6441314/90 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 0.125 | 4 | D6441310/12 | D6441312/12 | D6441314/12 |
| 5/16 | 5/16 | 1 | 4 | 0.010 | 4 | D6446310/10 | D6446312/10 | D6446314/10 |
| 5/16 | 5/16 | 1 | 4 | 0.015 | 4 | D6446310/15 | D6446312/15 | D6446314/15 |
| 5/16 | 5/16 | 1 | 4 | 0.020 | 4 | D6446310/20 | D6446312/20 | D6446314/20 |
| 5/16 | 5/16 | 1 | 4 | 0.030 | 4 | D6446310/30 | D6446312/30 | D6446314/30 |
| 5/16 | 5/16 | 1 | 4 | 0.045 | 4 | D6446310/45 | D6446312/45 | D6446314/45 |

**Additional Sizes On Pages 128, 129 & 131 - 137**

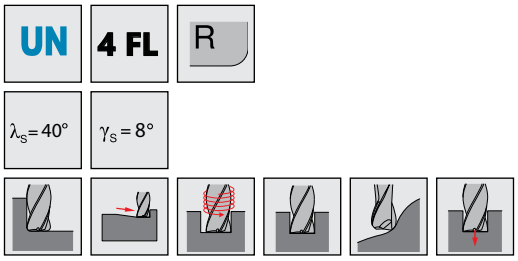
Application Range:

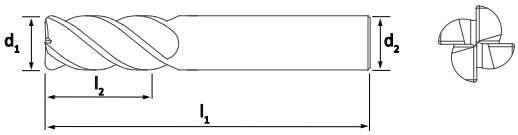
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D644CR

## 4 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8" - 1" = -.0001/-.0004 |
| Cutting Dia: | 1/8" - 1" = +.000/-.002 |
| Radius: | 1/8" - 1" = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 5/16 | 5/16 | 1 | 4 | 0.060 | 4 | D6446310/60 | D6446312/60 | D6446314/60 |
| 5/16 | 5/16 | 1 | 4 | 0.090 | 4 | D6446310/90 | D6446312/90 | D6446314/90 |
| 5/16 | 5/16 | 1 | 4 | 0.125 | 4 | D6446310/12 | D6446312/12 | D6446314/12 |
| 5/16 | 5/16 | 1-1/8 | 3 | 0.010 | 4 | D6443310/10 | D6443312/10 | D6443314/10 |
| 5/16 | 5/16 | 1-1/8 | 3 | 0.015 | 4 | D6443310/15 | D6443312/15 | D6443314/15 |
| 5/16 | 5/16 | 1-1/8 | 3 | 0.020 | 4 | D6443310/20 | D6443312/20 | D6443314/20 |
| 5/16 | 5/16 | 1-1/8 | 3 | 0.030 | 4 | D6443310/30 | D6443312/30 | D6443314/30 |
| 5/16 | 5/16 | 1-1/8 | 3 | 0.045 | 4 | D6443310/45 | D6443312/45 | D6443314/45 |
| 5/16 | 5/16 | 1-1/8 | 3 | 0.060 | 4 | D6443310/60 | D6443312/60 | D6443314/60 |
| 5/16 | 5/16 | 1-1/8 | 3 | 0.090 | 4 | D6443310/90 | D6443312/90 | D6443314/90 |
| 5/16 | 5/16 | 1-1/8 | 3 | 0.125 | 4 | D6443310/12 | D6443312/12 | D6443314/12 |
| 5/16 | 5/16 | 1-1/2 | 6 | 0.010 | 4 | D6447310/10 | D6447312/10 | D6447314/10 |
| 5/16 | 5/16 | 1-1/2 | 6 | 0.015 | 4 | D6447310/15 | D6447312/15 | D6447314/15 |
| 5/16 | 5/16 | 1-1/2 | 6 | 0.020 | 4 | D6447310/20 | D6447312/20 | D6447314/20 |
| 5/16 | 5/16 | 1-1/2 | 6 | 0.030 | 4 | D6447310/30 | D6447312/30 | D6447314/30 |
| 5/16 | 5/16 | 1-1/2 | 6 | 0.045 | 4 | D6447310/45 | D6447312/45 | D6447314/45 |
| 5/16 | 5/16 | 1-1/2 | 6 | 0.060 | 4 | D6447310/60 | D6447312/60 | D6447314/60 |
| 5/16 | 5/16 | 1-1/2 | 6 | 0.090 | 4 | D6447310/90 | D6447312/90 | D6447314/90 |
| 5/16 | 5/16 | 1-1/2 | 6 | 0.125 | 4 | D6447310/12 | D6447312/12 | D6447314/12 |
| 5/16 | 5/16 | 1-5/8 | 4 | 0.010 | 4 | D6444310/10 | D6444312/10 | D6444314/10 |
| 5/16 | 5/16 | 1-5/8 | 4 | 0.015 | 4 | D6444310/15 | D6444312/15 | D6444314/15 |
| 5/16 | 5/16 | 1-5/8 | 4 | 0.020 | 4 | D6444310/20 | D6444312/20 | D6444314/20 |
| 5/16 | 5/16 | 1-5/8 | 4 | 0.030 | 4 | D6444310/30 | D6444312/30 | D6444314/30 |
| 5/16 | 5/16 | 1-5/8 | 4 | 0.045 | 4 | D6444310/45 | D6444312/45 | D6444314/45 |
| 5/16 | 5/16 | 1-5/8 | 4 | 0.060 | 4 | D6444310/60 | D6444312/60 | D6444314/60 |
| 5/16 | 5/16 | 1-5/8 | 4 | 0.090 | 4 | D6444310/90 | D6444312/90 | D6444314/90 |
| 5/16 | 5/16 | 1-5/8 | 4 | 0.125 | 4 | D6444310/12 | D6444312/12 | D6444314/12 |
| 3/8 | 3/8 | 5/8 | 2 | 0.010 | 4 | D6442370/10 | D6442372/10 | D6442374/10 |
| 3/8 | 3/8 | 5/8 | 2 | 0.015 | 4 | D6442370/15 | D6442372/15 | D6442374/15 |
| 3/8 | 3/8 | 5/8 | 2 | 0.020 | 4 | D6442370/20 | D6442372/20 | D6442374/20 |
| 3/8 | 3/8 | 5/8 | 2 | 0.030 | 4 | D6442370/30 | D6442372/30 | D6442374/30 |
| 3/8 | 3/8 | 5/8 | 2 | 0.045 | 4 | D6442370/45 | D6442372/45 | D6442374/45 |
| 3/8 | 3/8 | 5/8 | 2 | 0.060 | 4 | D6442370/60 | D6442372/60 | D6442374/60 |
| 3/8 | 3/8 | 5/8 | 2 | 0.090 | 4 | D6442370/90 | D6442372/90 | D6442374/90 |

**Additional Sizes On Pages 128 -130 & 132 - 137**

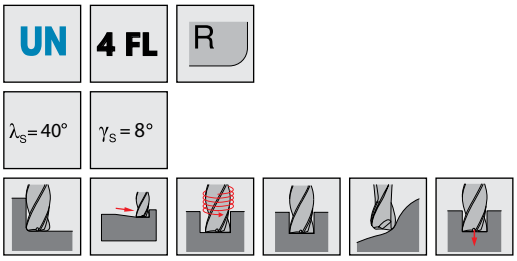
Application Range:

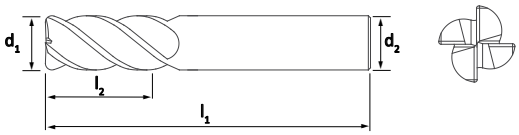
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D644CR

