

CATALOG &  
TECHNICAL  
GUIDE



**SOLID ROUND TOOLING**



**Niagara Cutter**  
A SECO TOOLS COMPANY



# YOUR SOLID TOOLING & TECHNOLOGY EXPERTS

## A TEST FOR OURSELVES & A PROMISE TO OUR CUSTOMERS

Niagara Cutter understands product consistency, quality, and maximum levels of performance are paramount to our customers. These fundamentals begin in our dedicated R&D, Engineering, and test facilities. The knowledge gained through these resources serve as a framework to educate not only ourselves, but also allow us to assist our customers in becoming competent and practical experts. Extensive product development and educational initiatives support Niagara Cutter's continuous achievement in exceeding industry expectations. Always striving for excellence and embracing the needs of our customer guarantee that the promise we make is the promise we keep... to provide the highest value cutting tools in the world.

**INNOVATION | TECHNOLOGY | QUALITY | SERVICE**



**Niagara Cutter**  
A SECO TOOLS COMPANY

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## TECHNICAL INFO

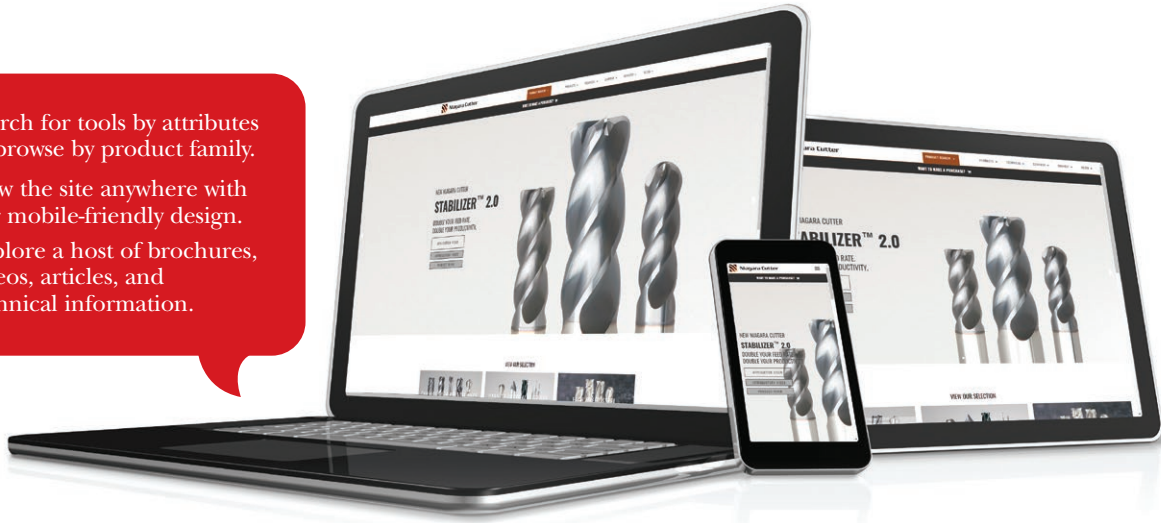
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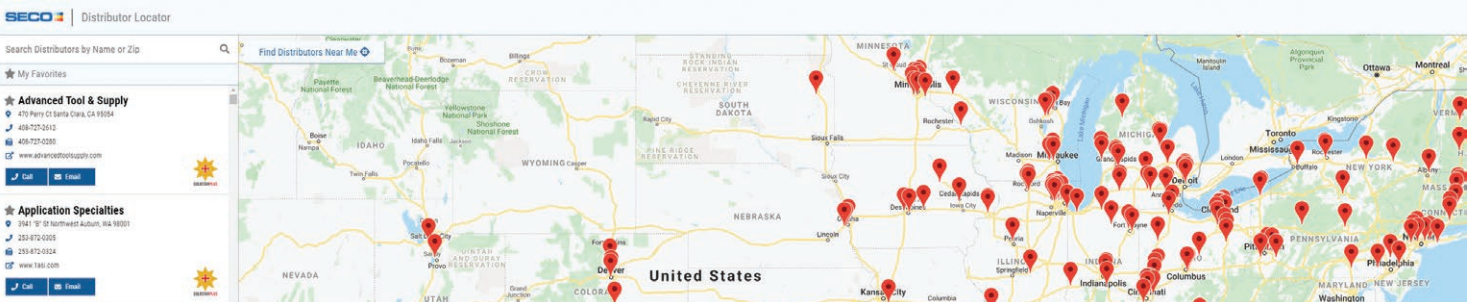


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Get the ultimate Seco solid milling guide. Calculate cutting data, application recommendations, horsepower, metal removal rates, and more for over 5,000 Seco solid carbide end mills from Jabro and Niagara Cutter. A newly redesigned rpm optimizer makes it easier to maintain a constant chip load, maximizing tool life. The full functionality the Solid Milling App (videos aside) is available off-line so you can get cutting data anywhere in the shop, even while you are standing at the machine. Download the free app from the [App Store](#) or [Google Play](#) today!

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## APPLICATION ENGINEERING

At Niagara Cutter, we are dedicated to a process of constant improvement and take pride in our record of significant innovation and industry advancements.

Our truly innovative and comprehensive systems approach to world-class products starts with listening and learning. Then, between initial concept and final product there is application engineering, prototype development, exhaustive product testing and critical analysis before culminating in a product that does not just perform, but outperforms that which previously existed.



## MANUFACTURING TECHNOLOGY

Niagara Cutter continues to invest heavily in automated processes, but in the final analysis these machines are only as capable as their programming and maintenance allows. The final products are only as consistent as the parameters set by Niagara's machinists. It is in these areas where no machine can match the human contribution.

Niagara Cutter aggressively pursues continuous improvement in its automated operations and its people. Therefore, the perfect operation between man and machine at Niagara Cutter results in a company that is far greater than the sum of its parts in achieving consistency and accuracy.



## PRODUCTS - HIGH PERFORMANCE CUTTING TOOL SOLUTIONS

Niagara Cutter offers many product styles, including end mills, thread mills, and special cutting tools to customer blueprints. With multiple material substrates (cobalt, tungsten carbide), tool geometries and PVD and CVD coatings, we provide a complete product range to meet your cutting tool requirements.

Our job is not just to produce premium cutting tools, but to produce premium cutting tools specific to your application and for absolute optimum performance. We do this by asking the critical questions and quickly responding with the most effective solution.



## **HIGH PERFORMANCE STABILIZER™ AND STABILIZER 2.0 SERIES** - Page 50

The Stabilizer 2.0 family of end mills raises the bar in high performance milling by incorporating a patented continuously varying asymmetrical geometry which helps create a smooth chatter free milling condition. This configuration, along with a specially engineered flute shape, allow for feed rates twice that of the previous Stabilizer.

Simplify tool selection and part programming with the newly expanded ST540 family of 5-flute end mills from Seco. Gain part processing versatility with the ability to handle slot milling, side mill roughing, side mill finishing and face milling applications as well as in traditional and high-performance optimized roughing, pocketing and ramping in all major material families – all with a single product family.



## **ELITE A & S SERIES** - Page 44

Our Elite series of end mills feature specific geometries for ferrous or nonferrous materials, available in 0.125 - 1.25" diameters.

The S638, S738 and S938 multi flute end mills are designed for Optimized and Peripheral Roughing and Finishing applications in Stainless Steel, Titanium and high temperature alloys.

The A series is designed for aluminum and non ferrous materials and is available with two or three flutes in a variety of configurations. The S series provides high performance machining in steel, stainless steel and high temperature alloys with three, four, five, six, seven and nine flutes.



## **HIGH FEED & MOLD & DIE** - Page 136

The mold & die range offers geometries for hard milling of steels up to 65Rc.

The SN200R, SN400R and SN500R cover a broad range of applications and materials. These end mills direct radial cutting pressure up into spindle for increased metal removal rates in deep pockets and long reach applications.

The MZN and MBZ family of end mills are designed to maximize productivity in hardened steels and superalloys. These end mills feature optimized substrate, geometry and coating to offer superior performance and process reliability.



## **CVD DIAMOND** - Page 164

Diamond is the material of choice for machining abrasive non-ferrous metals, ceramics, and composites. The unique hardness of the Diamond coating makes it more resistant to abrasive wear than any other cutting tool material. In addition, high chemical stability and the resulting low affinity to non-ferrous materials as well as the low coefficient of friction helps retard the formation of built-up edges.

CVD Diamond coating offers a new level of wear protection and performance. DiamondPlus™ coating combines micro and nano-crystalline diamond coatings into one super hard layer.



## **GENERAL PURPOSE C SERIES** - Page 194

The C series end mills with two, three, or four flutes are available in square, corner radius or ball end, uncoated or with TiAlN as standard. This broad range of end mills is typical for job shop environments where one tool can handle a variety of applications.



## **CHAMFER MILLS** - Page 241

Chamfer mills are available to produce either a 60° or 90° chamfer. Both styles are available with two or four flutes.



## **COBALT** - Page 251

General purpose M42 cobalt roughers and finishers are available in a wide variety of sizes in both center cutting and non center cutting geometries.

The VFP geometry is designed specifically for high metal removal rates in stainless steel and titanium alloys.

Our EXCEL end mills are a revolutionary solution that combines superior geometry, high grade cobalt substrate and wear resistant PVD coatings to handle difficult milling applications.

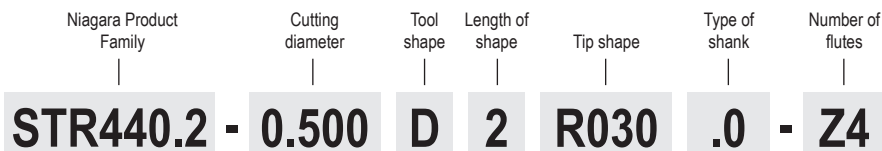


## **THREAD MILLS** - Page 301

Thread milling is a versatile and cost effective solution, especially if you are machining a variety of parts and materials on the same machine. Niagara Cutter offers a broad range of solid carbide thread mills to meet your requirements.

One thread mill can produce, regardless of diameter, thread forms of the same pitch. Thread forms produced can be internal or external, right-hand or left-hand. Plus, milled threads produce excellent form, finish, and dimensional accuracy, even in difficult to machine materials.

## END MILL PRODUCT CODE KEY



### PRODUCT LABEL



### PRODUCT RANGE

Example:

ST = STABILIZER

For all products, see catalog.

### CUTTING DIAMETER

Metric = 3 digit code (in case of 4 digit code: xx.xx mm)  
 Imperial = a decimal followed by a 3 digit code  
 For example: (050 = metric, 5 mm)  
 (.500 = imperial, 1/2 inch)

### TOOL SHAPE

| $(D_c = D_{M})$         |                  | $(D_c < D_{M})$  |                       |                        |                   | $(D_c > D_{M})$  |
|-------------------------|------------------|------------------|-----------------------|------------------------|-------------------|------------------|
|                         |                  |                  |                       |                        |                   |                  |
| <b>D</b><br>Cylindrical | <b>E</b><br>Neck | <b>F</b><br>Step | <b>G</b><br>Step neck | <b>J</b><br>Taper neck | <b>N</b><br>Taper | <b>P</b><br>Step |

### LENGTH OF SHAPE

- STUB = 1
- S = 2
- M = 3
- L = 4
- LR1 = 5
- LR2 = 6
- LR3 = 7
- LR4 = 8
- LR5 = 9

### TYPE OF SHANK

Indicates the shank types that are available.  
 .0 = Cylindrical  
 .3 = Weldon  
 .5 = Whistle Notch  
 .9 = Safe-Lock

### TIP SHAPE

| SQUARE END | BALL-NOSE | CORNER RADIUS | CHAMFER  | HIGH-FEED | TAPER    |
|------------|-----------|---------------|----------|-----------|----------|
|            |           |               |          |           |          |
| <b>S</b>   | <b>B</b>  | <b>R...</b>   | <b>C</b> | <b>H</b>  | <b>N</b> |

Size of radius for convex and concave radius tipped products

000 = For metric products the tip shape is shown by a three-digit figure.  
 By dividing this figure by 100 you will get the actual corner radius size in millimeters.

.000 = For inch products the tip shape is shown by a dot, followed by a three-digit figure.  
 This figure actually shows the size of the corner radius in inch (e.g. R.100 would indicate a radius of 0.100 Inch).

### NUMBER OF FLUTES

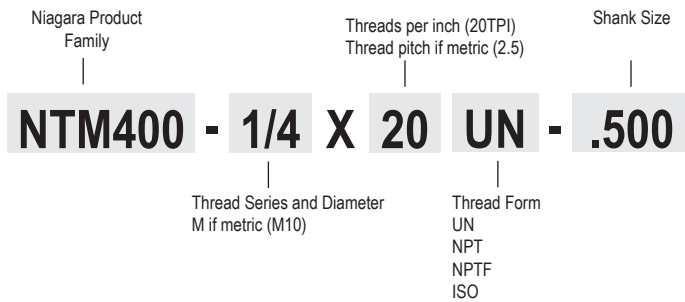
This figure indicates the number of flutes in the cutter.  
 For example:  
 Z2 = 2 flutes, Z6 = 6 flutes

### COATING

### DESCRIPTION

|        |             |
|--------|-------------|
| AICrN  | AICrN       |
| AITiN  | AITiN       |
| CVDDIA | Diamond CVD |
| TiAlN  | TiAlN       |
| TiCN   | TiCN        |
|        | Uncoated    |

## THREAD MILLING PRODUCT CODE KEY



### FORMULA








- $a_e$  = Width of cut/radial depth of cut
- $a_p$  = Depth of cut/axial depth of cut
- $f$  = Feed per revolution
- $f_z$  = Feed per tooth
- $n$  = Rev/min RPM
- $v_c$  = Surface footage/min
- $v_f$  = Table travel (in/min)
- $z_n$  = Number of teeth

## SYMBOL KEY





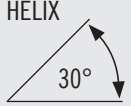



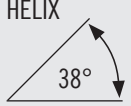
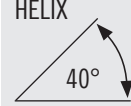


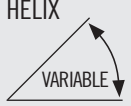
### TOOL MATERIAL - SUBSTRATE

|               |                                       |                  |
|---------------|---------------------------------------|------------------|
| SOLID CARBIDE | PREMIUM PARTICLE METAL<br>8.5% COBALT | M42<br>8% COBALT |
|---------------|---------------------------------------|------------------|

### TOOL END SHAPE

|  |  |   |   |
|--|--|---|---|
| SQUARE END<br>   | BALL END<br> | CHAMFER<br> 60° | CHAMFER<br> 90° |
| CHAMFER<br> 45° | RADIUS<br>  | HIGH FEED<br>  |   |



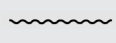
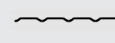
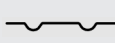
### HELIX ANGLE

|  |  |  |  |
|--|--|--|--|
| HELIX<br> 0°       | HELIX<br> 10° | HELIX<br> 15° | HELIX<br> 20° |
| HELIX<br> 30°      | HELIX<br> 35° | HELIX<br> 36° | HELIX<br> 37° |
| HELIX<br> 38°      | HELIX<br> 40° | HELIX<br> 45° | HELIX<br> 60° |
| HELIX<br> VARIABLE |  |  |  |

### END TEETH

|                |                    |
|----------------|--------------------|
| CENTER CUTTING | NON CENTER CUTTING |
|----------------|--------------------|

### ROUGHING PROFILES

|  |   |   |  |
|--|---|---|--|
| CHIPBREAKER<br>  | COARSE PITCH<br> | FINE PITCH<br> | TRUNCATED<br> |
| CHIPSPLITTER<br> |   |   |  |