## 4 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8" - 1" = -.0001/-.0004 |
| Cutting Dia: | 1/8" - 1" = +.000/-.002 |
| Radius: | 1/8" - 1" = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 3/8 | 3/8 | 5/8 | 2 | 0.125 | 4 | D6442370/12 | D6442372/12 | D6442374/12 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.010 | 4 | D6441370/10 | D6441372/10 | D6441374/10 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.015 | 4 | D6441370/15 | D6441372/15 | D6441374/15 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.020 | 4 | D6441370/20 | D6441372/20 | D6441374/20 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.030 | 4 | D6441370/30 | D6441372/30 | D6441374/30 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.045 | 4 | D6441370/45 | D6441372/45 | D6441374/45 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.060 | 4 | D6441370/60 | D6441372/60 | D6441374/60 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.090 | 4 | D6441370/90 | D6441372/90 | D6441374/90 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 0.125 | 4 | D6441370/12 | D6441372/12 | D6441374/12 |
| 3/8 | 3/8 | 1 | 4 | 0.010 | 4 | D6446370/10 | D6446372/10 | D6446374/10 |
| 3/8 | 3/8 | 1 | 4 | 0.015 | 4 | D6446370/15 | D6446372/15 | D6446374/15 |
| 3/8 | 3/8 | 1 | 4 | 0.020 | 4 | D6446370/20 | D6446372/20 | D6446374/20 |
| 3/8 | 3/8 | 1 | 4 | 0.030 | 4 | D6446370/30 | D6446372/30 | D6446374/30 |
| 3/8 | 3/8 | 1 | 4 | 0.045 | 4 | D6446370/45 | D6446372/45 | D6446374/45 |
| 3/8 | 3/8 | 1 | 4 | 0.060 | 4 | D6446370/60 | D6446372/60 | D6446374/60 |
| 3/8 | 3/8 | 1 | 4 | 0.090 | 4 | D6446370/90 | D6446372/90 | D6446374/90 |
| 3/8 | 3/8 | 1 | 4 | 0.125 | 4 | D6446370/12 | D6446372/12 | D6446374/12 |
| 3/8 | 3/8 | 1-1/8 | 3 | 0.010 | 4 | D6443370/10 | D6443372/10 | D6443374/10 |
| 3/8 | 3/8 | 1-1/8 | 3 | 0.015 | 4 | D6443370/15 | D6443372/15 | D6443374/15 |
| 3/8 | 3/8 | 1-1/8 | 3 | 0.020 | 4 | D6443370/20 | D6443372/20 | D6443374/20 |
| 3/8 | 3/8 | 1-1/8 | 3 | 0.030 | 4 | D6443370/30 | D6443372/30 | D6443374/30 |
| 3/8 | 3/8 | 1-1/8 | 3 | 0.045 | 4 | D6443370/45 | D6443372/45 | D6443374/45 |
| 3/8 | 3/8 | 1-1/8 | 3 | 0.060 | 4 | D6443370/60 | D6443372/60 | D6443374/60 |
| 3/8 | 3/8 | 1-1/8 | 3 | 0.090 | 4 | D6443370/90 | D6443372/90 | D6443374/90 |
| 3/8 | 3/8 | 1-1/8 | 3 | 0.125 | 4 | D6443370/12 | D6443372/12 | D6443374/12 |
| 3/8 | 3/8 | 1-1/2 | 6 | 0.010 | 4 | D6447370/10 | D6447372/10 | D6447374/10 |
| 3/8 | 3/8 | 1-1/2 | 6 | 0.015 | 4 | D6447370/15 | D6447372/15 | D6447374/15 |
| 3/8 | 3/8 | 1-1/2 | 6 | 0.020 | 4 | D6447370/20 | D6447372/20 | D6447374/20 |
| 3/8 | 3/8 | 1-1/2 | 6 | 0.030 | 4 | D6447370/30 | D6447372/30 | D6447374/30 |
| 3/8 | 3/8 | 1-1/2 | 6 | 0.045 | 4 | D6447370/45 | D6447372/45 | D6447374/45 |
| 3/8 | 3/8 | 1-1/2 | 6 | 0.060 | 4 | D6447370/60 | D6447372/60 | D6447374/60 |
| 3/8 | 3/8 | 1-1/2 | 6 | 0.090 | 4 | D6447370/90 | D6447372/90 | D6447374/90 |
| 3/8 | 3/8 | 1-1/2 | 6 | 0.125 | 4 | D6447370/12 | D6447372/12 | D6447374/12 |
| 3/8 | 3/8 | 1-3/4 | 4 | 0.010 | 4 | D6444370/10 | D6444372/10 | D6444374/10 |

**Additional Sizes On Pages 128 - 131 & 133 - 137**

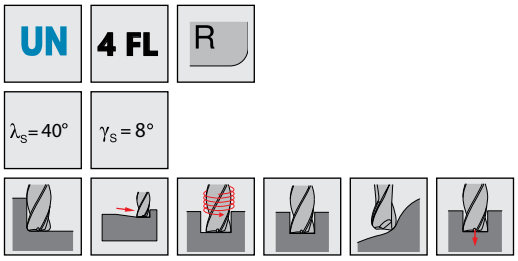
Application Range:

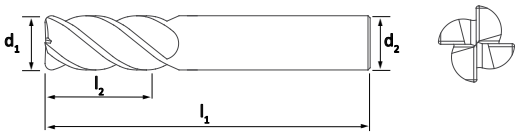
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D644CR

## 4 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 3/8 | 3/8 | 1-3/4 | 4 | 0.015 | 4 | D6444370/15 | D6444372/15 | D6444374/15 |
| 3/8 | 3/8 | 1-3/4 | 4 | 0.020 | 4 | D6444370/20 | D6444372/20 | D6444374/20 |
| 3/8 | 3/8 | 1-3/4 | 4 | 0.030 | 4 | D6444370/30 | D6444372/30 | D6444374/30 |
| 3/8 | 3/8 | 1-3/4 | 4 | 0.045 | 4 | D6444370/45 | D6444372/45 | D6444374/45 |
| 3/8 | 3/8 | 1-3/4 | 4 | 0.060 | 4 | D6444370/60 | D6444372/60 | D6444374/60 |
| 3/8 | 3/8 | 1-3/4 | 4 | 0.090 | 4 | D6444370/90 | D6444372/90 | D6444374/90 |
| 3/8 | 3/8 | 1-3/4 | 4 | 0.125 | 4 | D6444370/12 | D6444372/12 | D6444374/12 |
| 3/8 | 3/8 | 3 | 6 | 0.010 | 4 | D6448370/10 | D6448372/10 | D6448374/10 |
| 3/8 | 3/8 | 3 | 6 | 0.015 | 4 | D6448370/15 | D6448372/15 | D6448374/15 |
| 3/8 | 3/8 | 3 | 6 | 0.020 | 4 | D6448370/20 | D6448372/20 | D6448374/20 |
| 3/8 | 3/8 | 3 | 6 | 0.030 | 4 | D6448370/30 | D6448372/30 | D6448374/30 |
| 3/8 | 3/8 | 3 | 6 | 0.045 | 4 | D6448370/45 | D6448372/45 | D6448374/45 |
| 3/8 | 3/8 | 3 | 6 | 0.060 | 4 | D6448370/60 | D6448372/60 | D6448374/60 |
| 3/8 | 3/8 | 3 | 6 | 0.090 | 4 | D6448370/90 | D6448372/90 | D6448374/90 |
| 3/8 | 3/8 | 3 | 6 | 0.125 | 4 | D6448370/12 | D6448372/12 | D6448374/12 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.010 | 4 | D6442500/10 | D6442502/10 | D6442504/10 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.015 | 4 | D6442500/15 | D6442502/15 | D6442504/15 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.020 | 4 | D6442500/20 | D6442502/20 | D6442504/20 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.030 | 4 | D6442500/30 | D6442502/30 | D6442504/30 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.045 | 4 | D6442500/45 | D6442502/45 | D6442504/45 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.060 | 4 | D6442500/60 | D6442502/60 | D6442504/60 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.090 | 4 | D6442500/90 | D6442502/90 | D6442504/90 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 0.125 | 4 | D6442500/12 | D6442502/12 | D6442504/12 |
| 1/2 | 1/2 | 1 | 3 | 0.010 | 4 | D6441500/10 | D6441502/10 | D6441504/10 |
| 1/2 | 1/2 | 1 | 4 | 0.010 | 4 | D6446500/10 | D6446502/10 | D6446504/10 |
| 1/2 | 1/2 | 1 | 3 | 0.015 | 4 | D6441500/15 | D6441502/15 | D6441504/15 |
| 1/2 | 1/2 | 1 | 4 | 0.015 | 4 | D6446500/15 | D6446502/15 | D6446504/15 |
| 1/2 | 1/2 | 1 | 3 | 0.020 | 4 | D6441500/20 | D6441502/20 | D6441504/20 |
| 1/2 | 1/2 | 1 | 4 | 0.020 | 4 | D6446500/20 | D6446502/20 | D6446504/20 |
| 1/2 | 1/2 | 1 | 3 | 0.030 | 4 | D6441500/30 | D6441502/30 | D6441504/30 |
| 1/2 | 1/2 | 1 | 4 | 0.030 | 4 | D6446500/30 | D6446502/30 | D6446504/30 |
| 1/2 | 1/2 | 1 | 3 | 0.045 | 4 | D6441500/45 | D6441502/45 | D6441504/45 |
| 1/2 | 1/2 | 1 | 4 | 0.045 | 4 | D6446500/45 | D6446502/45 | D6446504/45 |
| 1/2 | 1/2 | 1 | 3 | 0.060 | 4 | D6441500/60 | D6441502/60 | D6441504/60 |

**Additional Sizes On Pages 128 - 132 & 134 - 137**

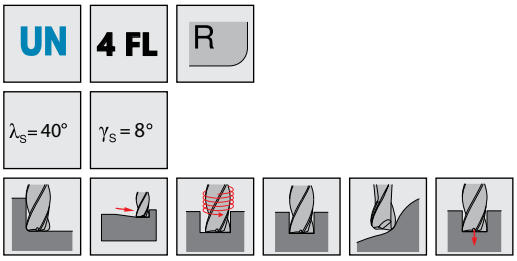
Application Range:

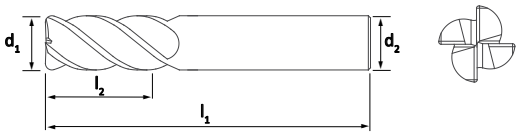
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D644CR