## SECO MATERIAL GROUP (SMG)

### STEEL, FERRITIC AND MARTENSITIC STAINLESS STEEL

| ISO | SMG NO. | REPRESENTATIVE MATERIAL | DESCRIPTION  | BHN       | kc1.1 x 1000 lbf/in2 | m <sub>c</sub> |
|-----|---------|-------------------------|--|-----------|----------------------|----------------|
| P   | 1       | 1010                    | Very soft carbon steels<br>Purely ferritic steels  | < 135     | 196                  | 0.21           |
|     | 2       | 1140                    | Free-cutting steels  | 120 < 210 | 218                  | 0.22           |
|     | 3       | 1045                    | Structural steels. Ordinary carbon steels with low to medium carbon content (<0,5%C)   | 135 < 165 | 218                  | 0.25           |
|     | 4       | 4140                    | Carbon steels with high carbon content (>0,5%C)<br>Medium hard steels for toughening. Ordinary low-alloy steels<br>Ferritic and martensitic stainless steels | 165 < 210 | 247                  | 0.24           |
|     | 5       | 4340                    | Normal tool steels<br>Harder steels for toughening<br>Martensitic stainless steels   | 210 < 270 | 276                  | 0.24           |
|     | 6       | D2                      | Difficult tool steels<br>High-alloy steels with high hardness<br>Martensitic stainless steels  | 270 < 360 | 290                  | 0.24           |
| H   | 7       | A128 Grade A            | Difficult high-strength steels with 42 to 56 HRc hardness<br>Hardened steels from material group 3-6<br>Martensitic stainless steels                         | > 360     | 421                  | 0.22           |

### FREE-CUTTING, AUSTENITIC AND DUPLEX STAINLESS STEEL

|   |    |     |  |  |     |      |
|---|----|-----|--|--|-----|------|
| M | 8  | 304 | Easy-cutting stainless steels<br>Free-cutting stainless steels<br>Calcium-treated stainless steels |  | 254 | 0.22 |
|   | 9  | 316 | Moderately difficult stainless steels<br>Austenitic and duplex stainless steels                    |  | 276 | 0.2  |
|   | 10 | 310 | Difficult stainless steels<br>Austenitic and duplex stainless steels                               |  | 297 | 0.2  |
|   | 11 | 330 | Very difficult stainless steels<br>Austenitic and duplex stainless steels                          |  | 312 | 0.2  |

### CAST IRON

|   |    |                |   |  |     |      |
|---|----|----------------|---|--|-----|------|
| K | 12 | 60-40-18       | Medium hard cast iron<br>Grey cast iron   |  | 167 | 0.22 |
|   | 13 | A536 80-55-06  | Low-alloy cast iron<br>Malleable cast iron<br>Nodular cast iron                                       |  | 178 | 0.25 |
|   | 14 | A536 100-70-03 | Moderately difficult alloy cast iron<br>Moderately difficult malleable cast iron<br>Nodular cast iron |  | 196 | 0.28 |
|   | 15 | A536 120-90-02 | Difficult high-alloy cast iron<br>Difficult malleable cast iron<br>Nodular cast iron                  |  | 213 | 0.3  |

### OTHER MATERIALS

|   |    |                                |                          |  |     |      |
|---|----|--------------------------------|--------------------------|--|-----|------|
| N | 16 | A380                           | Aluminum alloys: Low Si  |  | 101 | 0.25 |
|   | 17 | B390.0                         | Aluminum alloys: High Si |  | 101 | 0.27 |
|   | 18 | CA937                          | Copper alloys            |  |     |      |
| S | 19 | Discalloy                      | Fe-based superalloys     |  |     |      |
|   | 20 | Stellite 21                    | Co-based superalloys     |  | 377 | 0.24 |
|   | 21 | Inconel 718 (bar, forge, ring) | Ni-based superalloys     |  | 479 | 0.24 |
|   | 22 | Ti 6Al-4V (annealed)           | Titanium alloys          |  | 210 | 0.23 |

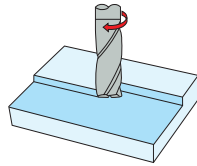
k<sub>c1.1</sub>-values with 0 degree effective cutting rake angle. For other rake angles, reduce the k<sub>c1.1</sub>-value by 1% for every degree increase in the cutting rake angle and vice versa. Keep in mind that the BHN-value is only an aid in the selection of the material group when the material has been worked by rolling, drawing, heat treatment or other methods that increase the strength of the material.

## BASIC MILLING OPERATIONS

### FACE MILLING

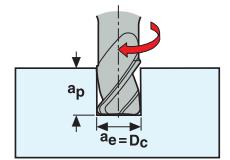
Operation where the tool is in engagement with less than 180° arc of contact.

Tool engagement:  
Small  $a_p$  and large  $a_e$ .



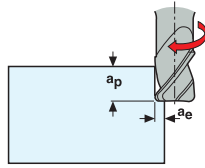
### SLOT MILLING

Operation where the full diameter is in engagement,  $a_e$  is equal to  $D_c$  and  $a_p$  up to 1½ times  $D_c$  depending on the machining strategy in use.



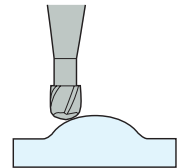
### SIDE MILLING

Operation where the side of the tool is in engagement,  $a_p$  is large and  $a_e$  is small.



### COPY MILLING

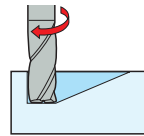
Operation where the radius is in engagement.  $a_p$  and  $a_e$  are both small.



## ADVANCED MILLING OPERATIONS

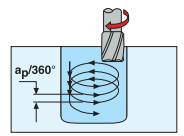
### RAMPING

Opening up a pocket by making a Z axis at an angle.



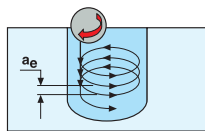
### HELICAL INTERPOLATION RAMPING

Opening a pocket by making a circular movement with the tool slightly less than 2 x D while ramping in Z axis.



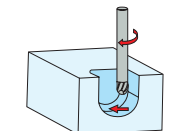
### TROCHOIDAL

Opening a slot by using side milling, making a partial circular movement in X- or Y-axis. (changing slot milling into side milling).



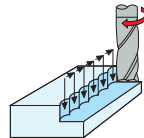
### PUSH-PULL

Machining a 3D form by making a down and up copying movement following the profile of the form.



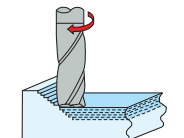
### PLUNGE MILLING

Opening up a deep slot by using drilling (Z) axis.



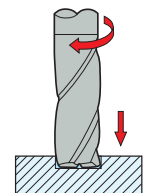
### Z-LEVELING

Machining a surface by making a small drilling or ramping in Z axis then opening the pocket with X and Y movements.



### DRILLING

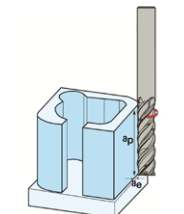
Making a hole with movement in Z axis.



### OPTIMIZED ROUGHING

Well defined tool paths with constant arc of contact for reliable roughing of simple & complex shapes.

The large axial depths ( $a_p$ ) & small radial depths ( $a_e$ ) of cut combined with high feeds per tooth ( $f_z$ ) and cutting speeds ( $V_c$ ) results in high productivity.





# DOUBLE YOUR FEED RATES

## STABILIZER™ 2.0

Raise the bar in your high performance milling operations with the Stabilizer 2.0 family of end mills. A patented continuously varying asymmetrical geometry helps create a smooth chatter free milling condition. This configuration, along with a specially engineered flute shape, allow for feed rates twice that of the previous Stabilizer.

### RANGE OVERVIEW

- 365 inch and 100 metric sizes
- Square, radius, and ball nose options
- Cylindrical shank with weldon option on inch product
- Diameters from 1/8" - 1" and 3 mm - 25 mm
- 1 x D, 2 x D and 3 x D length versions available

### STS430.2 / STR430.2 - 4-FLUTE, SQUARE END AND RADIUS

- .125" – 1.000" diameters, up to 3xD flute length

### STB430.2 - 4-FLUTE, BALL NOSE

- .125" – 1.000" diameters, 2xD flute length

### STRN430.2 / STBN430.2 - 4-FLUTE, RADIUS AND BALL NOSE NECKED OPTION

- .250" – 1.000" diameters, 2xD flute length and 3xD reach length

### STS430M.2 / STR430M.2 - 4-FLUTE, SQUARE END AND RADIUS

- 3 – 25mm diameters, up to 3xD flute length

### STB430M.2 - 4-FLUTE, BALL NOSE

- 3 – 25mm diameters, up to 3xD flute length

### STR440.2 - 4-FLUTE, RADIUS

- .125" – 1.000" diameters, up to 3xD flute length

### STB440.2 - 4-FLUTE, BALL NOSE

- .125" – 1.000" diameters, 2xD flute length

### STRN440.2 / STBN440.2 - 4-FLUTE, RADIUS AND BALL NOSE NECKED OPTION

- .250" – 1.000" diameters, 2xD flute length and 3xD reach length

### STR440M.2 / STB440M.2 - 4-FLUTE, SQUARE END AND RADIUS

- 3 – 25mm diameters, up to 3xD flute length

### MATERIAL GROUPS (430 SERIES)

Steel 1-6

Cast Iron 12-15

Non-ferrous 18

### MATERIAL GROUPS (440 SERIES)

Stainless Steel 8-11

Superalloys 19-22

### INDUSTRY TARGETS

- General Machining
- Aerospace
- Medical



# 6 TIPS

## HIGH PERFORMANCE MACHINING

High performance machining (HPM) with the new Stabilizer 2.0 can be highly effective in many 2D applications including slot milling, pocket milling and side milling. Higher metal removal rates can be achieved by increased feed rates and step overs pushing 50%+ of the cutter diameter compared to conventional machining strategies. Achieving the best possible results requires using these few common practices.

### 1. UNDERSTANDING THE NEED FOR INCREASED CUTTING PRESSURE

Due to the advanced flute geometry of the new Stabilizer 2.0, large step-overs need to be incorporated into the milling strategy in order to stabilize the tool while in cut. As a rule of thumb, a minimum of 20% of the diameter of the tool should be utilized. If the part and/or machine configuration does not allow for this large of a step-over, then the recommended catalog feed rate should be doubled to increase cutting pressure. Failure to "load" the tool may cause premature wear and a loss in productivity.

### 2. USE STRONG, SECURE TOOLHOLDERS & FIXTURING

The heavy cutting pressure of the Stabilizer 2.0 demands secure tool holders and fixturing. Utilizing an anti-pull-out system is the first choice when high performance milling is applied. Side lock holders, milling chucks and shrinkfit holders with anti-pull-out systems will help ensure that the tools are secure and provide optimal run-out of less than 0.0004". Some high precision collet systems and heavy-duty reinforced hydraulic chucks are a second option. However, the pull-out cannot be forgotten. Rigid fixturing and clamping will help ensure that the work piece stays fastened to the machining table.

### 3. LIMITING FACTORS OF MACHINE TOOLS

Knowing machine tool limitations and horse power consumption rates prior to implementing HPM strategies is crucial for success. These methods consume higher levels of horsepower and torque compared to standard milling strategies, this can push machine tools past their limits causing catastrophic failures. Using greater than a ½" diameter end mill in a CAT40 or similar size taper machine tool while utilizing HPM strategies could be problematic. Knowing your machine's limits is always the best option.

### 4. NOT ALL STAINLESS STEELS ARE CREATED EQUAL

To ensure optimal success, careful consideration must be taken when machining common pH hardened stainless steels such as 13-8, 15-5 and 17-4. When heat treated to a range of 32-42 Hrc, these materials have a machining characteristic like common tool steel. The ST430.2 is designed for steel machining applications and may be a better option than the ST440.2 which is the first choice tool for stainless steel applications. Utilizing the recommended cutting parameters for the ST440.2 while using the ST430.2, is a safe common practice.

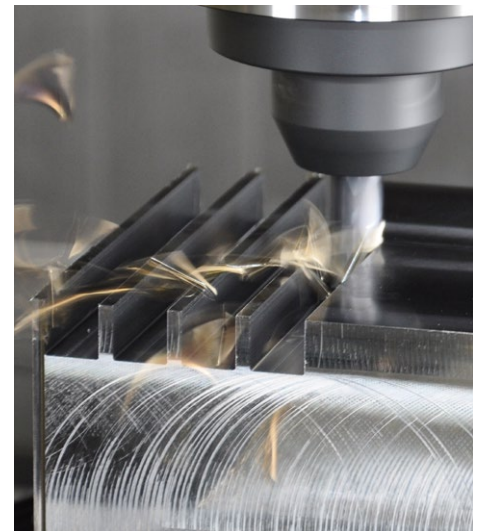
### 5. VERSATILE STABILIZER 2.0

If you wanted to choose one Stabilizer 2.0 series as an all-around tool for machining both steel and stainless steels, the ST440.2 series is the answer. Feed rates in steel are lower than the ST430.2 series due to reduced chip spacing (higher helix angle = less chip spacing). On average, the fpt of the ST440.2 series is 25% of the max feed rate in steel compared to the ST430.2 series.

**EXAMPLE:** fpt in 4140 for a 1.00" OD ST430.2 is 0.005", fpt for a 1.00" OD ST440.2 will only be 0.00375"

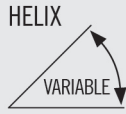
### 6. RECOMMENDED CUTTING PARAMETERS

Through meticulous research and years of first-hand experience, we have developed specific recommended cutting parameters. Cutting data is optimized for each tool's design, specifications and material groups. These configurations should always be used as a starting point and then modified from there depending on the application.



## STABILIZER™ 2.0-STS430.2

SOLID CARBIDE



CENTER CUTTING

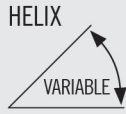


- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Weldon flat on shank sizes 3/8" and larger (optional)
- Ideal for profiling and slotting in steels, alloy steels, copper alloys, and cast iron
- Cutting Data - Page 44
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N09696</a> | STS430.2-0.125-D1-S.0-Z4 | 1/8       | 1/8       | 1/8           | 1-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09697</a> | STS430.2-0.125-D2-S.0-Z4 | 1/8       | 1/8       | 1/4           | 1-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09698</a> | STS430.2-0.125-D3-S.0-Z4 | 1/8       | 1/8       | 3/8           | 1-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09699</a> | STS430.2-0.156-F1-S.0-Z4 | 5/32      | 3/16      | 5/32          | 2              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09702</a> | STS430.2-0.156-F2-S.0-Z4 | 5/32      | 3/16      | 5/16          | 2              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09703</a> | STS430.2-0.156-F3-S.0-Z4 | 5/32      | 3/16      | 15/32         | 2              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09704</a> | STS430.2-0.188-D1-S.0-Z4 | 3/16      | 3/16      | 3/16          | 2              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09705</a> | STS430.2-0.188-D2-S.0-Z4 | 3/16      | 3/16      | 3/8           | 2              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09706</a> | STS430.2-0.188-D3-S.0-Z4 | 3/16      | 3/16      | 9/16          | 2              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09707</a> | STS430.2-0.219-F1-S.0-Z4 | 7/32      | 1/4       | 7/32          | 2              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09708</a> | STS430.2-0.219-F2-S.0-Z4 | 7/32      | 1/4       | 7/16          | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09709</a> | STS430.2-0.219-F3-S.0-Z4 | 7/32      | 1/4       | 21/32         | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09712</a> | STS430.2-0.250-D1-S.0-Z4 | 1/4       | 1/4       | 1/4           | 2              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09713</a> | STS430.2-0.250-D2-S.0-Z4 | 1/4       | 1/4       | 1/2           | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09714</a> | STS430.2-0.250-D3-S.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09715</a> | STS430.2-0.281-F1-S.0-Z4 | 9/32      | 5/16      | 9/32          | 2              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09716</a> | STS430.2-0.281-F2-S.0-Z4 | 9/32      | 5/16      | 9/16          | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09717</a> | STS430.2-0.281-F3-S.0-Z4 | 9/32      | 5/16      | 27/32         | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09718</a> | STS430.2-0.313-D1-S.0-Z4 | 5/16      | 5/16      | 5/16          | 2              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09719</a> | STS430.2-0.313-D2-S.0-Z4 | 5/16      | 5/16      | 5/8           | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09722</a> | STS430.2-0.313-D3-S.0-Z4 | 5/16      | 5/16      | 15/16         | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09723</a> | STS430.2-0.375-D1-S.0-Z4 | 3/8       | 3/8       | 3/8           | 2              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09724</a> | STS430.2-0.375-D1-S.3-Z4 | 3/8       | 3/8       | 3/8           | 2              | 4      | ALTIN   | WELDON      |
| <a href="#">N09725</a> | STS430.2-0.375-D2-S.0-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09726</a> | STS430.2-0.375-D2-S.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | ALTIN   | WELDON      |
| <a href="#">N09727</a> | STS430.2-0.375-D3-S.0-Z4 | 3/8       | 3/8       | 1-1/8         | 3              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09728</a> | STS430.2-0.375-D3-S.3-Z4 | 3/8       | 3/8       | 1-1/8         | 3              | 4      | ALTIN   | WELDON      |
| <a href="#">N09729</a> | STS430.2-0.438-D1-S.0-Z4 | 7/16      | 7/16      | 7/16          | 2-3/4          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09732</a> | STS430.2-0.438-D1-S.3-Z4 | 7/16      | 7/16      | 7/16          | 2-3/4          | 4      | ALTIN   | WELDON      |
| <a href="#">N09733</a> | STS430.2-0.438-D2-S.0-Z4 | 7/16      | 7/16      | 7/8           | 2-3/4          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09734</a> | STS430.2-0.438-D2-S.3-Z4 | 7/16      | 7/16      | 7/8           | 2-3/4          | 4      | ALTIN   | WELDON      |
| <a href="#">N09735</a> | STS430.2-0.438-D3-S.0-Z4 | 7/16      | 7/16      | 1-5/16        | 4              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09736</a> | STS430.2-0.438-D3-S.3-Z4 | 7/16      | 7/16      | 1-5/16        | 4              | 4      | ALTIN   | WELDON      |