## 4 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8" - 1" = -.0001/-.0004 |
| Cutting Dia: | 1/8" - 1" = +.000/-.002 |
| Radius: | 1/8" - 1" = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 1/2 | 1/2 | 1 | 4 | 0.060 | 4 | D6446500/60 | D6446502/60 | D6446504/60 |
| 1/2 | 1/2 | 1 | 3 | 0.090 | 4 | D6441500/90 | D6441502/90 | D6441504/90 |
| 1/2 | 1/2 | 1 | 4 | 0.090 | 4 | D6446500/90 | D6446502/90 | D6446504/90 |
| 1/2 | 1/2 | 1 | 3 | 0.125 | 4 | D6441500/12 | D6441502/12 | D6441504/12 |
| 1/2 | 1/2 | 1 | 4 | 0.125 | 4 | D6446500/12 | D6446502/12 | D6446504/12 |
| 1/2 | 1/2 | 1-1/2 | 6 | 0.010 | 4 | D6447500/10 | D6447502/10 | D6447504/10 |
| 1/2 | 1/2 | 1-1/2 | 6 | 0.015 | 4 | D6447500/15 | D6447502/15 | D6447504/15 |
| 1/2 | 1/2 | 1-1/2 | 6 | 0.020 | 4 | D6447500/20 | D6447502/20 | D6447504/20 |
| 1/2 | 1/2 | 1-1/2 | 6 | 0.030 | 4 | D6447500/30 | D6447502/30 | D6447504/30 |
| 1/2 | 1/2 | 1-1/2 | 6 | 0.045 | 4 | D6447500/45 | D6447502/45 | D6447504/45 |
| 1/2 | 1/2 | 1-1/2 | 6 | 0.060 | 4 | D6447500/60 | D6447502/60 | D6447504/60 |
| 1/2 | 1/2 | 1-1/2 | 6 | 0.090 | 4 | D6447500/90 | D6447502/90 | D6447504/90 |
| 1/2 | 1/2 | 1-1/2 | 6 | 0.125 | 4 | D6447500/12 | D6447502/12 | D6447504/12 |
| 1/2 | 1/2 | 2 | 4 | 0.010 | 4 | D6443500/10 | D6443502/10 | D6443504/10 |
| 1/2 | 1/2 | 2 | 4 | 0.015 | 4 | D6443500/15 | D6443502/15 | D6443504/15 |
| 1/2 | 1/2 | 2 | 4 | 0.020 | 4 | D6443500/20 | D6443502/20 | D6443504/20 |
| 1/2 | 1/2 | 2 | 4 | 0.030 | 4 | D6443500/30 | D6443502/30 | D6443504/30 |
| 1/2 | 1/2 | 2 | 4 | 0.045 | 4 | D6443500/45 | D6443502/45 | D6443504/45 |
| 1/2 | 1/2 | 2 | 4 | 0.060 | 4 | D6443500/60 | D6443502/60 | D6443504/60 |
| 1/2 | 1/2 | 2 | 4 | 0.090 | 4 | D6443500/90 | D6443502/90 | D6443504/90 |
| 1/2 | 1/2 | 2 | 4 | 0.125 | 4 | D6443500/12 | D6443502/12 | D6443504/12 |
| 1/2 | 1/2 | 3 | 6 | 0.010 | 4 | D6444500/10 | D6444502/10 | D6444504/10 |
| 1/2 | 1/2 | 3 | 6 | 0.015 | 4 | D6444500/15 | D6444502/15 | D6444504/15 |
| 1/2 | 1/2 | 3 | 6 | 0.020 | 4 | D6444500/20 | D6444502/20 | D6444504/20 |
| 1/2 | 1/2 | 3 | 6 | 0.030 | 4 | D6444500/30 | D6444502/30 | D6444504/30 |
| 1/2 | 1/2 | 3 | 6 | 0.045 | 4 | D6444500/45 | D6444502/45 | D6444504/45 |
| 1/2 | 1/2 | 3 | 6 | 0.060 | 4 | D6444500/60 | D6444502/60 | D6444504/60 |
| 1/2 | 1/2 | 3 | 6 | 0.090 | 4 | D6444500/90 | D6444502/90 | D6444504/90 |
| 1/2 | 1/2 | 3 | 6 | 0.125 | 4 | D6444500/12 | D6444502/12 | D6444504/12 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.010 | 4 | D6441620/10 | D6441622/10 | D6441624/10 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.015 | 4 | D6441620/15 | D6441622/15 | D6441624/15 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.020 | 4 | D6441620/20 | D6441622/20 | D6441624/20 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.030 | 4 | D6441620/30 | D6441622/30 | D6441624/30 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.045 | 4 | D6441620/45 | D6441622/45 | D6441624/45 |

**Additional Sizes On Pages 128 - 133 & 135 - 137**

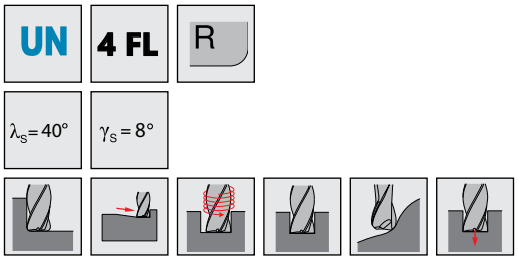
Application Range:

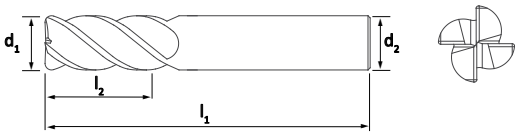
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D644CR

## 4 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.060 | 4 | D6441620/60 | D6441622/60 | D6441624/60 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.090 | 4 | D6441620/90 | D6441622/90 | D6441624/90 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 0.125 | 4 | D6441620/12 | D6441622/12 | D6441624/12 |
| 5/8 | 5/8 | 2 | 6 | 0.010 | 4 | D6446620/10 | D6446622/10 | D6446624/10 |
| 5/8 | 5/8 | 2 | 6 | 0.015 | 4 | D6446620/15 | D6446622/15 | D6446624/15 |
| 5/8 | 5/8 | 2 | 6 | 0.020 | 4 | D6446620/20 | D6446622/20 | D6446624/20 |
| 5/8 | 5/8 | 2 | 6 | 0.030 | 4 | D6446620/30 | D6446622/30 | D6446624/30 |
| 5/8 | 5/8 | 2 | 6 | 0.045 | 4 | D6446620/45 | D6446622/45 | D6446624/45 |
| 5/8 | 5/8 | 2 | 6 | 0.060 | 4 | D6446620/60 | D6446622/60 | D6446624/60 |
| 5/8 | 5/8 | 2 | 6 | 0.090 | 4 | D6446620/90 | D6446622/90 | D6446624/90 |
| 5/8 | 5/8 | 2 | 6 | 0.125 | 4 | D6446620/12 | D6446622/12 | D6446624/12 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 0.010 | 4 | D6443620/10 | D6443622/10 | D6443624/10 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 0.015 | 4 | D6443620/15 | D6443622/15 | D6443624/15 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 0.020 | 4 | D6443620/20 | D6443622/20 | D6443624/20 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 0.030 | 4 | D6443620/30 | D6443622/30 | D6443624/30 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 0.045 | 4 | D6443620/45 | D6443622/45 | D6443624/45 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 0.060 | 4 | D6443620/60 | D6443622/60 | D6443624/60 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 0.090 | 4 | D6443620/90 | D6443622/90 | D6443624/90 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 0.125 | 4 | D6443620/12 | D6443622/12 | D6443624/12 |
| 5/8 | 5/8 | 3 | 6 | 0.010 | 4 | D6444620/10 | D6444622/10 | D6444624/10 |
| 5/8 | 5/8 | 3 | 6 | 0.015 | 4 | D6444620/15 | D6444622/15 | D6444624/15 |
| 5/8 | 5/8 | 3 | 6 | 0.020 | 4 | D6444620/20 | D6444622/20 | D6444624/20 |
| 5/8 | 5/8 | 3 | 6 | 0.030 | 4 | D6444620/30 | D6444622/30 | D6444624/30 |
| 5/8 | 5/8 | 3 | 6 | 0.045 | 4 | D6444620/45 | D6444622/45 | D6444624/45 |
| 5/8 | 5/8 | 3 | 6 | 0.060 | 4 | D6444620/60 | D6444622/60 | D6444624/60 |
| 5/8 | 5/8 | 3 | 6 | 0.090 | 4 | D6444620/90 | D6444622/90 | D6444624/90 |
| 5/8 | 5/8 | 3 | 6 | 0.125 | 4 | D6444620/12 | D6444622/12 | D6444624/12 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.010 | 4 | D6441750/10 | D6441752/10 | D6441754/10 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.015 | 4 | D6441750/15 | D6441752/15 | D6441754/15 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.020 | 4 | D6441750/20 | D6441752/20 | D6441754/20 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.030 | 4 | D6441750/30 | D6441752/30 | D6441754/30 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.045 | 4 | D6441750/45 | D6441752/45 | D6441754/45 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.060 | 4 | D6441750/60 | D6441752/60 | D6441754/60 |
| 3/4 | 3/4 | 1-1/2 | 4 | 0.090 | 4 | D6441750/90 | D6441752/90 | D6441754/90 |

**Additional Sizes On Pages 128 - 134 & 136 - 137**

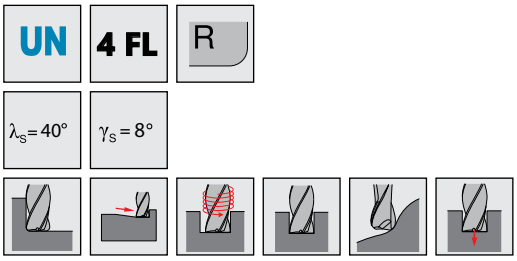
Application Range:

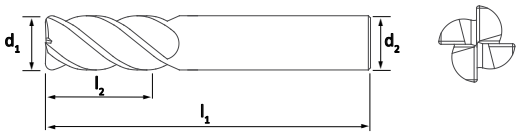
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D644CR