## STABILIZER™ 2.0-STS430.2 (CON'T)

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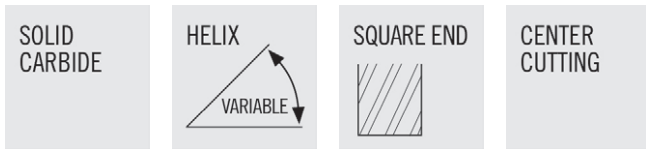
CENTER  
CUTTING



- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in steels, alloy steels, copper alloys, and cast iron
- Cutting Data - Page 44
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N09737</a> | STS430.2-0.500-D1-S.0-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09738</a> | STS430.2-0.500-D1-S.3-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | ALTIN   | WELDON      |
| <a href="#">N09739</a> | STS430.2-0.500-D2-S.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09742</a> | STS430.2-0.500-D2-S.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | WELDON      |
| <a href="#">N09743</a> | STS430.2-0.500-D3-S.0-Z4 | 1/2       | 1/2       | 1-1/4         | 3              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09744</a> | STS430.2-0.500-D3-S.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3              | 4      | ALTIN   | WELDON      |
| <a href="#">N09745</a> | STS430.2-0.500-D4-S.0-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09746</a> | STS430.2-0.500-D4-S.3-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | WELDON      |
| <a href="#">N09747</a> | STS430.2-0.625-D1-S.0-Z4 | 5/8       | 5/8       | 5/8           | 3              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09748</a> | STS430.2-0.625-D1-S.3-Z4 | 5/8       | 5/8       | 5/8           | 3              | 4      | ALTIN   | WELDON      |
| <a href="#">N09749</a> | STS430.2-0.625-D2-S.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09752</a> | STS430.2-0.625-D2-S.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | WELDON      |
| <a href="#">N09753</a> | STS430.2-0.625-D3-S.0-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09754</a> | STS430.2-0.625-D3-S.3-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | WELDON      |
| <a href="#">N09755</a> | STS430.2-0.750-D1-S.0-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09756</a> | STS430.2-0.750-D1-S.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | ALTIN   | WELDON      |
| <a href="#">N09757</a> | STS430.2-0.750-D2-S.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09758</a> | STS430.2-0.750-D2-S.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | WELDON      |
| <a href="#">N09759</a> | STS430.2-0.750-D3-S.0-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09762</a> | STS430.2-0.750-D3-S.3-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | WELDON      |
| <a href="#">N09763</a> | STS430.2-0.875-D1-S.0-Z4 | 7/8       | 7/8       | 7/8           | 4              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09764</a> | STS430.2-0.875-D1-S.3-Z4 | 7/8       | 7/8       | 7/8           | 4              | 4      | ALTIN   | WELDON      |
| <a href="#">N09765</a> | STS430.2-0.875-D2-S.0-Z4 | 7/8       | 7/8       | 1-3/4         | 4              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09766</a> | STS430.2-0.875-D2-S.3-Z4 | 7/8       | 7/8       | 1-3/4         | 4              | 4      | ALTIN   | WELDON      |
| <a href="#">N09767</a> | STS430.2-0.875-D3-S.0-Z4 | 7/8       | 7/8       | 2-5/8         | 5              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09768</a> | STS430.2-0.875-D3-S.3-Z4 | 7/8       | 7/8       | 2-5/8         | 5              | 4      | ALTIN   | WELDON      |
| <a href="#">N09769</a> | STS430.2-1.000-D1-S.0-Z4 | 1         | 1         | 1             | 4              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09772</a> | STS430.2-1.000-D1-S.3-Z4 | 1         | 1         | 1             | 4              | 4      | ALTIN   | WELDON      |
| <a href="#">N09773</a> | STS430.2-1.000-D2-S.0-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09774</a> | STS430.2-1.000-D2-S.3-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | WELDON      |
| <a href="#">N09775</a> | STS430.2-1.000-D3-S.0-Z4 | 1         | 1         | 3             | 6              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09776</a> | STS430.2-1.000-D3-S.3-Z4 | 1         | 1         | 3             | 6              | 4      | ALTIN   | WELDON      |

## STABILIZER™ 2.0-STS430M.2

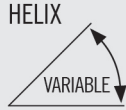


- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in steels, alloy steels, copper alloys, and cast iron
- Cutting Data - Page 45
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION             | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|-------------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N09538</a> | STS430M.2-030-F2-S.0-Z4 | 3mm       | 6mm       | 6mm           | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09539</a> | STS430M.2-030-F3-S.0-Z4 | 3mm       | 6mm       | 9mm           | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09542</a> | STS430M.2-040-F2-S.0-Z4 | 4mm       | 6mm       | 8mm           | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09543</a> | STS430M.2-040-F3-S.0-Z4 | 4mm       | 6mm       | 12mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09544</a> | STS430M.2-050-F2-S.0-Z4 | 5mm       | 6mm       | 10mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09545</a> | STS430M.2-050-F3-S.0-Z4 | 5mm       | 6mm       | 15mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09546</a> | STS430M.2-060-D2-S.0-Z4 | 6mm       | 6mm       | 12mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09547</a> | STS430M.2-060-D3-S.0-Z4 | 6mm       | 6mm       | 18mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09548</a> | STS430M.2-080-D2-S.0-Z4 | 8mm       | 8mm       | 16mm          | 64mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09549</a> | STS430M.2-080-D3-S.0-Z4 | 8mm       | 8mm       | 24mm          | 64mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09552</a> | STS430M.2-100-D2-S.0-Z4 | 10mm      | 10mm      | 20mm          | 73mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09553</a> | STS430M.2-100-D3-S.0-Z4 | 10mm      | 10mm      | 30mm          | 73mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09554</a> | STS430M.2-120-D2-S.0-Z4 | 12mm      | 12mm      | 24mm          | 84mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09555</a> | STS430M.2-120-D3-S.0-Z4 | 12mm      | 12mm      | 36mm          | 84mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09556</a> | STS430M.2-160-D2-S.0-Z4 | 16mm      | 16mm      | 32mm          | 93mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09557</a> | STS430M.2-160-D3-S.0-Z4 | 16mm      | 16mm      | 48mm          | 93mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09558</a> | STS430M.2-200-D2-S.0-Z4 | 20mm      | 20mm      | 40mm          | 105mm          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09559</a> | STS430M.2-200-D3-S.0-Z4 | 20mm      | 20mm      | 60mm          | 125mm          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09562</a> | STS430M.2-250-D2-S.0-Z4 | 25mm      | 25mm      | 50mm          | 115mm          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09563</a> | STS430M.2-250-D3-S.0-Z4 | 25mm      | 25mm      | 75mm          | 147mm          | 4      | ALTIN   | CYLINDRICAL |

## STABILIZER™ 2.0-STR430.2

SOLID  
CARBIDE



CENTER  
CUTTING

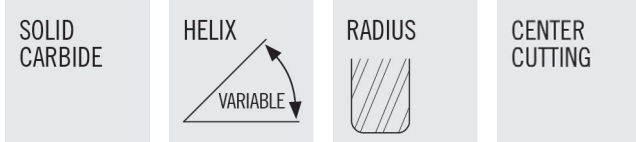


- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in steels, alloy steels, copper alloys, and cast iron
- Cutting Data - Page 44
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION                 | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|-----------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N09777</a> | STR430.2-0.125-D1-R010.0-Z4 | 1/8       | 1/8       | 1/8           | 1-1/2          | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09778</a> | STR430.2-0.125-D2-R010.0-Z4 | 1/8       | 1/8       | 1/4           | 1-1/2          | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09779</a> | STR430.2-0.125-D3-R010.0-Z4 | 1/8       | 1/8       | 3/8           | 1-1/2          | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09782</a> | STR430.2-0.156-F1-R010.0-Z4 | 5/32      | 3/16      | 5/32          | 2              | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09783</a> | STR430.2-0.156-F2-R010.0-Z4 | 5/32      | 3/16      | 5/16          | 2              | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09784</a> | STR430.2-0.156-F3-R010.0-Z4 | 5/32      | 3/16      | 15/32         | 2              | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09785</a> | STR430.2-0.188-D1-R010.0-Z4 | 3/16      | 3/16      | 3/16          | 2              | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09786</a> | STR430.2-0.188-D2-R010.0-Z4 | 3/16      | 3/16      | 3/8           | 2              | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09787</a> | STR430.2-0.188-D3-R010.0-Z4 | 3/16      | 3/16      | 9/16          | 2              | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09788</a> | STR430.2-0.219-F1-R020.0-Z4 | 7/32      | 1/4       | 7/32          | 2              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09789</a> | STR430.2-0.219-F2-R020.0-Z4 | 7/32      | 1/4       | 7/16          | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09792</a> | STR430.2-0.219-F3-R020.0-Z4 | 7/32      | 1/4       | 21/32         | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09793</a> | STR430.2-0.250-D1-R020.0-Z4 | 1/4       | 1/4       | 1/4           | 2              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09794</a> | STR430.2-0.250-D2-R020.0-Z4 | 1/4       | 1/4       | 1/2           | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09795</a> | STR430.2-0.250-D3-R020.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09796</a> | STR430.2-0.281-F1-R020.0-Z4 | 9/32      | 5/16      | 9/32          | 2              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09797</a> | STR430.2-0.281-F2-R020.0-Z4 | 9/32      | 5/16      | 9/16          | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09798</a> | STR430.2-0.281-F3-R020.0-Z4 | 9/32      | 5/16      | 27/32         | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09799</a> | STR430.2-0.313-D1-R020.0-Z4 | 5/16      | 5/16      | 5/16          | 2              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09802</a> | STR430.2-0.313-D2-R020.0-Z4 | 5/16      | 5/16      | 5/8           | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09803</a> | STR430.2-0.313-D3-R020.0-Z4 | 5/16      | 5/16      | 15/16         | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09804</a> | STR430.2-0.375-D1-R020.0-Z4 | 3/8       | 3/8       | 3/8           | 2              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09805</a> | STR430.2-0.375-D1-R020.3-Z4 | 3/8       | 3/8       | 3/8           | 2              | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09806</a> | STR430.2-0.375-D2-R020.0-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09807</a> | STR430.2-0.375-D2-R020.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09808</a> | STR430.2-0.375-D3-R020.0-Z4 | 3/8       | 3/8       | 1-1/8         | 3              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09809</a> | STR430.2-0.375-D3-R020.3-Z4 | 3/8       | 3/8       | 1-1/8         | 3              | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09812</a> | STR430.2-0.438-F1-R020.0-Z4 | 7/16      | 7/16      | 7/16          | 2-3/4          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09813</a> | STR430.2-0.438-F1-R020.3-Z4 | 7/16      | 7/16      | 7/16          | 2-3/4          | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09814</a> | STR430.2-0.438-F2-R020.0-Z4 | 7/16      | 7/16      | 7/8           | 2-3/4          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09815</a> | STR430.2-0.438-F2-R020.3-Z4 | 7/16      | 7/16      | 7/8           | 2-3/4          | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09816</a> | STR430.2-0.438-F3-R020.0-Z4 | 7/16      | 7/16      | 1-5/16        | 4              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09817</a> | STR430.2-0.438-F3-R020.3-Z4 | 7/16      | 7/16      | 1-5/16        | 4              | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09818</a> | STR430.2-0.500-D1-R030.0-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09819</a> | STR430.2-0.500-D1-R030.3-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | ALTIN   | 0.030  | WELDON      |



## STABILIZER™ 2.0-STR430.2 (CON'T)

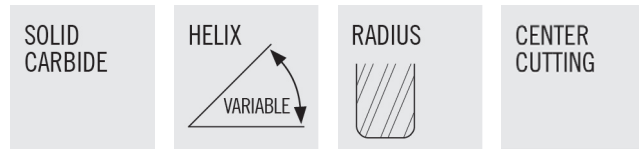


- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in steels, alloy steels, copper alloys, and cast iron

- Cutting Data - Page 44
- Tolerance Specs - Page 323

| PRODUCT NUMBER           | DESCRIPTION                 | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|--------------------------|-----------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N09844</a>   | STR430.2-0.500-D2-R030.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09845</a>   | STR430.2-0.500-D2-R030.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">03212567</a> | STR430.2-0.500-D2-R060.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">03212568</a> | STR430.2-0.500-D2-R060.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">03212569</a> | STR430.2-0.500-D2-R120.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">03212570</a> | STR430.2-0.500-D2-R120.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N09846</a>   | STR430.2-0.500-D3-R030.0-Z4 | 1/2       | 1/2       | 1-1/4         | 3              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09847</a>   | STR430.2-0.500-D3-R030.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">03212571</a> | STR430.2-0.500-D3-R060.0-Z4 | 1/2       | 1/2       | 1-1/4         | 3              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">03212572</a> | STR430.2-0.500-D3-R060.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">03212573</a> | STR430.2-0.500-D3-R120.0-Z4 | 1/2       | 1/2       | 1-1/4         | 3              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">03212574</a> | STR430.2-0.500-D3-R120.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N09848</a>   | STR430.2-0.500-D4-R030.0-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09849</a>   | STR430.2-0.500-D4-R030.3-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">03212575</a> | STR430.2-0.500-D4-R060.0-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">03212576</a> | STR430.2-0.500-D4-R060.3-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">03212577</a> | STR430.2-0.500-D4-R120.0-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">03212578</a> | STR430.2-0.500-D4-R120.3-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N09852</a>   | STR430.2-0.625-D1-R030.0-Z4 | 5/8       | 5/8       | 5/8           | 3              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09853</a>   | STR430.2-0.625-D1-R030.3-Z4 | 5/8       | 5/8       | 5/8           | 3              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09854</a>   | STR430.2-0.625-D2-R030.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09855</a>   | STR430.2-0.625-D2-R030.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">03212579</a> | STR430.2-0.625-D2-R060.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">03212580</a> | STR430.2-0.625-D2-R060.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">03212581</a> | STR430.2-0.625-D2-R090.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">03212582</a> | STR430.2-0.625-D2-R090.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.090  | WELDON      |
| <a href="#">03212583</a> | STR430.2-0.625-D2-R120.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">03212584</a> | STR430.2-0.625-D2-R120.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N09856</a>   | STR430.2-0.625-D3-R030.0-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09857</a>   | STR430.2-0.625-D3-R030.3-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">03212585</a> | STR430.2-0.625-D3-R060.0-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">03212586</a> | STR430.2-0.625-D3-R060.3-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">03212587</a> | STR430.2-0.625-D3-R090.0-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">03212588</a> | STR430.2-0.625-D3-R090.3-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.090  | WELDON      |
| <a href="#">03212589</a> | STR430.2-0.625-D3-R120.0-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.120  | CYLINDRICAL |