## 4 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 3/4 | 3/4 | 1-1/2 | 4 | 0.125 | 4 | D6441750/12 | D6441752/12 | D6441754/12 |
| 3/4 | 3/4 | 2 | 6 | 0.010 | 4 | D6446750/10 | D6446752/10 | D6446754/10 |
| 3/4 | 3/4 | 2 | 6 | 0.015 | 4 | D6446750/15 | D6446752/15 | D6446754/15 |
| 3/4 | 3/4 | 2 | 6 | 0.020 | 4 | D6446750/20 | D6446752/20 | D6446754/20 |
| 3/4 | 3/4 | 2 | 6 | 0.030 | 4 | D6446750/30 | D6446752/30 | D6446754/30 |
| 3/4 | 3/4 | 2 | 6 | 0.045 | 4 | D6446750/45 | D6446752/45 | D6446754/45 |
| 3/4 | 3/4 | 2 | 6 | 0.060 | 4 | D6446750/60 | D6446752/60 | D6446754/60 |
| 3/4 | 3/4 | 2 | 6 | 0.090 | 4 | D6446750/90 | D6446752/90 | D6446754/90 |
| 3/4 | 3/4 | 2 | 6 | 0.125 | 4 | D6446750/12 | D6446752/12 | D6446754/12 |
| 3/4 | 3/4 | 2-1/4 | 5 | 0.010 | 4 | D6443750/10 | D6443752/10 | D6443754/10 |
| 3/4 | 3/4 | 2-1/4 | 5 | 0.015 | 4 | D6443750/15 | D6443752/15 | D6443754/15 |
| 3/4 | 3/4 | 2-1/4 | 5 | 0.020 | 4 | D6443750/20 | D6443752/20 | D6443754/20 |
| 3/4 | 3/4 | 2-1/4 | 5 | 0.030 | 4 | D6443750/30 | D6443752/30 | D6443754/30 |
| 3/4 | 3/4 | 2-1/4 | 5 | 0.045 | 4 | D6443750/45 | D6443752/45 | D6443754/45 |
| 3/4 | 3/4 | 2-1/4 | 5 | 0.060 | 4 | D6443750/60 | D6443752/60 | D6443754/60 |
| 3/4 | 3/4 | 2-1/4 | 5 | 0.090 | 4 | D6443750/90 | D6443752/90 | D6443754/90 |
| 3/4 | 3/4 | 2-1/4 | 5 | 0.125 | 4 | D6443750/12 | D6443752/12 | D6443754/12 |
| 3/4 | 3/4 | 3 | 6 | 0.010 | 4 | D6444750/10 | D6444752/10 | D6444754/10 |
| 3/4 | 3/4 | 3 | 6 | 0.015 | 4 | D6444750/15 | D6444752/15 | D6444754/15 |
| 3/4 | 3/4 | 3 | 6 | 0.020 | 4 | D6444750/20 | D6444752/20 | D6444754/20 |
| 3/4 | 3/4 | 3 | 6 | 0.030 | 4 | D6444750/30 | D6444752/30 | D6444754/30 |
| 3/4 | 3/4 | 3 | 6 | 0.045 | 4 | D6444750/45 | D6444752/45 | D6444754/45 |
| 3/4 | 3/4 | 3 | 6 | 0.060 | 4 | D6444750/60 | D6444752/60 | D6444754/60 |
| 3/4 | 3/4 | 3 | 6 | 0.090 | 4 | D6444750/90 | D6444752/90 | D6444754/90 |
| 3/4 | 3/4 | 3 | 6 | 0.125 | 4 | D6444750/12 | D6444752/12 | D6444754/12 |
| 1 | 1 | 1-3/4 | 4 | 0.010 | 4 | D6441100/10 | D6441102/10 | D6441104/10 |
| 1 | 1 | 1-3/4 | 4 | 0.015 | 4 | D6441100/15 | D6441102/15 | D6441104/15 |
| 1 | 1 | 1-3/4 | 4 | 0.020 | 4 | D6441100/20 | D6441102/20 | D6441104/20 |
| 1 | 1 | 1-3/4 | 4 | 0.030 | 4 | D6441100/30 | D6441102/30 | D6441104/30 |
| 1 | 1 | 1-3/4 | 4 | 0.045 | 4 | D6441100/45 | D6441102/45 | D6441104/45 |
| 1 | 1 | 1-3/4 | 4 | 0.060 | 4 | D6441100/60 | D6441102/60 | D6441104/60 |
| 1 | 1 | 1-3/4 | 4 | 0.090 | 4 | D6441100/90 | D6441102/90 | D6441104/90 |
| 1 | 1 | 1-3/4 | 4 | 0.125 | 4 | D6441100/12 | D6441102/12 | D6441104/12 |
| 1 | 1 | 2 | 6 | 0.010 | 4 | D6446100/10 | D6446102/10 | D6446104/10 |

**Additional Sizes On Pages 128 - 135 & 137**

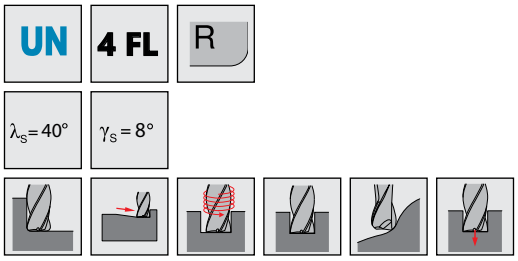
Application Range:

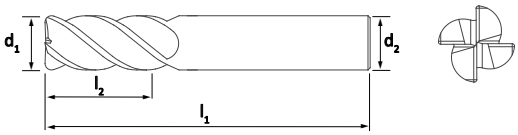
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D644CR

## 4 Flute Universal Corner Radius






**Tolerances**

| | |
|---|---|
| Shank: | 1/8” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Radius: | 1/8” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | R Radius | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 2 | 6 | 0.015 | 4 | D6446100/15 | D6446102/15 | D6446104/15 |
| 1 | 1 | 2 | 6 | 0.020 | 4 | D6446100/20 | D6446102/20 | D6446104/20 |
| 1 | 1 | 2 | 6 | 0.030 | 4 | D6446100/30 | D6446102/30 | D6446104/30 |
| 1 | 1 | 2 | 6 | 0.045 | 4 | D6446100/45 | D6446102/45 | D6446104/45 |
| 1 | 1 | 2 | 6 | 0.060 | 4 | D6446100/60 | D6446102/60 | D6446104/60 |
| 1 | 1 | 2 | 6 | 0.090 | 4 | D6446100/90 | D6446102/90 | D6446104/90 |
| 1 | 1 | 2 | 6 | 0.125 | 4 | D6446100/12 | D6446102/12 | D6446104/12 |
| 1 | 1 | 2-1/4 | 5 | 0.010 | 4 | D6443100/10 | D6443102/10 | D6443104/10 |
| 1 | 1 | 2-1/4 | 5 | 0.015 | 4 | D6443100/15 | D6443102/15 | D6443104/15 |
| 1 | 1 | 2-1/4 | 5 | 0.020 | 4 | D6443100/20 | D6443102/20 | D6443104/20 |
| 1 | 1 | 2-1/4 | 5 | 0.030 | 4 | D6443100/30 | D6443102/30 | D6443104/30 |
| 1 | 1 | 2-1/4 | 5 | 0.045 | 4 | D6443100/45 | D6443102/45 | D6443104/45 |
| 1 | 1 | 2-1/4 | 5 | 0.060 | 4 | D6443100/60 | D6443102/60 | D6443104/60 |
| 1 | 1 | 2-1/4 | 5 | 0.090 | 4 | D6443100/90 | D6443102/90 | D6443104/90 |
| 1 | 1 | 2-1/4 | 5 | 0.125 | 4 | D6443100/12 | D6443102/12 | D6443104/12 |
| 1 | 1 | 3 | 6 | 0.010 | 4 | D6444100/10 | D6444102/10 | D6444104/10 |
| 1 | 1 | 3 | 6 | 0.015 | 4 | D6444100/15 | D6444102/15 | D6444104/15 |
| 1 | 1 | 3 | 6 | 0.020 | 4 | D6444100/20 | D6444102/20 | D6444104/20 |
| 1 | 1 | 3 | 6 | 0.030 | 4 | D6444100/30 | D6444102/30 | D6444104/30 |
| 1 | 1 | 3 | 6 | 0.045 | 4 | D6444100/45 | D6444102/45 | D6444104/45 |
| 1 | 1 | 3 | 6 | 0.060 | 4 | D6444100/60 | D6444102/60 | D6444104/60 |
| 1 | 1 | 3 | 6 | 0.090 | 4 | D6444100/90 | D6444102/90 | D6444104/90 |
| 1 | 1 | 3 | 6 | 0.125 | 4 | D6444100/12 | D6444102/12 | D6444104/12 |

**Additional Sizes On Pages 128 - 136**

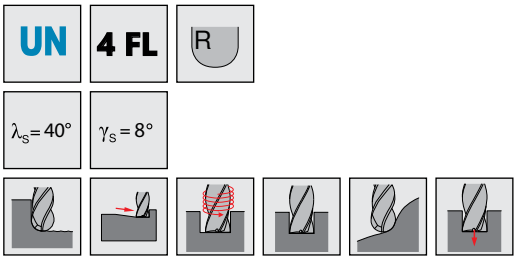
Application Range:

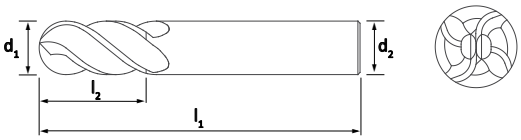
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D664