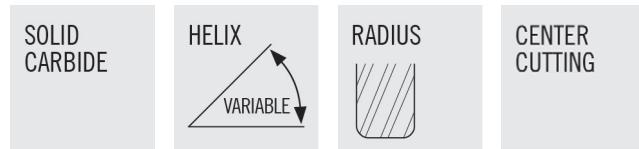
## STABILIZER™ 2.0-STR430.2 (CON'T)



- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in steels, alloy steels, copper alloys, and cast iron
- Cutting Data - Page 44
- Tolerance Specs - Page 323

| PRODUCT NUMBER           | DESCRIPTION                 | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|--------------------------|-----------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">03212590</a> | STR430.2-0.625-D3-R120.3-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N09858</a>   | STR430.2-0.750-D1-R030.0-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09859</a>   | STR430.2-0.750-D1-R030.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09862</a>   | STR430.2-0.750-D2-R030.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09863</a>   | STR430.2-0.750-D2-R030.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">03212591</a> | STR430.2-0.750-D2-R060.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">03212592</a> | STR430.2-0.750-D2-R060.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">03212593</a> | STR430.2-0.750-D2-R090.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">03212594</a> | STR430.2-0.750-D2-R090.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.090  | WELDON      |
| <a href="#">03212595</a> | STR430.2-0.750-D2-R120.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">03212596</a> | STR430.2-0.750-D2-R120.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">03212597</a> | STR430.2-0.750-D2-R250.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.250  | CYLINDRICAL |
| <a href="#">03212598</a> | STR430.2-0.750-D2-R250.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.250  | WELDON      |
| <a href="#">N09864</a>   | STR430.2-0.750-D3-R030.0-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09865</a>   | STR430.2-0.750-D3-R030.3-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">03212599</a> | STR430.2-0.750-D3-R060.0-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">03212600</a> | STR430.2-0.750-D3-R060.3-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">03212601</a> | STR430.2-0.750-D3-R090.0-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">03212602</a> | STR430.2-0.750-D3-R090.3-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.090  | WELDON      |
| <a href="#">03212603</a> | STR430.2-0.750-D3-R120.0-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">03212604</a> | STR430.2-0.750-D3-R120.3-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">03212606</a> | STR430.2-0.750-D3-R250.0-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.250  | CYLINDRICAL |
| <a href="#">03212607</a> | STR430.2-0.750-D3-R250.3-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.250  | WELDON      |
| <a href="#">N09866</a>   | STR430.2-0.875-D1-R030.0-Z4 | 7/8       | 7/8       | 7/8           | 4              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09867</a>   | STR430.2-0.875-D1-R030.3-Z4 | 7/8       | 7/8       | 7/8           | 4              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09868</a>   | STR430.2-0.875-D2-R030.0-Z4 | 7/8       | 7/8       | 1-3/4         | 4              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09869</a>   | STR430.2-0.875-D2-R030.3-Z4 | 7/8       | 7/8       | 1-3/4         | 4              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09872</a>   | STR430.2-0.875-D3-R030.0-Z4 | 7/8       | 7/8       | 2-5/8         | 5              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09873</a>   | STR430.2-0.875-D3-R030.3-Z4 | 7/8       | 7/8       | 2-5/8         | 5              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09874</a>   | STR430.2-1.000-D1-R030.0-Z4 | 1         | 1         | 1             | 4              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09875</a>   | STR430.2-1.000-D1-R030.3-Z4 | 1         | 1         | 1             | 4              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09876</a>   | STR430.2-1.000-D2-R030.0-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09877</a>   | STR430.2-1.000-D2-R030.3-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09878</a>   | STR430.2-1.000-D3-R030.0-Z4 | 1         | 1         | 3             | 6              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09879</a>   | STR430.2-1.000-D3-R030.3-Z4 | 1         | 1         | 3             | 6              | 4      | ALTIN   | 0.030  | WELDON      |

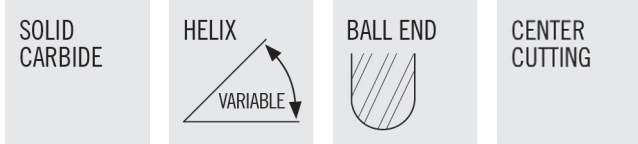
## STABILIZER™ 2.0-STR430M.2



- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in steels, alloy steels, copper alloys, and cast iron
- Cutting Data - Page 45
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION                | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|----------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N09564</a> | STR430M.2-030-F2-R025.0-Z4 | 3mm       | 6mm       | 6mm           | 58mm           | 4      | ALTIN   | 0.25mm | CYLINDRICAL |
| <a href="#">N09565</a> | STR430M.2-030-F3-R025.0-Z4 | 3mm       | 6mm       | 9mm           | 58mm           | 4      | ALTIN   | 0.25mm | CYLINDRICAL |
| <a href="#">N09566</a> | STR430M.2-040-F2-R025.0-Z4 | 4mm       | 6mm       | 8mm           | 58mm           | 4      | ALTIN   | 0.25mm | CYLINDRICAL |
| <a href="#">N09567</a> | STR430M.2-040-F3-R025.0-Z4 | 4mm       | 6mm       | 12mm          | 58mm           | 4      | ALTIN   | 0.25mm | CYLINDRICAL |
| <a href="#">N09568</a> | STR430M.2-050-F2-R025.0-Z4 | 5mm       | 6mm       | 10mm          | 58mm           | 4      | ALTIN   | 0.25mm | CYLINDRICAL |
| <a href="#">N09569</a> | STR430M.2-050-F3-R025.0-Z4 | 5mm       | 6mm       | 15mm          | 58mm           | 4      | ALTIN   | 0.25mm | CYLINDRICAL |
| <a href="#">N09582</a> | STR430M.2-060-D2-R050.0-Z4 | 6mm       | 6mm       | 12mm          | 58mm           | 4      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N09583</a> | STR430M.2-060-D3-R050.0-Z4 | 6mm       | 6mm       | 18mm          | 58mm           | 4      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N09584</a> | STR430M.2-080-D2-R050.0-Z4 | 8mm       | 8mm       | 16mm          | 64mm           | 4      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N09585</a> | STR430M.2-080-D3-R050.0-Z4 | 8mm       | 8mm       | 24mm          | 64mm           | 4      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N09586</a> | STR430M.2-100-D2-R050.0-Z4 | 10mm      | 10mm      | 20mm          | 73mm           | 4      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N09587</a> | STR430M.2-100-D3-R050.0-Z4 | 10mm      | 10mm      | 30mm          | 73mm           | 4      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N09588</a> | STR430M.2-120-D2-R075.0-Z4 | 12mm      | 12mm      | 24mm          | 84mm           | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09589</a> | STR430M.2-120-D3-R075.0-Z4 | 12mm      | 12mm      | 36mm          | 84mm           | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09602</a> | STR430M.2-160-D2-R075.0-Z4 | 16mm      | 16mm      | 32mm          | 93mm           | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09603</a> | STR430M.2-160-D3-R075.0-Z4 | 16mm      | 16mm      | 48mm          | 93mm           | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09604</a> | STR430M.2-200-D2-R075.0-Z4 | 20mm      | 20mm      | 40mm          | 105mm          | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09605</a> | STR430M.2-200-D3-R075.0-Z4 | 20mm      | 20mm      | 60mm          | 125mm          | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09606</a> | STR430M.2-250-D2-R075.0-Z4 | 25mm      | 25mm      | 50mm          | 115mm          | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09607</a> | STR430M.2-250-D3-R075.0-Z4 | 25mm      | 25mm      | 75mm          | 147mm          | 4      | ALTIN   | 0.75mm | CYLINDRICAL |

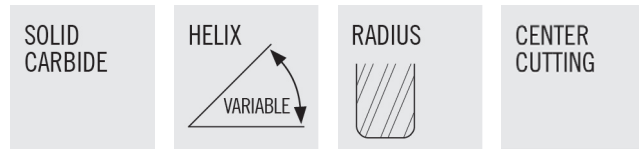
## STABILIZER™ 2.0-STB430.2 & STB430M.2



- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in steels, alloy steels, copper alloys, and cast iron
- Cutting Data STB430.2 - Page 44
- Tolerance Specs STB430.2- Page 323
- Cutting Data STB430M.2 - Page 45
- Tolerance Specs STB430M.2- Page 323

| PRODUCT NUMBER            | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|---------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <b>INCH - STB430.2</b>    |                          |           |           |               |                |        |         |             |
| <a href="#">N09369</a>    | STB430.2-0.125-D2-B.0-Z4 | 1/8       | 1/8       | 1/4           | 1-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09373</a>    | STB430.2-0.188-D2-B.0-Z4 | 3/16      | 3/16      | 3/8           | 2              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09383</a>    | STB430.2-0.250-D2-B.0-Z4 | 1/4       | 1/4       | 1/2           | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09386</a>    | STB430.2-0.313-D2-B.0-Z4 | 5/16      | 5/16      | 5/8           | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09387</a>    | STB430.2-0.375-D2-B.0-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09389</a>    | STB430.2-0.375-D2-B.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | ALTIN   | WELDON      |
| <a href="#">N09393</a>    | STB430.2-0.438-D2-B.0-Z4 | 7/16      | 7/16      | 7/8           | 2-3/4          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09396</a>    | STB430.2-0.438-D2-B.3-Z4 | 7/16      | 7/16      | 7/8           | 2-3/4          | 4      | ALTIN   | WELDON      |
| <a href="#">N09397</a>    | STB430.2-0.500-D2-B.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09398</a>    | STB430.2-0.500-D2-B.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | WELDON      |
| <a href="#">N09399</a>    | STB430.2-0.625-D2-B.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09402</a>    | STB430.2-0.625-D2-B.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | WELDON      |
| <a href="#">N09403</a>    | STB430.2-0.750-D2-B.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09404</a>    | STB430.2-0.750-D2-B.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | WELDON      |
| <a href="#">N09405</a>    | STB430.2-1.000-D2-B.0-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09406</a>    | STB430.2-1.000-D2-B.3-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | WELDON      |
| <b>METRIC - STB430M.2</b> |                          |           |           |               |                |        |         |             |
| <a href="#">N09608</a>    | STB430M.2-030-F2-B.0-Z4  | 3mm       | 6mm       | 6mm           | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09609</a>    | STB430M.2-030-F3-B.0-Z4  | 3mm       | 6mm       | 9mm           | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09612</a>    | STB430M.2-040-F2-B.0-Z4  | 4mm       | 6mm       | 8mm           | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09613</a>    | STB430M.2-040-F3-B.0-Z4  | 4mm       | 6mm       | 12mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09614</a>    | STB430M.2-050-F2-B.0-Z4  | 5mm       | 6mm       | 10mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09615</a>    | STB430M.2-050-F3-B.0-Z4  | 5mm       | 6mm       | 15mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09616</a>    | STB430M.2-060-D2-B.0-Z4  | 6mm       | 6mm       | 12mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09617</a>    | STB430M.2-060-D3-B.0-Z4  | 6mm       | 6mm       | 18mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09618</a>    | STB430M.2-080-D2-B.0-Z4  | 8mm       | 8mm       | 16mm          | 64mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09622</a>    | STB430M.2-080-D3-B.0-Z4  | 8mm       | 8mm       | 24mm          | 64mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09623</a>    | STB430M.2-100-D2-B.0-Z4  | 10mm      | 10mm      | 20mm          | 73mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09624</a>    | STB430M.2-100-D3-B.0-Z4  | 10mm      | 10mm      | 30mm          | 73mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09626</a>    | STB430M.2-120-D2-B.0-Z4  | 12mm      | 12mm      | 24mm          | 84mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09627</a>    | STB430M.2-120-D3-B.0-Z4  | 12mm      | 12mm      | 36mm          | 84mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09628</a>    | STB430M.2-160-D2-B.0-Z4  | 16mm      | 16mm      | 32mm          | 93mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09631</a>    | STB430M.2-160-D3-B.0-Z4  | 16mm      | 16mm      | 48mm          | 93mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09632</a>    | STB430M.2-200-D2-B.0-Z4  | 20mm      | 20mm      | 40mm          | 105mm          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09633</a>    | STB430M.2-200-D3-B.0-Z4  | 20mm      | 20mm      | 60mm          | 125mm          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09634</a>    | STB430M.2-250-D2-B.0-Z4  | 25mm      | 25mm      | 50mm          | 115mm          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09635</a>    | STB430M.2-250-D3-B.0-Z4  | 25mm      | 25mm      | 75mm          | 147mm          | 4      | ALTIN   | CYLINDRICAL |

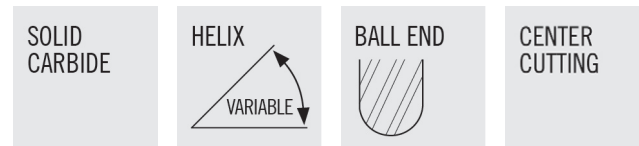
## STABILIZER™ 2.0-STRN430.2



- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in steels, alloy steels, copper alloys, and cast iron
- Cutting Data - Page 46
- Tolerance Specs - Page 323

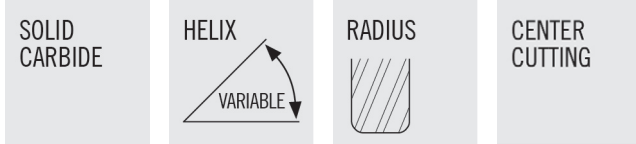
| PRODUCT NUMBER         | DESCRIPTION                  | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH  | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|------------------------------|-----------|-----------|---------------|----------------|----------|--------|--------|---------|--------|-------------|
| <a href="#">N09447</a> | STRN430.2-0.250-E2-R020.0-Z4 | 1/4       | 1/4       | 1/2           | 2-1/2          | 0.240    | 3/4    | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09448</a> | STRN430.2-0.313-E2-R020.0-Z4 | 5/16      | 5/16      | 5/8           | 3              | 0.300    | 15/16  | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09449</a> | STRN430.2-0.375-E2-R020.0-Z4 | 3/8       | 3/8       | 3/4           | 3              | 0.360    | 1-1/8  | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09456</a> | STRN430.2-0.375-E2-R020.3-Z4 | 3/8       | 3/8       | 3/4           | 3              | 0.360    | 1-1/8  | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09457</a> | STRN430.2-0.438-E2-R020.0-Z4 | 7/16      | 7/16      | 7/8           | 4              | 0.420    | 1-5/16 | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09462</a> | STRN430.2-0.438-E2-R020.3-Z4 | 7/16      | 7/16      | 7/8           | 4              | 0.420    | 1-5/16 | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09463</a> | STRN430.2-0.500-E2-R030.0-Z4 | 1/2       | 1/2       | 1             | 3              | 0.480    | 1-1/2  | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09464</a> | STRN430.2-0.500-E2-R030.3-Z4 | 1/2       | 1/2       | 1             | 3              | 0.480    | 1-1/2  | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09465</a> | STRN430.2-0.625-E2-R030.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 0.600    | 1-7/8  | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09466</a> | STRN430.2-0.625-E2-R030.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 0.600    | 1-7/8  | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09467</a> | STRN430.2-0.750-E2-R030.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 0.720    | 2-1/4  | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09468</a> | STRN430.2-0.750-E2-R030.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 0.720    | 2-1/4  | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09469</a> | STRN430.2-1.000-E2-R030.0-Z4 | 1         | 1         | 2             | 5              | 0.960    | 3      | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09472</a> | STRN430.2-1.000-E2-R030.3-Z4 | 1         | 1         | 2             | 5              | 0.960    | 3      | 4      | ALTIN   | 0.030  | WELDON      |