## 4 Flute Universal Ball






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Ball: | 1/32” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/32 | 1/8 | 3/32 | 1-1/2 | 4 | D6641030 | D6641032 | D6641034 |
| 3/64 | 1/8 | 9/64 | 1-1/2 | 4 | D6641040 | D6641042 | D6641044 |
| 1/16 | 1/8 | 1/8 | 1-1/2 | 4 | D6642060 | D6642062 | D6642064 |
| 1/16 | 1/8 | 3/16 | 1-1/2 | 4 | D6641060 | D6641062 | D6641064 |
| 5/64 | 1/8 | 1/4 | 1-1/2 | 4 | D6641070 | D6641072 | D6641074 |
| 3/32 | 1/8 | 3/16 | 1-1/2 | 4 | D6642090 | D6642092 | D6642094 |
| 3/32 | 1/8 | 9/32 | 1-1/2 | 4 | D6641090 | D6641092 | D6641094 |
| 7/64 | 1/8 | 3/16 | 1-1/2 | 4 | D6642190 | D6642192 | D6642194 |
| 7/64 | 1/8 | 3/8 | 1-1/2 | 4 | D6641190 | D6641192 | D6641194 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 4 | D6642120 | D6642122 | D6642124 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 4 | D6641120 | D6641122 | D6641124 |
| 1/8 | 1/8 | 3/4 | 2-1/4 | 4 | D6643120 | D6643122 | D6643124 |
| 1/8 | 1/8 | 3/4 | 3 | 4 | D6646120 | D6646122 | D6646124 |
| 1/8 | 1/8 | 1 | 3 | 4 | D6644120 | D6644122 | D6644124 |
| 9/64 | 3/16 | 3/8 | 2 | 4 | D6642140 | D6642142 | D6642144 |
| 9/64 | 3/16 | 1/2 | 2 | 4 | D6641140 | D6641142 | D6641144 |
| 5/32 | 3/16 | 3/8 | 2 | 4 | D6642150 | D6642152 | D6642154 |
| 5/32 | 3/16 | 1/2 | 2 | 4 | D6641150 | D6641152 | D6641154 |
| 11/64 | 3/16 | 3/8 | 2 | 4 | D6642170 | D6642172 | D6642174 |
| 11/64 | 3/16 | 5/8 | 2 | 4 | D6641170 | D6641172 | D6641174 |
| 3/16 | 3/16 | 3/8 | 2 | 4 | D6642180 | D6642182 | D6642184 |
| 3/16 | 3/16 | 5/8 | 2 | 4 | D6641180 | D6641182 | D6641184 |
| 3/16 | 3/16 | 3/4 | 2-1/2 | 4 | D6643180 | D6643182 | D6643184 |
| 3/16 | 3/16 | 1 | 4 | 4 | D6646180 | D6646182 | D6646184 |
| 3/16 | 3/16 | 1-1/8 | 3 | 4 | D6644180 | D6644182 | D6644184 |
| 13/64 | 1/4 | 3/8 | 2 | 4 | D6642200 | D6642202 | D6642204 |
| 13/64 | 1/4 | 5/8 | 2-1/2 | 4 | D6641200 | D6641202 | D6641204 |
| 7/32 | 1/4 | 3/8 | 2 | 4 | D6642210 | D6642212 | D6642214 |
| 7/32 | 1/4 | 5/8 | 2-1/2 | 4 | D6641210 | D6641212 | D6641214 |
| 15/64 | 1/4 | 3/8 | 2 | 4 | D6642230 | D6642232 | D6642234 |
| 15/64 | 1/4 | 3/4 | 2-1/2 | 4 | D6641230 | D6641232 | D6641234 |
| 1/4 | 1/4 | 3/8 | 2 | 4 | D6642250 | D6642252 | D6642254 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 4 | D6641250 | D6641252 | D6641254 |
| 1/4 | 1/4 | 1 | 4 | 4 | D6646250 | D6646252 | D6646254 |
| 1/4 | 1/4 | 1-1/8 | 3 | 4 | D6643250 | D6643252 | D6643254 |
| 1/4 | 1/4 | 1-1/2 | 4 | 4 | D6644250 | D6644252 | D6644254 |

**Additional Sizes On Pages 139 - 140**

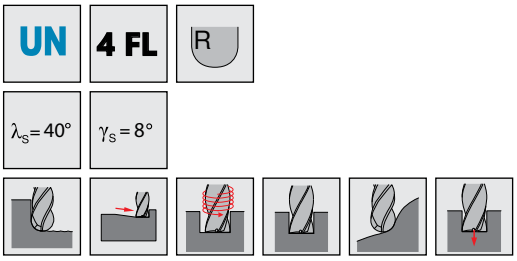
Application Range:

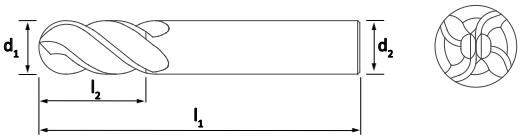
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D664

## 4 Flute Universal Ball






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Ball: | 1/32” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/4 | 1/4 | 1-1/2 | 6 | 4 | D6647250 | D6647252 | D6647254 |
| 17/64 | 5/16 | 1/2 | 2 | 4 | D6642260 | D6642262 | D6642264 |
| 17/64 | 5/16 | 3/4 | 2-1/2 | 4 | D6641260 | D6641262 | D6641264 |
| 9/32 | 5/16 | 1/2 | 2 | 4 | D6642280 | D6642282 | D6642284 |
| 9/32 | 5/16 | 3/4 | 2-1/2 | 4 | D6641280 | D6641282 | D6641284 |
| 19/64 | 5/16 | 1/2 | 2 | 4 | D6642290 | D6642292 | D6642294 |
| 19/64 | 5/16 | 3/4 | 2-1/2 | 4 | D6641290 | D6641292 | D6641294 |
| 5/16 | 5/16 | 1/2 | 2 | 4 | D6642310 | D6642312 | D6642314 |
| 5/16 | 5/16 | 3/4 | 2-1/2 | 4 | D6641310 | D6641312 | D6641314 |
| 5/16 | 5/16 | 1 | 4 | 4 | D6646310 | D6646312 | D6646314 |
| 5/16 | 5/16 | 1-1/8 | 3 | 4 | D6643310 | D6643312 | D6643314 |
| 5/16 | 5/16 | 1-1/2 | 6 | 4 | D6647310 | D6647312 | D6647314 |
| 5/16 | 5/16 | 1-5/8 | 4 | 4 | D6644310 | D6644312 | D6644314 |
| 21/64 | 3/8 | 5/8 | 2 | 4 | D6642320 | D6642322 | D6642324 |
| 21/64 | 3/8 | 7/8 | 2-1/2 | 4 | D6641320 | D6641322 | D6641324 |
| 11/32 | 3/8 | 5/8 | 2 | 4 | D6642340 | D6642342 | D6642344 |
| 11/32 | 3/8 | 7/8 | 2-1/2 | 4 | D6641340 | D6641342 | D6641344 |
| 23/64 | 3/8 | 5/8 | 2 | 4 | D6642350 | D6642352 | D6642354 |
| 23/64 | 3/8 | 7/8 | 2-1/2 | 4 | D6641350 | D6641352 | D6641354 |
| 3/8 | 3/8 | 5/8 | 2 | 4 | D6642370 | D6642372 | D6642374 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 4 | D6641370 | D6641372 | D6641374 |
| 3/8 | 3/8 | 1 | 4 | 4 | D6646370 | D6646372 | D6646374 |
| 3/8 | 3/8 | 1-1/8 | 3 | 4 | D6643370 | D6643372 | D6643374 |
| 3/8 | 3/8 | 1-1/2 | 6 | 4 | D6647370 | D6647372 | D6647374 |
| 3/8 | 3/8 | 1-3/4 | 4 | 4 | D6644370 | D6644372 | D6644374 |
| 3/8 | 3/8 | 3 | 6 | 4 | D6648370 | D6648372 | D6648374 |
| 25/64 | 7/16 | 5/8 | 2 | 4 | D6642390 | D6642392 | D6642394 |
| 25/64 | 7/16 | 1 | 2-3/4 | 4 | D6641390 | D6641392 | D6641394 |
| 13/32 | 7/16 | 5/8 | 2 | 4 | D6642400 | D6642402 | D6642404 |
| 13/32 | 7/16 | 1 | 2-3/4 | 4 | D6641400 | D6641402 | D6641404 |
| 27/64 | 7/16 | 5/8 | 2 | 4 | D6642420 | D6642422 | D6642424 |
| 27/64 | 7/16 | 1 | 2-3/4 | 4 | D6641420 | D6641422 | D6641424 |
| 7/16 | 7/16 | 5/8 | 2 | 4 | D6642430 | D6642432 | D6642434 |
| 7/16 | 7/16 | 1 | 2-3/4 | 4 | D6641430 | D6641432 | D6641434 |
| 7/16 | 7/16 | 1 | 4 | 4 | D6646430 | D6646432 | D6646434 |
| 7/16 | 7/16 | 1-1/2 | 6 | 4 | D6647430 | D6647432 | D6647434 |

**Additional Sizes On Pages 138 & 140**

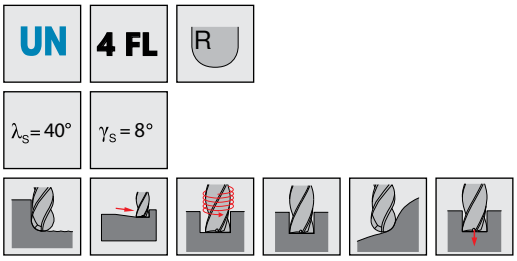
Application Range:

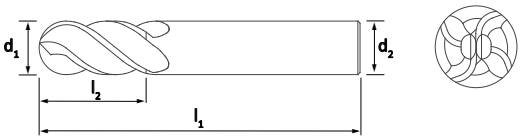
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D664