## STABILIZER™ 2.0-STBN430.2



| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH  | FLUTES | COATING | SHANK TYPE  |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|----------|--------|--------|---------|-------------|
| <a href="#">N09473</a> | STBN430.2-0.250-E2-B.0-Z4 | 1/4       | 1/4       | 1/2           | 2-1/2          | 0.240    | 3/4    | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09474</a> | STBN430.2-0.313-E2-B.0-Z4 | 5/16      | 5/16      | 5/8           | 3              | 0.300    | 15/16  | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09475</a> | STBN430.2-0.375-E2-B.0-Z4 | 3/8       | 3/8       | 3/4           | 3              | 0.360    | 1-1/8  | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09476</a> | STBN430.2-0.375-E2-B.3-Z4 | 3/8       | 3/8       | 3/4           | 3              | 0.360    | 1-1/8  | 4      | ALTIN   | WELDON      |
| <a href="#">N09477</a> | STBN430.2-0.438-E2-B.0-Z4 | 7/16      | 7/16      | 7/8           | 4              | 0.420    | 1-5/16 | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09478</a> | STBN430.2-0.438-E2-B.3-Z4 | 7/16      | 7/16      | 7/8           | 4              | 0.420    | 1-5/16 | 4      | ALTIN   | WELDON      |
| <a href="#">N09479</a> | STBN430.2-0.500-E2-B.0-Z4 | 1/2       | 1/2       | 1             | 3              | 0.480    | 1-1/2  | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09493</a> | STBN430.2-0.500-E2-B.3-Z4 | 1/2       | 1/2       | 1             | 3              | 0.480    | 1-1/2  | 4      | ALTIN   | WELDON      |
| <a href="#">N09494</a> | STBN430.2-0.625-E2-B.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 0.600    | 1-7/8  | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09495</a> | STBN430.2-0.625-E2-B.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 0.600    | 1-7/8  | 4      | ALTIN   | WELDON      |
| <a href="#">N09496</a> | STBN430.2-0.750-E2-B.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 0.720    | 2-1/4  | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09497</a> | STBN430.2-0.750-E2-B.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 0.720    | 2-1/4  | 4      | ALTIN   | WELDON      |
| <a href="#">N09499</a> | STBN430.2-1.000-E2-B.0-Z4 | 1         | 1         | 2             | 5              | 0.960    | 3      | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09502</a> | STBN430.2-1.000-E2-B.3-Z4 | 1         | 1         | 2             | 5              | 0.960    | 3      | 4      | ALTIN   | WELDON      |

## STABILIZER™ 2.0-STR440.2

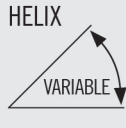


- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in stainless steels, steels over 42 Rc, titanium, and inconel
- Cutting Data - Page 47
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION                 | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|-----------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N09882</a> | STR440.2-0.125-D1-R010.0-Z4 | 1/8       | 1/8       | 1/8           | 1-1/2          | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09883</a> | STR440.2-0.125-D2-R010.0-Z4 | 1/8       | 1/8       | 1/4           | 1-1/2          | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09884</a> | STR440.2-0.125-D3-R010.0-Z4 | 1/8       | 1/8       | 3/8           | 1-1/2          | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09885</a> | STR440.2-0.156-D1-R010.0-Z4 | 5/32      | 3/16      | 5/32          | 2              | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09886</a> | STR440.2-0.156-F2-R010.0-Z4 | 5/32      | 3/16      | 5/16          | 2              | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09887</a> | STR440.2-0.156-F3-R010.0-Z4 | 5/32      | 3/16      | 15/32         | 2              | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09888</a> | STR440.2-0.188-D1-R010.0-Z4 | 3/16      | 3/16      | 3/16          | 2              | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09889</a> | STR440.2-0.188-D2-R010.0-Z4 | 3/16      | 3/16      | 3/8           | 2              | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09892</a> | STR440.2-0.188-D3-R010.0-Z4 | 3/16      | 3/16      | 9/16          | 2              | 4      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N09893</a> | STR440.2-0.219-F1-R020.0-Z4 | 7/32      | 1/4       | 7/32          | 2              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09894</a> | STR440.2-0.219-F2-R020.0-Z4 | 7/32      | 1/4       | 7/16          | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09895</a> | STR440.2-0.219-F3-R020.0-Z4 | 7/32      | 1/4       | 21/32         | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09896</a> | STR440.2-0.250-D1-R020.0-Z4 | 1/4       | 1/4       | 1/4           | 2              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09897</a> | STR440.2-0.250-D2-R020.0-Z4 | 1/4       | 1/4       | 1/2           | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09898</a> | STR440.2-0.250-D3-R020.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09899</a> | STR440.2-0.281-F1-R020.0-Z4 | 9/32      | 5/16      | 9/32          | 2              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09902</a> | STR440.2-0.281-F2-R020.0-Z4 | 9/32      | 5/16      | 9/16          | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09903</a> | STR440.2-0.281-F3-R020.0-Z4 | 9/32      | 5/16      | 27/32         | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09904</a> | STR440.2-0.313-D1-R020.0-Z4 | 5/16      | 5/16      | 5/16          | 2              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09905</a> | STR440.2-0.313-D2-R020.0-Z4 | 5/16      | 5/16      | 5/8           | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09906</a> | STR440.2-0.313-D3-R020.0-Z4 | 5/16      | 5/16      | 15/16         | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09907</a> | STR440.2-0.375-D1-R020.0-Z4 | 3/8       | 3/8       | 3/8           | 2              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09908</a> | STR440.2-0.375-D1-R020.3-Z4 | 3/8       | 3/8       | 3/8           | 2              | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09909</a> | STR440.2-0.375-D2-R020.0-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09912</a> | STR440.2-0.375-D2-R020.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09913</a> | STR440.2-0.375-D3-R020.0-Z4 | 3/8       | 3/8       | 1-1/8         | 3              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09914</a> | STR440.2-0.375-D3-R020.3-Z4 | 3/8       | 3/8       | 1-1/8         | 3              | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09915</a> | STR440.2-0.438-D1-R020.0-Z4 | 7/16      | 7/16      | 7/16          | 2-3/4          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09916</a> | STR440.2-0.438-D1-R020.3-Z4 | 7/16      | 7/16      | 7/16          | 2-3/4          | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09917</a> | STR440.2-0.438-D2-R020.0-Z4 | 7/16      | 7/16      | 7/8           | 2-3/4          | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09919</a> | STR440.2-0.438-D2-R020.3-Z4 | 7/16      | 7/16      | 7/8           | 2-3/4          | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09934</a> | STR440.2-0.438-D3-R020.0-Z4 | 7/16      | 7/16      | 1-5/16        | 4              | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09935</a> | STR440.2-0.438-D3-R020.3-Z4 | 7/16      | 7/16      | 1-5/16        | 4              | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09939</a> | STR440.2-0.500-D1-R030.0-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09942</a> | STR440.2-0.500-D1-R030.3-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09943</a> | STR440.2-0.500-D1-R060.0-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | ALTIN   | 0.060  | CYLINDRICAL |

## STABILIZER™ 2.0-STR440.2 (CON'T)

SOLID CARBIDE



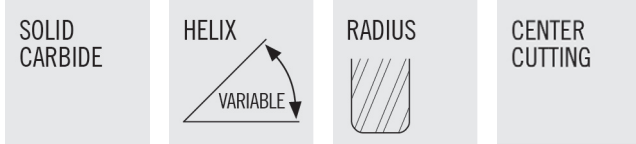
CENTER CUTTING



- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in stainless steels, steels over 42 Rc, titanium, and inconel
- Cutting Data - Page 47
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION                 | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|-----------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N09944</a> | STR440.2-0.500-D1-R060.3-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">N09945</a> | STR440.2-0.500-D1-R120.0-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N09946</a> | STR440.2-0.500-D1-R120.3-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N09947</a> | STR440.2-0.500-D2-R030.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09948</a> | STR440.2-0.500-D2-R030.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09949</a> | STR440.2-0.500-D3-R030.0-Z4 | 1/2       | 1/2       | 1-1/4         | 3              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09952</a> | STR440.2-0.500-D3-R030.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09953</a> | STR440.2-0.500-D2-R060.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N09954</a> | STR440.2-0.500-D2-R060.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">N09955</a> | STR440.2-0.500-D2-R120.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N09956</a> | STR440.2-0.500-D2-R120.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N09957</a> | STR440.2-0.500-D4-R030.0-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09958</a> | STR440.2-0.500-D4-R030.3-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09959</a> | STR440.2-0.500-D3-R060.0-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N09962</a> | STR440.2-0.500-D3-R060.3-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">N09963</a> | STR440.2-0.500-D3-R120.0-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N09964</a> | STR440.2-0.500-D3-R120.3-Z4 | 1/2       | 1/2       | 1-1/2         | 4              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N09965</a> | STR440.2-0.625-D1-R030.0-Z4 | 5/8       | 5/8       | 5/8           | 3              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09966</a> | STR440.2-0.625-D1-R030.3-Z4 | 5/8       | 5/8       | 5/8           | 3              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09967</a> | STR440.2-0.625-D1-R060.0-Z4 | 5/8       | 5/8       | 5/8           | 3              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N09968</a> | STR440.2-0.625-D1-R060.3-Z4 | 5/8       | 5/8       | 5/8           | 3              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">N09969</a> | STR440.2-0.625-D1-R120.0-Z4 | 5/8       | 5/8       | 5/8           | 3              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N09972</a> | STR440.2-0.625-D1-R120.3-Z4 | 5/8       | 5/8       | 5/8           | 3              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N09973</a> | STR440.2-0.625-D2-R030.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09974</a> | STR440.2-0.625-D2-R030.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09975</a> | STR440.2-0.625-D2-R060.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N09976</a> | STR440.2-0.625-D2-R060.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">N09977</a> | STR440.2-0.625-D2-R120.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N09978</a> | STR440.2-0.625-D2-R120.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N09979</a> | STR440.2-0.625-D3-R030.0-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09982</a> | STR440.2-0.625-D3-R030.3-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09983</a> | STR440.2-0.625-D3-R060.0-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N09984</a> | STR440.2-0.625-D3-R060.3-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">N00328</a> | STR440.2-0.625-D3-R120.0-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N00329</a> | STR440.2-0.625-D3-R120.3-Z4 | 5/8       | 5/8       | 1-7/8         | 4              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N00332</a> | STR440.2-0.750-D1-R030.0-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | ALTIN   | 0.030  | CYLINDRICAL |

## STABILIZER™ 2.0-STR440.2 (CON'T)

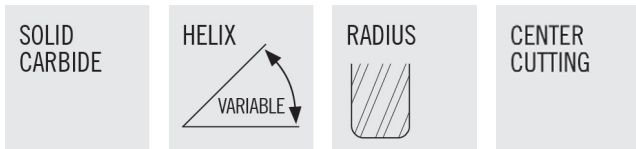


- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in stainless steels, steels over 42 Rc, titanium, and inconel
- Cutting Data - Page 47
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION                 | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|-----------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N00333</a> | STR440.2-0.750-D1-R030.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N00334</a> | STR440.2-0.750-D1-R060.0-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N00335</a> | STR440.2-0.750-D1-R060.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">N00336</a> | STR440.2-0.750-D1-R120.0-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N00337</a> | STR440.2-0.750-D1-R120.3-Z4 | 3/4       | 3/4       | 3/4           | 4              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N00338</a> | STR440.2-0.750-D2-R030.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N00339</a> | STR440.2-0.750-D2-R030.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N00342</a> | STR440.2-0.750-D2-R060.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N00343</a> | STR440.2-0.750-D2-R060.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">N00344</a> | STR440.2-0.750-D2-R120.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N00345</a> | STR440.2-0.750-D2-R120.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N00346</a> | STR440.2-0.750-D3-R030.0-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N00347</a> | STR440.2-0.750-D3-R030.3-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N00348</a> | STR440.2-0.750-D3-R060.0-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N00349</a> | STR440.2-0.750-D3-R060.3-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">N00352</a> | STR440.2-0.750-D3-R120.0-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N00353</a> | STR440.2-0.750-D3-R120.3-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N00354</a> | STR440.2-1.000-D1-R030.0-Z4 | 1         | 1         | 1             | 4              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N00355</a> | STR440.2-1.000-D1-R030.3-Z4 | 1         | 1         | 1             | 4              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09327</a> | STR440.2-1.000-D1-R060.0-Z4 | 1         | 1         | 1             | 4              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N09329</a> | STR440.2-1.000-D1-R060.3-Z4 | 1         | 1         | 1             | 4              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">N09333</a> | STR440.2-1.000-D1-R120.0-Z4 | 1         | 1         | 1             | 4              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N09336</a> | STR440.2-1.000-D1-R120.3-Z4 | 1         | 1         | 1             | 4              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N09337</a> | STR440.2-1.000-D2-R030.0-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09339</a> | STR440.2-1.000-D2-R030.3-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09343</a> | STR440.2-1.000-D2-R060.0-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N09346</a> | STR440.2-1.000-D2-R060.3-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">N09347</a> | STR440.2-1.000-D2-R120.0-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N09349</a> | STR440.2-1.000-D2-R120.3-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | 0.120  | WELDON      |
| <a href="#">N09356</a> | STR440.2-1.000-D3-R030.0-Z4 | 1         | 1         | 3             | 6              | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09357</a> | STR440.2-1.000-D3-R030.3-Z4 | 1         | 1         | 3             | 6              | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09359</a> | STR440.2-1.000-D3-R060.0-Z4 | 1         | 1         | 3             | 6              | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N09363</a> | STR440.2-1.000-D3-R060.3-Z4 | 1         | 1         | 3             | 6              | 4      | ALTIN   | 0.060  | WELDON      |
| <a href="#">N09366</a> | STR440.2-1.000-D3-R120.0-Z4 | 1         | 1         | 3             | 6              | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N09367</a> | STR440.2-1.000-D3-R120.3-Z4 | 1         | 1         | 3             | 6              | 4      | ALTIN   | 0.120  | WELDON      |