## 4 Flute Universal Ball






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1” = +.000/-.002 |
| Ball: | 1/32” - 1” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 7/16 | 7/16 | 2 | 4 | 4 | D6643430 | D6643432 | D6643434 |
| 7/16 | 7/16 | 3 | 6 | 4 | D6644430 | D6644432 | D6644434 |
| 29/64 | 1/2 | 5/8 | 2-1/2 | 4 | D6642450 | D6642452 | D6642454 |
| 29/64 | 1/2 | 1 | 3 | 4 | D6641450 | D6641452 | D6641454 |
| 15/32 | 1/2 | 5/8 | 2-1/2 | 4 | D6642460 | D6642462 | D6642464 |
| 15/32 | 1/2 | 1 | 3 | 4 | D6641460 | D6641462 | D6641464 |
| 31/64 | 1/2 | 5/8 | 2-1/2 | 4 | D6642480 | D6642482 | D6642484 |
| 31/64 | 1/2 | 1 | 3 | 4 | D6641480 | D6641482 | D6641484 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 4 | D6642500 | D6642502 | D6642504 |
| 1/2 | 1/2 | 1 | 3 | 4 | D6641500 | D6641502 | D6641504 |
| 1/2 | 1/2 | 1 | 4 | 4 | D6646500 | D6646502 | D6646504 |
| 1/2 | 1/2 | 1-1/2 | 6 | 4 | D6647500 | D6647502 | D6647504 |
| 1/2 | 1/2 | 2 | 4 | 4 | D6643500 | D6643502 | D6643504 |
| 1/2 | 1/2 | 3 | 6 | 4 | D6644500 | D6644502 | D6644504 |
| 9/16 | 9/16 | 7/8 | 3 | 4 | D6642560 | D6642562 | D6642564 |
| 9/16 | 9/16 | 1-1/4 | 3-1/2 | 4 | D6641560 | D6641562 | D6641564 |
| 9/16 | 9/16 | 2 | 6 | 4 | D6646560 | D6646562 | D6646564 |
| 9/16 | 9/16 | 3 | 6 | 4 | D6644560 | D6644562 | D6644564 |
| 5/8 | 5/8 | 7/8 | 3 | 4 | D6642620 | D6642622 | D6642624 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 4 | D6641620 | D6641622 | D6641624 |
| 5/8 | 5/8 | 2 | 6 | 4 | D6646620 | D6646622 | D6646624 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 4 | D6643620 | D6643622 | D6643624 |
| 5/8 | 5/8 | 3 | 6 | 4 | D6644620 | D6644622 | D6644624 |
| 11/16 | 3/4 | 1 | 3 | 4 | D6642680 | D6642682 | D6642684 |
| 11/16 | 3/4 | 1-1/2 | 4 | 4 | D6641680 | D6641682 | D6641684 |
| 3/4 | 3/4 | 1 | 3 | 4 | D6642750 | D6642752 | D6642754 |
| 3/4 | 3/4 | 1-1/2 | 4 | 4 | D6641750 | D6641752 | D6641754 |
| 3/4 | 3/4 | 2 | 6 | 4 | D6646750 | D6646752 | D6646754 |
| 3/4 | 3/4 | 2-1/4 | 5 | 4 | D6643750 | D6643752 | D6643754 |
| 3/4 | 3/4 | 3 | 6 | 4 | D6644750 | D6644752 | D6644754 |
| 7/8 | 7/8 | 1-3/4 | 4 | 4 | D6641870 | D6641872 | D6641874 |
| 1 | 1 | 1-3/4 | 4 | 4 | D6641100 | D6641102 | D6641104 |
| 1 | 1 | 2 | 6 | 4 | D6646100 | D6646102 | D6646104 |
| 1 | 1 | 2-1/4 | 5 | 4 | D6643100 | D6643102 | D6643104 |
| 1 | 1 | 3 | 6 | 4 | D6644100 | D6644102 | D6644104 |

**Additional Sizes On Pages 138 & 139**

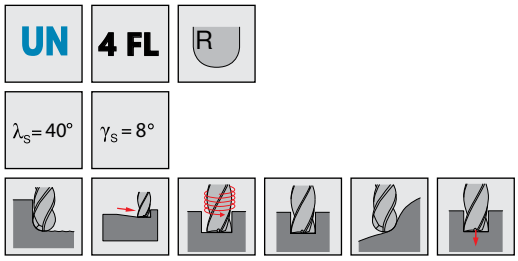
Application Range:

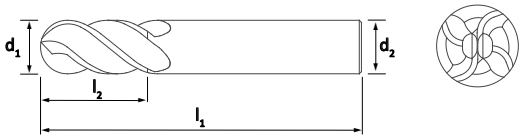
| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

Feeds & Speeds Available on Page 146

# Series D664M

## 4 Flute Universal Ball






**Tolerances**

| | |
|---|---|
| Shank: | 1mm - 25mm = -.0025/-.0102 |
| Cutting Dia: | 1mm - 2.5mm = +/-.0127 |
| Cutting Dia: | 3mm - 25mm = +.000/-.0508 |
| Ball: | 1mm - 25mm = +/-.0254 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1.0mm | 3.0mm | 2.0mm | 38.0mm | 4 | D66420390 | D66420392 | D66420394 |
| 1.0mm | 3.0mm | 4.0mm | 38.0mm | 4 | D66410390 | D66410392 | D66410394 |
| 1.5mm | 3.0mm | 3.0mm | 38.0mm | 4 | D66420590 | D66420592 | D66420594 |
| 1.5mm | 3.0mm | 6.0mm | 38.0mm | 4 | D66410590 | D66410592 | D66410594 |
| 2.0mm | 3.0mm | 4.0mm | 38.0mm | 4 | D66420780 | D66420782 | D66420784 |
| 2.0mm | 3.0mm | 8.0mm | 38.0mm | 4 | D66410780 | D66410782 | D66410784 |
| 2.5mm | 3.0mm | 5.0mm | 38.0mm | 4 | D66420980 | D66420982 | D66420984 |
| 2.5mm | 3.0mm | 9.5mm | 38.0mm | 4 | D66410980 | D66410982 | D66410984 |
| 3.0mm | 3.0mm | 6.0mm | 38.0mm | 4 | D66421180 | D66421182 | D66421184 |
| 3.0mm | 3.0mm | 12.0mm | 38.0mm | 4 | D66411180 | D66411182 | D66411184 |
| 3.5mm | 4.0mm | 7.0mm | 50.0mm | 4 | D66421370 | D66421372 | D66421374 |
| 3.5mm | 4.0mm | 12.0mm | 50.0mm | 4 | D66411370 | D66411372 | D66411374 |
| 4.0mm | 4.0mm | 8.0mm | 50.0mm | 4 | D66421570 | D66421572 | D66421574 |
| 4.0mm | 4.0mm | 14.0mm | 50.0mm | 4 | D66411570 | D66411572 | D66411574 |
| 4.5mm | 6.0mm | 9.5mm | 63.0mm | 4 | D66421770 | D66421772 | D66421774 |
| 4.5mm | 6.0mm | 16.0mm | 63.0mm | 4 | D66411770 | D66411772 | D66411774 |
| 5.0mm | 6.0mm | 10.0mm | 63.0mm | 4 | D66421960 | D66421962 | D66421964 |
| 5.0mm | 6.0mm | 16.0mm | 63.0mm | 4 | D66411960 | D66411962 | D66411964 |
| 6.0mm | 6.0mm | 12.0mm | 63.0mm | 4 | D66422360 | D66422362 | D66422364 |
| 6.0mm | 6.0mm | 19.0mm | 63.0mm | 4 | D66412360 | D66412362 | D66412364 |
| 7.0mm | 8.0mm | 12.0mm | 63.0mm | 4 | D66422750 | D66422752 | D66422754 |
| 7.0mm | 8.0mm | 19.0mm | 63.0mm | 4 | D66412750 | D66412752 | D66412754 |
| 8.0mm | 8.0mm | 12.0mm | 63.0mm | 4 | D66423150 | D66423152 | D66423154 |
| 8.0mm | 8.0mm | 20.0mm | 63.0mm | 4 | D66413150 | D66413152 | D66413154 |
| 9.0mm | 10.0mm | 14.0mm | 70.0mm | 4 | D66423540 | D66423542 | D66423544 |
| 9.0mm | 10.0mm | 25.0mm | 70.0mm | 4 | D66413540 | D66413542 | D66413544 |
| 10.0mm | 10.0mm | 14.0mm | 70.0mm | 4 | D66423930 | D66423932 | D66423934 |
| 10.0mm | 10.0mm | 25.0mm | 70.0mm | 4 | D66413930 | D66413932 | D66413934 |
| 11.0mm | 12.0mm | 14.0mm | 76.0mm | 4 | D66424330 | D66424332 | D66424334 |
| 11.0mm | 12.0mm | 25.0mm | 76.0mm | 4 | D66414330 | D66414332 | D66414334 |
| 12.0mm | 12.0mm | 16.0mm | 76.0mm | 4 | D66424720 | D66424722 | D66424724 |
| 12.0mm | 12.0mm | 25.0mm | 76.0mm | 4 | D66414720 | D66414722 | D66414724 |
| 14.0mm | 14.0mm | 32.0mm | 89.0mm | 4 | D66415510 | D66415512 | D66415514 |
| 16.0mm | 16.0mm | 32.0mm | 89.0mm | 4 | D66416290 | D66416292 | D66416294 |
| 18.0mm | 18.0mm | 38.0mm | 100.0mm | 4 | D66417080 | D66417082 | D66417084 |
| 20.0mm | 20.0mm | 38.0mm | 100.0mm | 4 | D66417870 | D66417872 | D66417874 |
| 25.0mm | 25.0mm | 38.0mm | 100.0mm | 4 | D66419840 | D66419842 | D66419844 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

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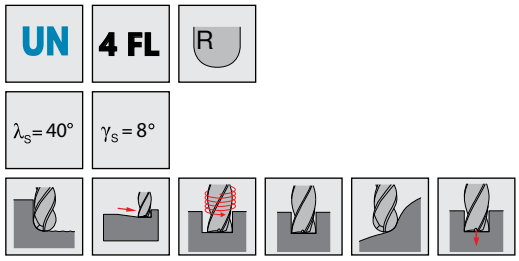
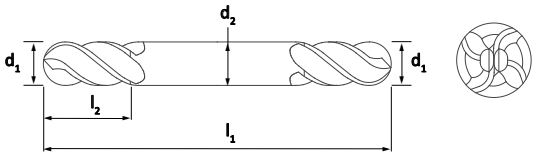
# Series D864