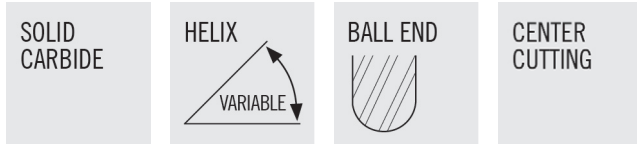
## STABILIZER™ 2.0-STR440M.2



- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in stainless steels, steels over 42 Rc, titanium, and inconel
- Cutting Data - Page 48
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION                | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|----------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N09636</a> | STR440M.2-030-F2-R025.0-Z4 | 3mm       | 6mm       | 6mm           | 58mm           | 4      | ALTIN   | 0.25mm | CYLINDRICAL |
| <a href="#">N09637</a> | STR440M.2-030-F3-R025.0-Z4 | 3mm       | 6mm       | 9mm           | 58mm           | 4      | ALTIN   | 0.25mm | CYLINDRICAL |
| <a href="#">N09645</a> | STR440M.2-040-F2-R025.0-Z4 | 4mm       | 6mm       | 8mm           | 58mm           | 4      | ALTIN   | 0.25mm | CYLINDRICAL |
| <a href="#">N09646</a> | STR440M.2-040-F3-R025.0-Z4 | 4mm       | 6mm       | 12mm          | 58mm           | 4      | ALTIN   | 0.25mm | CYLINDRICAL |
| <a href="#">N09647</a> | STR440M.2-050-F2-R025.0-Z4 | 5mm       | 6mm       | 10mm          | 58mm           | 4      | ALTIN   | 0.25mm | CYLINDRICAL |
| <a href="#">N09648</a> | STR440M.2-050-F3-R025.0-Z4 | 5mm       | 6mm       | 15mm          | 58mm           | 4      | ALTIN   | 0.25mm | CYLINDRICAL |
| <a href="#">N09649</a> | STR440M.2-060-D2-R050.0-Z4 | 6mm       | 6mm       | 12mm          | 58mm           | 4      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N09650</a> | STR440M.2-060-D3-R050.0-Z4 | 6mm       | 6mm       | 18mm          | 58mm           | 4      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N09651</a> | STR440M.2-080-D2-R050.0-Z4 | 8mm       | 8mm       | 16mm          | 64mm           | 4      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N09652</a> | STR440M.2-080-D3-R050.0-Z4 | 8mm       | 8mm       | 24mm          | 64mm           | 4      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N09653</a> | STR440M.2-100-D2-R050.0-Z4 | 10mm      | 10mm      | 20mm          | 73mm           | 4      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N09654</a> | STR440M.2-100-D3-R050.0-Z4 | 10mm      | 10mm      | 30mm          | 73mm           | 4      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N09655</a> | STR440M.2-120-D2-R075.0-Z4 | 12mm      | 12mm      | 24mm          | 84mm           | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09665</a> | STR440M.2-120-D3-R075.0-Z4 | 12mm      | 12mm      | 36mm          | 84mm           | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09667</a> | STR440M.2-160-D2-R075.0-Z4 | 16mm      | 16mm      | 32mm          | 93mm           | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09668</a> | STR440M.2-160-D3-R075.0-Z4 | 16mm      | 16mm      | 48mm          | 93mm           | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09670</a> | STR440M.2-200-D2-R075.0-Z4 | 20mm      | 20mm      | 40mm          | 105mm          | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09671</a> | STR440M.2-200-D3-R075.0-Z4 | 20mm      | 20mm      | 60mm          | 125mm          | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09672</a> | STR440M.2-250-D2-R075.0-Z4 | 25mm      | 25mm      | 50mm          | 115mm          | 4      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N09673</a> | STR440M.2-250-D3-R075.0-Z4 | 25mm      | 25mm      | 75mm          | 147mm          | 4      | ALTIN   | 0.75mm | CYLINDRICAL |

## STABILIZER™ 2.0-STB440.2 & STB440M.2

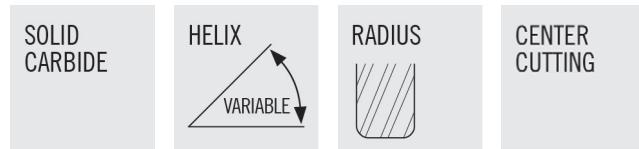


- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in stainless steels, steels over 42 Rc, titanium, and inconel

- Cutting Data STB440.2 - Page 47
- Tolerance Specs STB440.2 - Page 323
- Cutting Data STB440M.2 - Page 48
- Tolerance Specs STB440M.2 - Page 323

| PRODUCT NUMBER            | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|---------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <b>INCH - STB440.2</b>    |                          |           |           |               |                |        |         |             |
| <a href="#">N09407</a>    | STB440.2-0.125-D2-B.0-Z4 | 1/8       | 1/8       | 1/4           | 1-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09408</a>    | STB440.2-0.188-D2-B.0-Z4 | 3/16      | 3/16      | 3/8           | 2              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09409</a>    | STB440.2-0.250-D2-B.0-Z4 | 1/4       | 1/4       | 1/2           | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09422</a>    | STB440.2-0.313-D2-B.0-Z4 | 5/16      | 5/16      | 5/8           | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09423</a>    | STB440.2-0.375-D2-B.0-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09426</a>    | STB440.2-0.375-D2-B.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | ALTIN   | WELDON      |
| <a href="#">N09427</a>    | STB440.2-0.438-D2-B.0-Z4 | 7/16      | 7/16      | 7/8           | 2-3/4          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09428</a>    | STB440.2-0.438-D2-B.3-Z4 | 7/16      | 7/16      | 7/8           | 2-3/4          | 4      | ALTIN   | WELDON      |
| <a href="#">N09429</a>    | STB440.2-0.500-D2-B.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09432</a>    | STB440.2-0.500-D2-B.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | ALTIN   | WELDON      |
| <a href="#">N09433</a>    | STB440.2-0.625-D2-B.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09442</a>    | STB440.2-0.625-D2-B.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | ALTIN   | WELDON      |
| <a href="#">N09443</a>    | STB440.2-0.750-D2-B.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09444</a>    | STB440.2-0.750-D2-B.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | ALTIN   | WELDON      |
| <a href="#">N09445</a>    | STB440.2-1.000-D2-B.0-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09446</a>    | STB440.2-1.000-D2-B.3-Z4 | 1         | 1         | 2             | 5              | 4      | ALTIN   | WELDON      |
| <b>METRIC - STB440M.2</b> |                          |           |           |               |                |        |         |             |
| <a href="#">N09674</a>    | STB440M.2-030-F2-B.0-Z4  | 3mm       | 6mm       | 6mm           | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09675</a>    | STB440M.2-030-F3-B.0-Z4  | 3mm       | 6mm       | 9mm           | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09676</a>    | STB440M.2-040-F2-B.0-Z4  | 4mm       | 6mm       | 8mm           | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09677</a>    | STB440M.2-040-F3-B.0-Z4  | 4mm       | 6mm       | 12mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09679</a>    | STB440M.2-050-F2-B.0-Z4  | 5mm       | 6mm       | 10mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09680</a>    | STB440M.2-050-F3-B.0-Z4  | 5mm       | 6mm       | 15mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09682</a>    | STB440M.2-060-D2-B.0-Z4  | 6mm       | 6mm       | 12mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09683</a>    | STB440M.2-060-D3-B.0-Z4  | 6mm       | 6mm       | 18mm          | 58mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09684</a>    | STB440M.2-080-D2-B.0-Z4  | 8mm       | 8mm       | 16mm          | 64mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09685</a>    | STB440M.2-080-D3-B.0-Z4  | 8mm       | 8mm       | 24mm          | 64mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09686</a>    | STB440M.2-100-D2-B.0-Z4  | 10mm      | 10mm      | 20mm          | 73mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09687</a>    | STB440M.2-100-D3-B.0-Z4  | 10mm      | 10mm      | 30mm          | 73mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09688</a>    | STB440M.2-120-D2-B.0-Z4  | 12mm      | 12mm      | 24mm          | 84mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09689</a>    | STB440M.2-120-D3-B.0-Z4  | 12mm      | 12mm      | 36mm          | 84mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09690</a>    | STB440M.2-160-D2-B.0-Z4  | 16mm      | 16mm      | 32mm          | 93mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09691</a>    | STB440M.2-160-D3-B.0-Z4  | 16mm      | 16mm      | 48mm          | 93mm           | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09692</a>    | STB440M.2-200-D2-B.0-Z4  | 20mm      | 20mm      | 40mm          | 105mm          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09693</a>    | STB440M.2-200-D3-B.0-Z4  | 20mm      | 20mm      | 60mm          | 125mm          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09694</a>    | STB440M.2-250-D2-B.0-Z4  | 25mm      | 25mm      | 50mm          | 115mm          | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09695</a>    | STB440M.2-250-D3-B.0-Z4  | 25mm      | 25mm      | 75mm          | 147mm          | 4      | ALTIN   | CYLINDRICAL |

## STABILIZER™ 2.0-STRN440.2

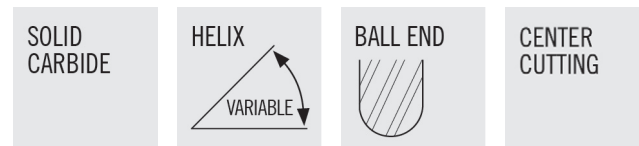


- US Patent # 6,991,409
- Eccentric Primary Relief
- Continuous Varying Asymmetrical Flute Geometry
- Ideal for profiling and slotting in stainless steels, steels over 42 Rc, titanium, and inconel

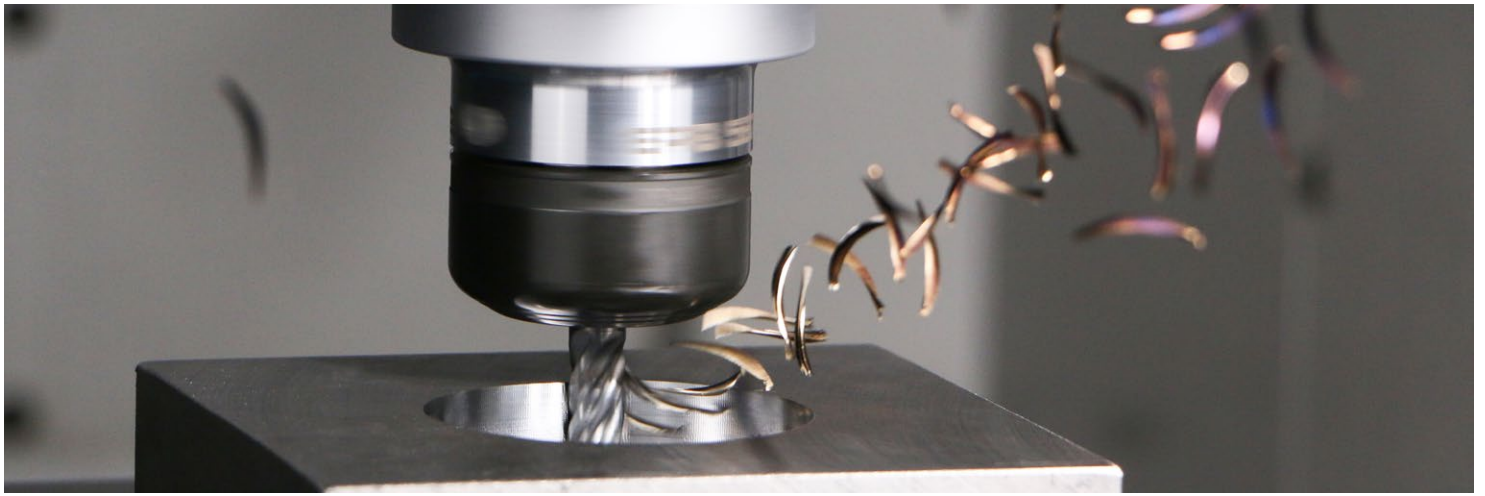
- Cutting Data STRN440.2 - Page 49
- Tolerance Specs STRN440.2 - Page 323
- Cutting Data STBN440.2 - Page 49
- Tolerance Specs STBN440.2 - Page 323

| PRODUCT NUMBER         | DESCRIPTION                  | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH  | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|------------------------------|-----------|-----------|---------------|----------------|----------|--------|--------|---------|--------|-------------|
| <a href="#">N09503</a> | STRN440.2-0.250-E2-R020.0-Z4 | 1/4       | 1/4       | 1/2           | 2-1/2          | 0.240    | 3/4    | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09504</a> | STRN440.2-0.313-E2-R020.0-Z4 | 5/16      | 5/16      | 5/8           | 3              | 0.300    | 15/16  | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09505</a> | STRN440.2-0.375-E2-R020.0-Z4 | 3/8       | 3/8       | 3/4           | 3              | 0.360    | 1-1/8  | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09506</a> | STRN440.2-0.375-E2-R020.3-Z4 | 3/8       | 3/8       | 3/4           | 3              | 0.360    | 1-1/8  | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09507</a> | STRN440.2-0.438-E2-R020.0-Z4 | 7/16      | 7/16      | 7/8           | 4              | 0.420    | 1-5/16 | 4      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N09508</a> | STRN440.2-0.438-E2-R020.3-Z4 | 7/16      | 7/16      | 7/8           | 4              | 0.420    | 1-5/16 | 4      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N09509</a> | STRN440.2-0.500-E2-R030.0-Z4 | 1/2       | 1/2       | 1             | 3              | 0.480    | 1-1/2  | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09512</a> | STRN440.2-0.500-E2-R030.3-Z4 | 1/2       | 1/2       | 1             | 3              | 0.480    | 1-1/2  | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09513</a> | STRN440.2-0.625-E2-R030.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 0.600    | 1-7/8  | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09515</a> | STRN440.2-0.625-E2-R030.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 0.600    | 1-7/8  | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09516</a> | STRN440.2-0.750-E2-R030.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 0.720    | 2-1/4  | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09517</a> | STRN440.2-0.750-E2-R030.3-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 0.720    | 2-1/4  | 4      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N09518</a> | STRN440.2-1.000-E2-R030.0-Z4 | 1         | 1         | 2             | 5              | 0.960    | 3      | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N09519</a> | STRN440.2-1.000-E2-R030.3-Z4 | 1         | 1         | 2             | 5              | 0.960    | 3      | 4      | ALTIN   | 0.030  | WELDON      |

## STABILIZER™ 2.0-STBN440.2



| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIAM | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH  | FLUTES | COATING | SHANK TYPE  |
|------------------------|---------------------------|-----------|------------|---------------|----------------|----------|--------|--------|---------|-------------|
| <a href="#">N09522</a> | STBN440.2-0.250-E2-B.0-Z4 | 1/4       | 1/4        | 1/2           | 2-1/2          | 0.240    | 3/4    | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09523</a> | STBN440.2-0.313-E2-B.0-Z4 | 5/16      | 5/16       | 5/8           | 3              | 0.300    | 15/16  | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09524</a> | STBN440.2-0.375-E2-B.0-Z4 | 3/8       | 3/8        | 3/4           | 3              | 0.360    | 1-1/8  | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09525</a> | STBN440.2-0.375-E2-B.3-Z4 | 3/8       | 3/8        | 3/4           | 3              | 0.360    | 1-1/8  | 4      | ALTIN   | WELDON      |
| <a href="#">N09526</a> | STBN440.2-0.438-E2-B.0-Z4 | 7/16      | 7/16       | 7/8           | 4              | 0.420    | 1-5/16 | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09527</a> | STBN440.2-0.438-E2-B.3-Z4 | 7/16      | 7/16       | 7/8           | 4              | 0.420    | 1-5/16 | 4      | ALTIN   | WELDON      |
| <a href="#">N09528</a> | STBN440.2-0.500-E2-B.0-Z4 | 1/2       | 1/2        | 1             | 3              | 0.480    | 1-1/2  | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09529</a> | STBN440.2-0.500-E2-B.3-Z4 | 1/2       | 1/2        | 1             | 3              | 0.480    | 1-1/2  | 4      | ALTIN   | WELDON      |
| <a href="#">N09532</a> | STBN440.2-0.625-E2-B.0-Z4 | 5/8       | 5/8        | 1-1/4         | 3-1/2          | 0.600    | 1-7/8  | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09533</a> | STBN440.2-0.625-E2-B.3-Z4 | 5/8       | 5/8        | 1-1/4         | 3-1/2          | 0.600    | 1-7/8  | 4      | ALTIN   | WELDON      |
| <a href="#">N09534</a> | STBN440.2-0.750-E2-B.0-Z4 | 3/4       | 3/4        | 1-1/2         | 4              | 0.720    | 2-1/4  | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09535</a> | STBN440.2-0.750-E2-B.3-Z4 | 3/4       | 3/4        | 1-1/2         | 4              | 0.720    | 2-1/4  | 4      | ALTIN   | WELDON      |
| <a href="#">N09536</a> | STBN440.2-1.000-E2-B.0-Z4 | 1         | 1          | 2             | 5              | 0.960    | 3      | 4      | ALTIN   | CYLINDRICAL |
| <a href="#">N09537</a> | STBN440.2-1.000-E2-B.3-Z4 | 1         | 1          | 2             | 5              | 0.960    | 3      | 4      | ALTIN   | WELDON      |



# GET A TOOLROOM WORTH OF PRODUCTIVITY AND VERSATILITY IN ONE END MILL

## STABILIZER™ 5-FLUTE

Simplify tool selection and part programming with the new Niagara Cutter™ multi-purpose ST540 family of 5-flute end mills. Gain part processing versatility with the ability to handle slot milling, side mill roughing, side mill finishing and face milling applications as well as in traditional and high-performance optimized roughing, pocketing and ramping – all with a single product family. Reduce your tool inventory with the universal ST540 family and work equally effective in all materials such as steel, cast iron, stainless steels and superalloys.

### RANGE OVERVIEW

- 1/81 inch and metric sizes
- Cylindrical and Weldon Shank Options

### STS540 / STR540 - 5-FLUTE, SQUARE & RADIUS

- .125" – 1.000" diameters (and 6mm-12mm), up to 4xD flute length

### STRN540 - 5-FLUTE, NECKED SERIES

- .250" – 1.000" diameters, up to 2xD flute length and 8xD reach length

### STRCS540 - 5-FLUTE, CHIP SPLITTER SERIES

- .250" – .750" diameters, up to 3.2xD flute length

### YOUR BENEFITS

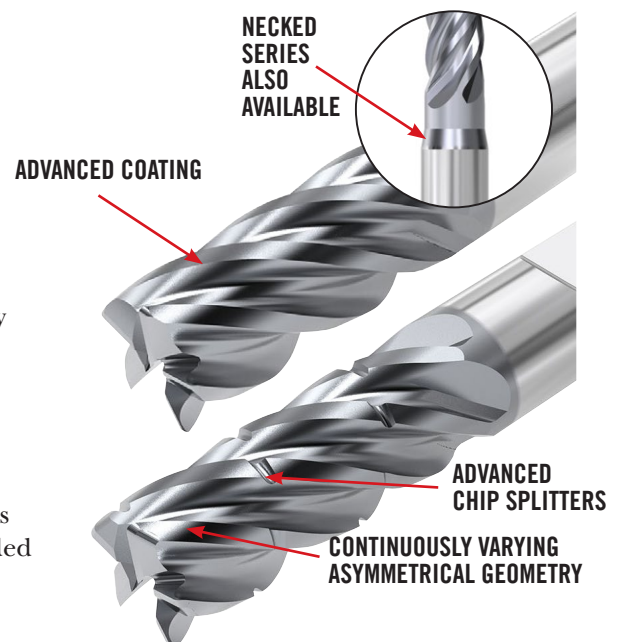
- More aggressive full slotting and large radial stepover cuts made possible by the 5-flute design's efficient chip evacuation
- Maintain optimal cutting speeds and achieve high-quality surfaces with the superior harmonics and chatter reduction of variable geometry
- Superior tool life, wear resistance and edge strength thanks to advanced coatings, full eccentric reliefs and asymmetrical cutting edges
- Maximize material removal in long-tool applications and prevent long chips from nesting and causing downtime or ruining surface finishes with extended reach configurations and a new advanced chip splitter

| MATERIAL GROUPS      |
|----------------------|
| Steel 1-6            |
| Stainless Steel 8-11 |
| Cast Iron 12-15      |
| Superalloys 19-22    |

Bridge the gap between the Stabilizer™ 2.0 and the S638, S738, S938 Multi Flute product family

### INDUSTRY TARGETS

- Aerospace
- Automotive
- General Machining
- Medical



# 4 TIPS

## FOR HIGH-PERFORMANCE VERSATILITY

The right 5-Flute end mill offers a unique balance of versatility and performance across a variety of high performance applications, materials, and setups. Subpar machines with limited horsepower, fixture rigidity, spindle type, CNC controller lookahead and programming styles can wreak havoc on more specialized high-performance end mills. 5-Flutes rough, finish, even optimize rough without requiring the finer tuning or optimal setups of its 4 or 6-flute counterparts.

### 1. BEING STUCK IN THE MIDDLE CAN BE A GOOD THING

4-flute end mills designed for heavy roughing applications typically struggle to perform when it comes to light radial stepovers less than 20% of the diameter of the tool. This means that finishing cuts are almost always out of the question. On the other side of the spectrum, multi-flute end mills with 6 flutes or more excel in optimized roughing and side mill finishing applications, typically taking less than 15% of the diameter radial stepovers. However, these end mills lack the chip spacing for heavy slotting and side milling cuts. The 5-flute ST540 Stabilizer™ falls right in the middle because it takes both roughing and finishing cuts with ease as well as slot milling, helical ramping and face milling cuts. If you are looking for one tool for all square shoulder milling applications, the 5-flute ST540 Stabilizer is the tool for you.

### 2. VERSATILITY + PERFORMANCE = COST SAVINGS

We are all looking for ways to reduce machining costs. In the fast-paced world of manufacturing, more and more machine shops are having to machine wider ranges of materials utilizing multiple square shoulder milling strategies. This poses a unique challenge for machine shops because not all end mills and materials are created equal. Some end mills are designed for only certain materials and others only work well in certain types of milling applications. Trying to have the right tool for every application and material can cause tooling costs to increase and fluctuate rapidly. Utilizing the ST540 product family helps reduce tooling costs and increase consistent performance due to its unique ability to work in all material types regardless of machining strategy.

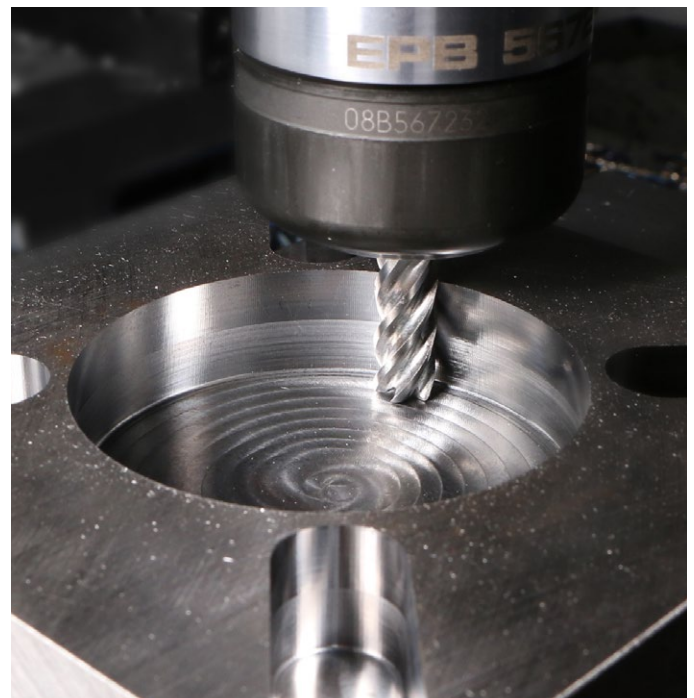
### 3. BALANCE IS KEY TO SUCCESS

Looking to find balance in your manufacturing processes? Utilizing the 5-flute ST540 Stabilizer product family is a great way to balance tooling cost, performance and versatility. Material type, machining strategy, machine setup and fixture rigidity all play a vital role in the machining process. The variable flute geometry coupled with varied helix angles and edge prep ensure consistent performance and reliable tool life. The break-up of chatter and harmonics results in less cutting edge failure due to micro chipping.

### 4. THE "BEST" ISN'T ALWAYS THE BEST

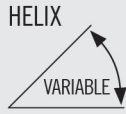
When choosing the proper end mill for your machining process, sometimes using the best of the best may not be the best choice. Most end mills designed for high-performance machining strategies require high amounts of horsepower, torque and rigidity. End mills specialized for advanced side milling strategies require newer CNC machining centers with advanced controls to keep up with rapidly changing feed rates and high spindle speeds.

If your machining centers lack any one of these requirements using a more versatile 5-flute geometry like the ST540 can offer high-performance solutions in less than optimal machining conditions. A tough carbide substrate coupled with an advanced coating and edge prep ensure that the ST540 product family maintains consistent quality by protecting the cutting edges from irregular machining conditions.

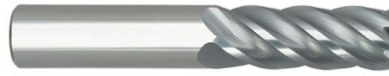


## STABILIZER™-STS540 & STS540M

SOLID CARBIDE



CENTER CUTTING

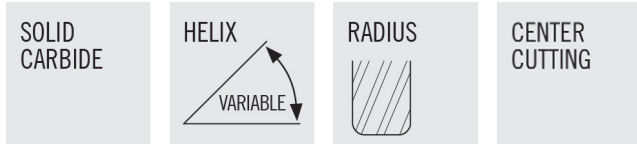


- Asymmetrical cutting edges
- US Patent # 6,991,409
- Ideal for profiling, high speed and trochoidal milling, stainless, titanium, high temperature alloys, carbon, alloy and tool steels
- Full Eccentric Relief

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- Tolerance Specs STS540 - Page 323
- Cutting Data STS540M - Page 56 - 59
- Tolerance Specs STS540M - Page 323

| PRODUCT NUMBER           | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|--------------------------|------------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">03257826</a> | STS540-0.125-D2-S.0-Z5 | 1/8       | 1/8       | 1/4           | 1-1/2          | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257828</a> | STS540-0.125-D4-S.0-Z5 | 1/8       | 1/8       | 1/2           | 1-1/2          | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257830</a> | STS540-0.156-F2-S.0-Z5 | 5/32      | 3/16      | 5/16          | 2              | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257832</a> | STS540-0.156-F4-S.0-Z5 | 5/32      | 3/16      | 9/16          | 2              | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257834</a> | STS540-0.188-D2-S.0-Z5 | 3/16      | 3/16      | 5/16          | 2              | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257836</a> | STS540-0.188-D3-S.0-Z5 | 3/16      | 3/16      | 9/16          | 2              | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257838</a> | STS540-0.219-F2-S.0-Z5 | 7/32      | 1/4       | 3/8           | 2              | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257840</a> | STS540-0.219-F3-S.0-Z5 | 7/32      | 1/4       | 3/4           | 2-1/2          | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257842</a> | STS540-0.250-D1-S.0-Z5 | 1/4       | 1/4       | 3/8           | 2              | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">N68625</a>   | STS540-0.250-D3-S.0-Z5 | 1/4       | 1/4       | 3/4           | 2-1/2          | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">N68626</a>   | STS540-0.313-D2-S.0-Z5 | 5/16      | 5/16      | 3/4           | 2-1/2          | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257857</a> | STS540-0.375-D1-S.0-Z5 | 3/8       | 3/8       | 1/2           | 2-1/2          | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">N68627</a>   | STS540-0.375-D2-S.0-Z5 | 3/8       | 3/8       | 7/8           | 2-1/2          | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257880</a> | STS540-0.500-D1-S.0-Z5 | 1/2       | 1/2       | 5/8           | 3              | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257881</a> | STS540-0.500-D1-S.3-Z5 | 1/2       | 1/2       | 5/8           | 3              | 5      | ALCRN   | WELDON      |
| <a href="#">03257889</a> | STS540-0.500-D2-S.0-Z5 | 1/2       | 1/2       | 1             | 3              | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257890</a> | STS540-0.500-D2-S.3-Z5 | 1/2       | 1/2       | 1             | 3              | 5      | ALCRN   | WELDON      |
| <a href="#">N68628</a>   | STS540-0.500-D3-S.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257919</a> | STS540-0.625-D1-S.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257920</a> | STS540-0.625-D1-S.3-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALCRN   | WELDON      |
| <a href="#">N68629</a>   | STS540-0.625-D2-S.0-Z5 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257927</a> | STS540-0.625-D4-S.0-Z5 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257929</a> | STS540-0.625-D5-S.0-Z5 | 5/8       | 5/8       | 2-1/8         | 4              | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257940</a> | STS540-0.750-D1-S.0-Z5 | 3/4       | 3/4       | 7/8           | 3              | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">N68630</a>   | STS540-0.750-D2-S.0-Z5 | 3/4       | 3/4       | 1-1/2         | 4              | 5      | ALCRN   | CYLINDRICAL |
| <b>METRIC - STS540M</b>  |                        |           |           |               |                |        |         |             |
| <a href="#">N68699</a>   | STS540M-060-D2-S.0-Z5  | 6mm       | 6mm       | 12mm          | 58mm           | 5      | ALTIN   | CYLINDRICAL |
| <a href="#">N68700</a>   | STS540M-080-D2-S.0-Z5  | 8mm       | 8mm       | 16mm          | 64mm           | 5      | ALTIN   | CYLINDRICAL |
| <a href="#">N68701</a>   | STS540M-100-D2-S.0-Z5  | 10mm      | 10mm      | 20mm          | 73mm           | 5      | ALTIN   | CYLINDRICAL |
| <a href="#">N68702</a>   | STS540M-120-D2-S.0-Z5  | 12mm      | 12mm      | 24mm          | 84mm           | 5      | ALTIN   | CYLINDRICAL |

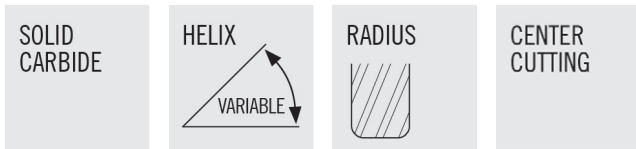
## STABILIZER™-STR540



- Asymmetrical flute geometry
- US Patent # 6,991,409
- Ideal for profiling, high speed and trochoidal milling, stainless, titanium, high temperature alloys, carbon, alloy and tool steels
- Full Eccentric Relief
- Cutting Data STR540 - Page 50 - 53
- Tolerance Specs STR540 - Page 323