## 4 Flute Universal Ball






**Tolerances**

| | |
|---|---|
| Shank: | 1/32” - 1/2” = -.0001/-.0004 |
| Cutting Dia: | 1/32” - 7/64” = +/-.0005 |
| Cutting Dia: | 1/8” - 1/2” = +.000/-.002 |
| Ball: | 1/32” - 1/2” = +/-.001 |

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 1/32 | 1/8 | 1/16 | 1-1/2 | 4 | D8642030 | D8642032 | D8642034 |
| 3/64 | 1/8 | 3/32 | 1-1/2 | 4 | D8642040 | D8642042 | D8642044 |
| 1/16 | 1/8 | 1/8 | 1-1/2 | 4 | D8642060 | D8642062 | D8642064 |
| 5/64 | 1/8 | 5/32 | 1-1/2 | 4 | D8642070 | D8642072 | D8642074 |
| 3/32 | 1/8 | 3/16 | 1-1/2 | 4 | D8642090 | D8642092 | D8642094 |
| 7/64 | 1/8 | 3/16 | 1-1/2 | 4 | D8642190 | D8642192 | D8642194 |
| 1/8 | 1/8 | 1/4 | 1-1/2 | 4 | D8642120 | D8642122 | D8642124 |
| 1/8 | 3/8 | 3/8 | 3 | 4 | D8641120 | D8641122 | D8641124 |
| 9/64 | 3/16 | 5/16 | 2 | 4 | D8642140 | D8642142 | D8642144 |
| 5/32 | 3/16 | 5/16 | 2 | 4 | D8642150 | D8642152 | D8642154 |
| 5/32 | 3/8 | 7/16 | 3 | 4 | D8641150 | D8641152 | D8641154 |
| 11/64 | 3/16 | 5/16 | 2 | 4 | D8642170 | D8642172 | D8642174 |
| 3/16 | 3/16 | 3/8 | 2 | 4 | D8642180 | D8642182 | D8642184 |
| 3/16 | 3/8 | 1/2 | 3 | 4 | D8641180 | D8641182 | D8641184 |
| 13/64 | 1/4 | 1/2 | 2-1/2 | 4 | D8642200 | D8642202 | D8642204 |
| 7/32 | 1/4 | 7/16 | 2-1/2 | 4 | D8642210 | D8642212 | D8642214 |
| 15/64 | 1/4 | 1/2 | 2-1/2 | 4 | D8642230 | D8642232 | D8642234 |
| 1/4 | 1/4 | 1/2 | 2-1/2 | 4 | D8642250 | D8642252 | D8642254 |
| 1/4 | 3/8 | 5/8 | 3 | 4 | D8641250 | D8641252 | D8641254 |
| 9/32 | 5/16 | 1/2 | 2-1/2 | 4 | D8642280 | D8642282 | D8642284 |
| 5/16 | 5/16 | 1/2 | 2-1/2 | 4 | D8642310 | D8642312 | D8642314 |
| 5/16 | 3/8 | 3/4 | 3-1/2 | 4 | D8641310 | D8641312 | D8641314 |
| 3/8 | 3/8 | 1/2 | 2-1/2 | 4 | D8642370 | D8642372 | D8642374 |
| 3/8 | 3/8 | 3/4 | 3-1/2 | 4 | D8641370 | D8641372 | D8641374 |
| 7/16 | 7/16 | 9/16 | 2-3/4 | 4 | D8642430 | D8642432 | D8642434 |
| 1/2 | 1/2 | 5/8 | 3 | 4 | D8642500 | D8642502 | D8642504 |
| 1/2 | 1/2 | 1 | 4 | 4 | D8641500 | D8641502 | D8641504 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | ● | ● | |

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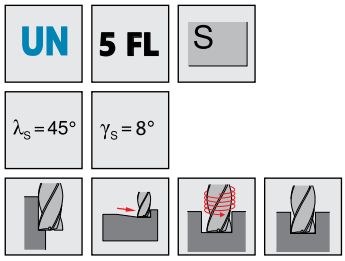
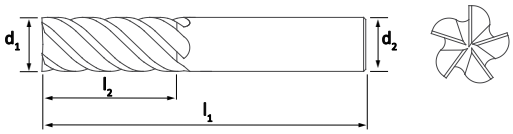
# Series D645

## 5 Flute Universal






**Tolerances**

Shank: 1/8" - 1" = -.0001/-.0004

Cutting Dia: 1/8" - 1" = +.000/.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | AlTiN |
|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | 5 | D6452120 | D6452124 |
| 1/8 | 1/8 | 1/2 | 1-1/2 | 5 | D6451120 | D6451124 |
| 5/32 | 3/16 | 5/16 | 2 | 5 | D6452150 | D6452154 |
| 5/32 | 3/16 | 9/16 | 2 | 5 | D6451150 | D6451154 |
| 3/16 | 3/16 | 5/16 | 2 | 5 | D6452180 | D6452184 |
| 3/16 | 3/16 | 9/16 | 2 | 5 | D6451180 | D6451184 |
| 7/32 | 1/4 | 3/8 | 2 | 5 | D6452210 | D6452214 |
| 7/32 | 1/4 | 3/4 | 2-1/2 | 5 | D6451210 | D6451214 |
| 1/4 | 1/4 | 3/8 | 2 | 5 | D6452250 | D6452254 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 5 | D6451250 | D6451254 |
| 1/4 | 1/4 | 1-1/4 | 4 | 5 | D6454250 | D6454254 |
| 9/32 | 5/16 | 7/16 | 2 | 5 | D6452280 | D6452284 |
| 9/32 | 5/16 | 13/16 | 2-1/2 | 5 | D6451280 | D6451284 |
| 5/16 | 5/16 | 7/16 | 2 | 5 | D6452310 | D6452314 |
| 5/16 | 5/16 | 13/16 | 2-1/2 | 5 | D6451310 | D6451314 |
| 11/32 | 3/8 | 1/2 | 2 | 5 | D6452340 | D6452344 |
| 11/32 | 3/8 | 1 | 2-1/2 | 5 | D6451340 | D6451344 |
| 3/8 | 3/8 | 1/2 | 2 | 5 | D6452370 | D6452374 |
| 3/8 | 3/8 | 1 | 2-1/2 | 5 | D6451370 | D6451374 |
| 3/8 | 3/8 | 1-1/2 | 4 | 5 | D6454370 | D6454374 |
| 13/32 | 7/16 | 1 | 2-3/4 | 5 | D6451400 | D6451404 |
| 7/16 | 7/16 | 1 | 2-3/4 | 5 | D6451430 | D6451434 |
| 15/32 | 1/2 | 1-1/4 | 3 | 5 | D6451460 | D6451464 |
| 1/2 | 1/2 | 5/8 | 2-1/2 | 5 | D6452500 | D6452504 |
| 1/2 | 1/2 | 1-1/4 | 3 | 5 | D6451500 | D6451504 |
| 1/2 | 1/2 | 2 | 4 | 5 | D6453500 | D6453504 |
| 9/16 | 9/16 | 1-1/2 | 3-1/2 | 5 | D6451560 | D6451564 |
| 5/8 | 5/8 | 3/4 | 3 | 5 | D6452620 | D6452624 |
| 5/8 | 5/8 | 1-5/8 | 3-1/2 | 5 | D6451620 | D6451624 |
| 5/8 | 5/8 | 2-1/2 | 5 | 5 | D6453620 | D6453624 |
| 3/4 | 3/4 | 1 | 3 | 5 | D6452750 | D6452754 |
| 3/4 | 3/4 | 1-5/8 | 4 | 5 | D6451750 | D6451754 |
| 3/4 | 3/4 | 3-1/4 | 6 | 5 | D6454750 | D6454754 |
| 7/8 | 7/8 | 2 | 4 | 5 | D6451870 | D6451874 |
| 1 | 1 | 1-1/4 | 3 | 5 | D6452100 | D6452104 |
| 1 | 1 | 2 | 4 | 5 | D6451100 | D6451104 |
| 1 | 1 | 3-1/4 | 6 | 5 | D6454100 | D6454104 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | | | |

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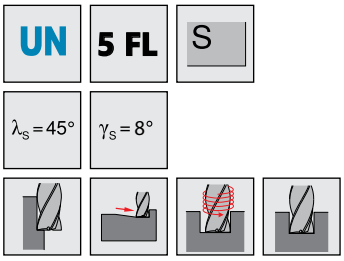
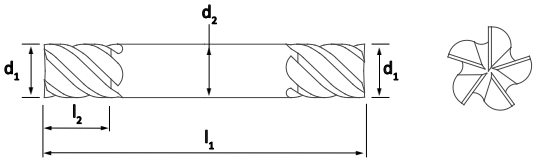
# Series D845

## 5 Flute Universal






**Tolerances**

Shank: 1/8” - 1/2” = -.0001/-.0004
Cutting Dia: 1/8” - 1/2” = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | AlTiN |
|---|---|---|---|---|---|---|
| 1/8 | 1/8 | 1/4 | 1-1/2 | 5 | D8452120 | D8452124 |
| 3/16 | 3/16 | 5/16 | 2 | 5 | D8452180 | D8452184 |
| 1/4 | 1/4 | 3/8 | 2-1/2 | 5 | D8452250 | D8452254 |
| 5/16 | 5/16 | 7/16 | 2-1/2 | 5 | D8452310 | D8452314 |
| 3/8 | 3/8 | 1/2 | 2-1/2 | 5 | D8452370 | D8452374 |
| 7/16 | 7/16 | 9/16 | 2-3/4 | 5 | D8452430 | D8452434 |
| 1/2 | 1/2 | 5/8 | 3 | 5 | D8452500 | D8452504 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | | | |

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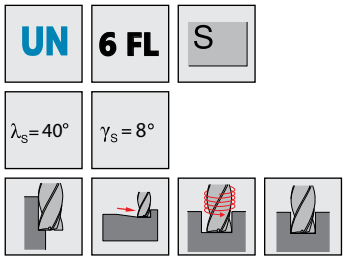
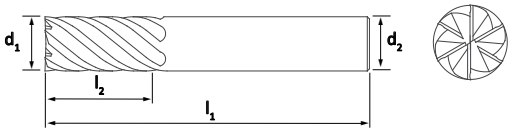
# Series D646

## 6 Flute Universal






**Tolerances**

Shank: 3/16” - 1” = -.0001/-.0004

Cutting Dia: 3/16” - 1” = +.000/-.002

| $d_1$ Dia | $d_2$ Shank | $l_2$ LOC | $l_1$ OAL | Flutes | Uncoated | TiCN | AlTiN |
|---|---|---|---|---|---|---|---|
| 3/16 | 3/16 | 5/8 | 2 | 6 | D6461180 | D6461182 | D6461184 |
| 1/4 | 1/4 | 3/4 | 2-1/2 | 6 | D6461250 | D6461252 | D6461254 |
| 1/4 | 1/4 | 1-1/8 | 3 | 6 | D6463250 | D6463252 | D6463254 |
| 5/16 | 5/16 | 7/8 | 2-1/2 | 6 | D6461310 | D6461312 | D6461314 |
| 3/8 | 3/8 | 7/8 | 2-1/2 | 6 | D6461370 | D6461372 | D6461374 |
| 3/8 | 3/8 | 1-1/8 | 3 | 6 | D6463370 | D6463372 | D6463374 |
| 7/16 | 7/16 | 1 | 2-3/4 | 6 | D6461430 | D6461432 | D6461434 |
| 1/2 | 1/2 | 1 | 3 | 6 | D6461500 | D6461502 | D6461504 |
| 1/2 | 1/2 | 2 | 4 | 6 | D6463500 | D6463502 | D6463504 |
| 5/8 | 5/8 | 1-1/4 | 3-1/2 | 6 | D6461620 | D6461622 | D6461624 |
| 5/8 | 5/8 | 2-1/8 | 4-5/8 | 6 | D6463620 | D6463622 | D6463624 |
| 3/4 | 3/4 | 1-1/2 | 4 | 6 | D6461750 | D6461752 | D6461754 |
| 3/4 | 3/4 | 2-1/4 | 5 | 6 | D6463750 | D6463752 | D6463754 |
| 1 | 1 | 1-3/4 | 4 | 6 | D6461100 | D6461102 | D6461104 |
| 1 | 1 | 2-1/4 | 5 | 6 | D6463100 | D6463102 | D6463104 |

Application Range:

| Steel | Tool Steel | Hardened Steel | Stainless Steel | Titanium | High Temp Alloys | Cast Iron | Aluminum | Aluminum High Silicone | Copper, Brass | Plastic, Composites |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | ● | ● | ● | ● | ● | ● | | | | |

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DESIGN-RITE XL

| MATERIAL | SPEED (S.M.F.) | END MILL DIAMETER UP TO 1/4" | UP TO 1/2" | UP TO 1" |
|---|---|---|---|---|
| | | FEED PER TOOTH (INCHES) | | |
| Aluminum/Aluminum Alloys | 600-1200 | .0002-.0020 | .0020-.0040 | .0060-.0100 |
| Brass/Bronze | 200-350 | .0005-.0020 | .0020-.0030 | .0040-.0080 |
| Copper/Copper Alloys | 350-900 | .0005-.0020 | .0020 | .0020-.0060 |
| Iron-Cast (soft) | 200-500 | .0005-.0020 | .0020-.0030 | .0030-.0080 |
| Iron-Cast (hard) | 80-350 | .0003-.0008 | .0008-.0020 | .0020-.0040 |
| Iron-Ductile | 80-400 | .0002-.0010 | .0010-.0020 | .0020-.0060 |
| Iron-Malleable | 200-600 | .0002-.0010 | .0010-.0030 | .0030-.0070 |
| Magnesium/Magnesium Alloys | 800-1400 | .0005-.0020 | .0020-.0060 | .0040-.0100 |
| Monel/High Nickel Steel | 150-300 | .0002-.0010 | .0010-.0020 | .0020-.0040 |
| Plastics | 600-1200 | .0006-.0030 | .0030-.0060 | .0060-.0150 |
| Plastic-Glass Filled | 300-800 | .0006-.0030 | .0030-.0040 | .0040-.0120 |
| Refractory Alloys | 80-400 | .0002-.0010 | .0010 | .0010-.0020 |
| Steel-Low Carbon | 200-500 | .0002-.0010 | .0010-.0030 | .0030-.0070 |
| Steel-Medium Carbon | 100-250 | .0004-.0015 | .0015-.0020 | .0020-.0050 |
| Steel-Hardened | 25-120 | .0002-.0005 | .0005-.0010 | .0010-.0030 |
| Steel-Mold | 200-350 | .0002-.0010 | .0010-.0020 | .0020-.0060 |
| Steel-Tool | 100-300 | .0002-.0010 | .0010-.0020 | .0020-.0060 |

## ALL DESIGN-RITE END MILLS ARE CENTER CUTTING

- Lower Radial Width of Cut – Higher range of recommended surface speeds should be used
- Greater Radial Width of Cut – Lower range of recommended surface speeds should be used
- For Slotting Applications – Speeds should be reduced by approximately 20% of lowest range value
- For Peripheral Applications – Axial depth of cut not to exceed 1-1/2 times the cutter diameter
- Long & X-Long End Mills – Reduce feed per tooth by 50%
- TiCN & AlTiN Coating – Increase S.F.M. by 25% to 40%

## S.F.M./R.P.M. CONVERSION CHART

| S.F.M. | DIAMETER 1/16 | 3/32 | 1/8 | 5/32 | 3/16 | 7/32 | 1/4 | 5/16 | 3/8 | 7/16 | 1/2 | 5/8 | 3/4 | 7/8 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | 3,050 | 2,040 | 1,530 | 1,220 | 1,020 | 875 | 765 | 610 | 510 | 440 | 380 | 310 | 250 | 220 | 190 |
| 75 | 4,580 | 3,060 | 2,290 | 1,830 | 1,530 | 1,310 | 1,150 | 920 | 760 | 660 | 570 | 460 | 380 | 330 | 285 |
| 100 | 6,100 | 4,080 | 3,050 | 2,450 | 2,040 | 1,750 | 1,530 | 1,220 | 1,020 | 870 | 760 | 610 | 510 | 440 | 385 |
| 125 | 7,630 | 5,100 | 3,820 | 3,050 | 2,550 | 2,180 | 1,920 | 1,530 | 1,270 | 1,100 | 950 | 770 | 630 | 550 | 475 |
| 150 | 9,150 | 6,120 | 4,570 | 3,670 | 3,060 | 2,620 | 2,290 | 1,830 | 1,530 | 1,310 | 1,140 | 920 | 760 | 660 | 575 |
| 175 | 10,680 | 7,140 | 5,350 | 4,270 | 3,570 | 3,060 | 2,680 | 2,140 | 1,780 | 1,540 | 1,330 | 1,080 | 880 | 770 | 665 |
| 200 | 12,200 | 8,150 | 6,100 | 4,900 | 4,070 | 3,500 | 3,100 | 2,450 | 2,000 | 1,750 | 1,500 | 1,200 | 1,000 | 875 | 750 |
| 300 | 18,500 | 12,200 | 9,200 | 7,300 | 6,100 | 5,250 | 4,600 | 3,700 | 3,100 | 2,600 | 2,300 | 1,800 | 1,500 | 1,300 | 1,100 |
| 400 | 24,500 | 16,300 | 12,200 | 9,800 | 8,150 | 7,000 | 6,100 | 4,900 | 4,100 | 3,500 | 3,050 | 2,450 | 2,050 | 1,750 | 1,525 |
| 500 | 30,500 | 20,400 | 15,300 | 12,200 | 10,200 | 8,700 | 7,600 | 6,100 | 5,100 | 4,400 | 3,800 | 3,100 | 2,500 | 2,200 | 1,900 |
| 750 | 45,800 | 36,700 | 22,900 | 18,300 | 15,300 | 13,100 | 11,500 | 9,200 | 7,600 | 6,550 | 5,700 | 4,600 | 3,800 | 3,770 | 2,850 |
| 1,000 | – | 40,800 | 30,600 | 24,500 | 20,400 | 17,500 | 15,300 | 12,200 | 10,200 | 8,750 | 7,650 | 6,100 | 5,100 | 4,400 | 3,800 |
| 1,500 | – | – | 45,900 | 36,700 | 30,600 | 26,200 | 22,900 | 18,300 | 15,300 | 13,150 | 11,300 | 9,200 | 7,600 | 6,500 | 5,700 |
| 2,000 | – | – | – | 49,000 | 40,800 | 35,000 | 30,600 | 24,400 | 20,400 | 17,500 | 15,300 | 12,200 | 10,200 | 8,700 | 7,600 |
| 3,000 | – | – | – | – | – | 52,500 | 45,900 | 36,600 | 30,600 | 26,250 | 22,900 | 18,300 | 15,300 | 13,100 | 11,400 |
| 4,000 | – | – | – | – | – | – | – | 48,800 | 40,800 | 35,000 | 30,600 | 24,400 | 20,400 | 17,500 | 15,200 |
| 5,000 | – | – | – | – | – | – | – | – | – | 43,700 | 38,200 | 30,600 | 25,500 | 21,800 | 19,000 |

# Notes

PROMAX Premier

PROMAX Premium

DESIGN-RITE XL

Contact for further information:

CERATIZIT Sacramento, LP
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