| PRODUCT NUMBER           | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|--------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">03257827</a> | STR540-0.125-D2-R010.0-Z5 | 1/8       | 1/8       | 1/4           | 1-1/2          | 5      | ALCRN   | 0.010  | CYLINDRICAL |
| <a href="#">03257829</a> | STR540-0.125-D4-R010.0-Z5 | 1/8       | 1/8       | 1/2           | 1-1/2          | 5      | ALCRN   | 0.010  | CYLINDRICAL |
| <a href="#">03257831</a> | STR540-0.156-F2-R010.0-Z5 | 5/32      | 3/16      | 5/16          | 2              | 5      | ALCRN   | 0.010  | CYLINDRICAL |
| <a href="#">03257833</a> | STR540-0.156-F4-R010.0-Z5 | 5/32      | 3/16      | 9/16          | 2              | 5      | ALCRN   | 0.010  | CYLINDRICAL |
| <a href="#">03257835</a> | STR540-0.188-D2-R010.0-Z5 | 3/16      | 3/16      | 5/16          | 2              | 5      | ALCRN   | 0.010  | CYLINDRICAL |
| <a href="#">03257837</a> | STR540-0.188-D3-R010.0-Z5 | 3/16      | 3/16      | 9/16          | 2              | 5      | ALCRN   | 0.010  | CYLINDRICAL |
| <a href="#">03257839</a> | STR540-0.219-F2-R010.0-Z5 | 7/32      | 1/4       | 3/8           | 2              | 5      | ALCRN   | 0.010  | CYLINDRICAL |
| <a href="#">03257841</a> | STR540-0.219-F3-R010.0-Z5 | 7/32      | 1/4       | 3/4           | 2-1/2          | 5      | ALCRN   | 0.010  | CYLINDRICAL |
| <a href="#">03257843</a> | STR540-0.250-D1-R015.0-Z5 | 1/4       | 1/4       | 3/8           | 2              | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257844</a> | STR540-0.250-D1-R030.0-Z5 | 1/4       | 1/4       | 3/8           | 2              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257845</a> | STR540-0.250-D1-R045.0-Z5 | 1/4       | 1/4       | 3/8           | 2              | 5      | ALCRN   | 0.045  | CYLINDRICAL |
| <a href="#">N68632</a>   | STR540-0.250-D3-R015.0-Z5 | 1/4       | 1/4       | 3/4           | 2-1/2          | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">N68639</a>   | STR540-0.250-D3-R030.0-Z5 | 1/4       | 1/4       | 3/4           | 2-1/2          | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">N68646</a>   | STR540-0.250-D3-R045.0-Z5 | 1/4       | 1/4       | 3/4           | 2-1/2          | 5      | ALCRN   | 0.045  | CYLINDRICAL |
| <a href="#">03257846</a> | STR540-0.250-D4-R015.0-Z5 | 1/4       | 1/4       | 1             | 3              | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">N68633</a>   | STR540-0.313-D2-R015.0-Z5 | 5/16      | 5/16      | 3/4           | 2-1/2          | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257858</a> | STR540-0.375-D1-R015.0-Z5 | 3/8       | 3/8       | 1/2           | 2-1/2          | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257859</a> | STR540-0.375-D1-R030.0-Z5 | 3/8       | 3/8       | 1/2           | 2-1/2          | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257860</a> | STR540-0.375-D1-R045.0-Z5 | 3/8       | 3/8       | 1/2           | 2-1/2          | 5      | ALCRN   | 0.045  | CYLINDRICAL |
| <a href="#">N68634</a>   | STR540-0.375-D2-R015.0-Z5 | 3/8       | 3/8       | 7/8           | 2-1/2          | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">N68641</a>   | STR540-0.375-D2-R030.0-Z5 | 3/8       | 3/8       | 7/8           | 2-1/2          | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">N68648</a>   | STR540-0.375-D2-R045.0-Z5 | 3/8       | 3/8       | 7/8           | 2-1/2          | 5      | ALCRN   | 0.045  | CYLINDRICAL |
| <a href="#">03257861</a> | STR540-0.375-D2-R060.0-Z5 | 3/8       | 3/8       | 7/8           | 2-1/2          | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257862</a> | STR540-0.375-D3-R030.0-Z5 | 3/8       | 3/8       | 1-1/4         | 3              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257863</a> | STR540-0.375-D4-R030.0-Z5 | 3/8       | 3/8       | 1-1/2         | 4              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257882</a> | STR540-0.500-D1-R015.0-Z5 | 1/2       | 1/2       | 5/8           | 3              | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257883</a> | STR540-0.500-D1-R030.0-Z5 | 1/2       | 1/2       | 5/8           | 3              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257884</a> | STR540-0.500-D1-R030.3-Z5 | 1/2       | 1/2       | 5/8           | 3              | 5      | ALCRN   | 0.030  | WELDON      |
| <a href="#">03257885</a> | STR540-0.500-D1-R045.0-Z5 | 1/2       | 1/2       | 5/8           | 3              | 5      | ALCRN   | 0.045  | CYLINDRICAL |
| <a href="#">03257886</a> | STR540-0.500-D1-R060.0-Z5 | 1/2       | 1/2       | 5/8           | 3              | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257887</a> | STR540-0.500-D1-R060.3-Z5 | 1/2       | 1/2       | 5/8           | 3              | 5      | ALCRN   | 0.060  | WELDON      |
| <a href="#">03257888</a> | STR540-0.500-D1-R120.0-Z5 | 1/2       | 1/2       | 5/8           | 3              | 5      | ALCRN   | 0.120  | CYLINDRICAL |
| <a href="#">03257891</a> | STR540-0.500-D2-R015.0-Z5 | 1/2       | 1/2       | 1             | 3              | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257892</a> | STR540-0.500-D2-R030.0-Z5 | 1/2       | 1/2       | 1             | 3              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257893</a> | STR540-0.500-D2-R030.3-Z5 | 1/2       | 1/2       | 1             | 3              | 5      | ALCRN   | 0.030  | WELDON      |
| <a href="#">03257894</a> | STR540-0.500-D2-R060.0-Z5 | 1/2       | 1/2       | 1             | 3              | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257895</a> | STR540-0.500-D2-R060.3-Z5 | 1/2       | 1/2       | 1             | 3              | 5      | ALCRN   | 0.060  | WELDON      |

## STABILIZER™-STR540 (CON'T)



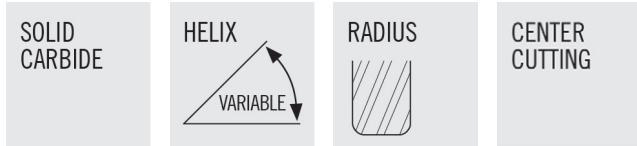
- Asymmetrical flute geometry
- US Patent # 6,991,409
- Ideal for profiling, high speed and trochoidal milling, stainless, titanium, high temperature alloys, carbon, alloy and tool steels
- Full Eccentric Relief

- Cutting Data STR540 - Page 50 - 53
- Tolerance Specs STR540 - Page 323

| PRODUCT NUMBER           | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|--------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N68635</a>   | STR540-0.500-D3-R015.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">N68642</a>   | STR540-0.500-D3-R030.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">N68649</a>   | STR540-0.500-D3-R045.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALCRN   | 0.045  | CYLINDRICAL |
| <a href="#">N68653</a>   | STR540-0.500-D3-R060.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">N68657</a>   | STR540-0.500-D3-R090.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALCRN   | 0.090  | CYLINDRICAL |
| <a href="#">N68661</a>   | STR540-0.500-D3-R125.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALCRN   | 0.125  | CYLINDRICAL |
| <a href="#">03257896</a> | STR540-0.500-D4-R030.0-Z5 | 1/2       | 1/2       | 1-5/8         | 4              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257897</a> | STR540-0.500-D4-R030.3-Z5 | 1/2       | 1/2       | 1-5/8         | 4              | 5      | ALCRN   | 0.030  | WELDON      |
| <a href="#">03257898</a> | STR540-0.500-D5-R030.0-Z5 | 1/2       | 1/2       | 2             | 4              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257899</a> | STR540-0.500-D5-R030.3-Z5 | 1/2       | 1/2       | 2             | 4              | 5      | ALCRN   | 0.030  | WELDON      |
| <a href="#">03257921</a> | STR540-0.625-D1-R015.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257922</a> | STR540-0.625-D1-R030.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257923</a> | STR540-0.625-D1-R030.3-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALCRN   | 0.030  | WELDON      |
| <a href="#">03257924</a> | STR540-0.625-D1-R060.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257925</a> | STR540-0.625-D1-R060.3-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALCRN   | 0.060  | WELDON      |
| <a href="#">03257926</a> | STR540-0.625-D1-R120.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALCRN   | 0.120  | CYLINDRICAL |
| <a href="#">N68636</a>   | STR540-0.625-D2-R015.0-Z5 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">N68643</a>   | STR540-0.625-D2-R030.0-Z5 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">N68650</a>   | STR540-0.625-D2-R045.0-Z5 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 5      | ALCRN   | 0.045  | CYLINDRICAL |
| <a href="#">N68654</a>   | STR540-0.625-D2-R060.0-Z5 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">N68658</a>   | STR540-0.625-D2-R090.0-Z5 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 5      | ALCRN   | 0.090  | CYLINDRICAL |
| <a href="#">N68662</a>   | STR540-0.625-D2-R125.0-Z5 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 5      | ALCRN   | 0.125  | CYLINDRICAL |
| <a href="#">03257928</a> | STR540-0.625-D4-R030.3-Z5 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 5      | ALCRN   | 0.030  | WELDON      |
| <a href="#">03257930</a> | STR540-0.625-D5-R030.3-Z5 | 5/8       | 5/8       | 2-1/8         | 4              | 5      | ALCRN   | 0.030  | WELDON      |
| <a href="#">03257941</a> | STR540-0.750-D1-R030.0-Z5 | 3/4       | 3/4       | 7/8           | 3              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257942</a> | STR540-0.750-D1-R060.0-Z5 | 3/4       | 3/4       | 7/8           | 3              | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257943</a> | STR540-0.750-D1-R120.0-Z5 | 3/4       | 3/4       | 7/8           | 3              | 5      | ALCRN   | 0.120  | CYLINDRICAL |
| <a href="#">N68644</a>   | STR540-0.750-D2-R030.0-Z5 | 3/4       | 3/4       | 1-1/2         | 4              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">N68655</a>   | STR540-0.750-D2-R060.0-Z5 | 3/4       | 3/4       | 1-1/2         | 4              | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">N68659</a>   | STR540-0.750-D2-R090.0-Z5 | 3/4       | 3/4       | 1-1/2         | 4              | 5      | ALCRN   | 0.090  | CYLINDRICAL |
| <a href="#">N68663</a>   | STR540-0.750-D2-R125.0-Z5 | 3/4       | 3/4       | 1-1/2         | 4              | 5      | ALCRN   | 0.125  | CYLINDRICAL |
| <a href="#">03257944</a> | STR540-0.750-D3-R030.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257945</a> | STR540-0.750-D3-R030.3-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALCRN   | 0.030  | WELDON      |
| <a href="#">03257946</a> | STR540-0.750-D4-R030.0-Z5 | 3/4       | 3/4       | 2-1/4         | 5              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257947</a> | STR540-0.750-D5-R030.0-Z5 | 3/4       | 3/4       | 2-3/4         | 5              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">N68638</a>   | STR540-1.000-D2-R015.0-Z5 | 1         | 1         | 1-3/4         | 4              | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">N68645</a>   | STR540-1.000-D2-R030.0-Z5 | 1         | 1         | 1-3/4         | 4              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">N68656</a>   | STR540-1.000-D2-R060.0-Z5 | 1         | 1         | 1-3/4         | 4              | 5      | ALCRN   | 0.060  | CYLINDRICAL |



## STABILIZER™-STR540M

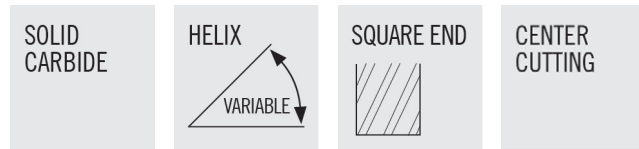


- Asymmetrical flute geometry
- US Patent # 6,991,409
- Ideal for profiling, high speed and trochoidal milling, stainless, titanium, high temperature alloys, carbon, alloy and tool steels
- Full Eccentric Relief

- Cutting Data STR540M - Page 56 - 59
- Tolerance Specs STR540M - Page 323

| PRODUCT NUMBER          | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|-------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <b>METRIC - STR540M</b> |                          |           |           |               |                |        |         |        |             |
| <a href="#">N68717</a>  | STR540M-060-D2-R050.0-Z5 | 6mm       | 6mm       | 12mm          | 58mm           | 5      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N68718</a>  | STR540M-080-D2-R050.0-Z5 | 8mm       | 8mm       | 16mm          | 64mm           | 5      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N68719</a>  | STR540M-100-D2-R050.0-Z5 | 10mm      | 10mm      | 20mm          | 73mm           | 5      | ALTIN   | 0.50mm | CYLINDRICAL |
| <a href="#">N68720</a>  | STR540M-120-D2-R075.0-Z5 | 12mm      | 12mm      | 24mm          | 84mm           | 5      | ALTIN   | 0.75mm | CYLINDRICAL |
| <a href="#">N68722</a>  | STR540M-160-D2-R075.0-Z5 | 16mm      | 16mm      | 32mm          | 93mm           | 5      | ALTIN   | 0.75mm | CYLINDRICAL |

## STABILIZER™-STSN540

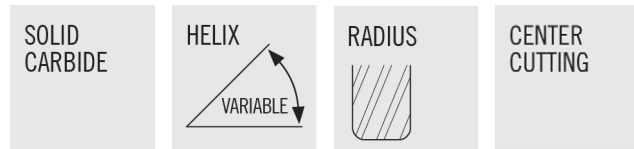


- Asymmetrical cutting edges
- US Patent # 6,991,409
- Ideal for profiling, high speed and trochoidal milling, stainless, titanium, high temperature alloys, carbon, alloy and tool steels
- Full Eccentric Relief

- Cutting Data STSN540 - Page 50 - 55
- Tolerance Specs STSN540 - Page 323

| PRODUCT NUMBER           | DESCRIPTION             | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | SHANK TYPE  |
|--------------------------|-------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|-------------|
| <a href="#">03257848</a> | STSN540-0.250-E4-S.0-Z5 | 1/4       | 1/4       | 1/2           | 3              | 0.240    | 1     | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257851</a> | STSN540-0.250-E5-S.0-Z5 | 1/4       | 1/4       | 1/2           | 4              | 0.240    | 1-1/4 | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257854</a> | STSN540-0.250-E8-S.0-Z5 | 1/4       | 1/4       | 1/2           | 4              | 0.240    | 2-1/8 | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257865</a> | STSN540-0.375-E4-S.0-Z5 | 3/8       | 3/8       | 3/4           | 3              | 0.360    | 1-1/2 | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257870</a> | STSN540-0.375-E5-S.0-Z5 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-1/8 | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257875</a> | STSN540-0.375-E8-S.0-Z5 | 3/8       | 3/8       | 1/2           | 6              | 0.360    | 3-1/8 | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257904</a> | STSN540-0.500-E4-S.0-Z5 | 1/2       | 1/2       | 1             | 4              | 0.480    | 2     | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257909</a> | STSN540-0.500-E6-S.0-Z5 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3-1/8 | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257914</a> | STSN540-0.500-E8-S.0-Z5 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257934</a> | STSN540-0.625-E4-S.0-Z5 | 5/8       | 5/8       | 1-1/4         | 5              | 0.600    | 2-1/2 | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257937</a> | STSN540-0.625-E5-S.0-Z5 | 5/8       | 5/8       | 3/4           | 6              | 0.600    | 3-3/8 | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257951</a> | STSN540-0.750-E3-S.0-Z5 | 3/4       | 3/4       | 1-1/8         | 5              | 0.720    | 2-1/2 | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257955</a> | STSN540-0.750-E4-S.0-Z5 | 3/4       | 3/4       | 1-1/2         | 5              | 0.720    | 3     | 5      | ALCRN   | CYLINDRICAL |
| <a href="#">03257959</a> | STSN540-0.750-E5-S.0-Z5 | 3/4       | 3/4       | 1-1/8         | 6              | 0.720    | 4-1/8 | 5      | ALCRN   | CYLINDRICAL |

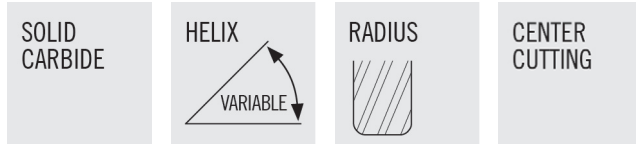
## STABILIZER™ - STRN540



- Asymmetrical cutting edges
- US Patent # 6,991,409
- Ideal for profiling, high speed and trochoidal milling, stainless, titanium, high temperature alloys, carbon, alloy and tool steels
- Full Eccentric Relief
- Cutting Data STRN540 - Page 50 - 55
- Tolerance Specs STRN540 - Page 323

| PRODUCT NUMBER           | DESCRIPTION                | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|--------------------------|----------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|--------|-------------|
| <a href="#">03257849</a> | STRN540-0.250-E4-R015.0-Z5 | 1/4       | 1/4       | 1/2           | 3              | 0.240    | 1     | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257850</a> | STRN540-0.250-E4-R030.0-Z5 | 1/4       | 1/4       | 1/2           | 3              | 0.240    | 1     | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257852</a> | STRN540-0.250-E5-R015.0-Z5 | 1/4       | 1/4       | 1/2           | 4              | 0.240    | 1-1/4 | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257853</a> | STRN540-0.250-E5-R030.0-Z5 | 1/4       | 1/4       | 1/2           | 4              | 0.240    | 1-1/4 | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257855</a> | STRN540-0.250-E8-R015.0-Z5 | 1/4       | 1/4       | 1/2           | 4              | 0.240    | 2-1/8 | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257856</a> | STRN540-0.250-E8-R030.0-Z5 | 1/4       | 1/4       | 1/2           | 4              | 0.240    | 2-1/8 | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257866</a> | STRN540-0.375-E4-R015.0-Z5 | 3/8       | 3/8       | 3/4           | 3              | 0.360    | 1-1/2 | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257867</a> | STRN540-0.375-E4-R030.0-Z5 | 3/8       | 3/8       | 3/4           | 3              | 0.360    | 1-1/2 | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257868</a> | STRN540-0.375-E4-R045.0-Z5 | 3/8       | 3/8       | 3/4           | 3              | 0.360    | 1-1/2 | 5      | ALCRN   | 0.045  | CYLINDRICAL |
| <a href="#">03257869</a> | STRN540-0.375-E4-R060.0-Z5 | 3/8       | 3/8       | 3/4           | 3              | 0.360    | 1-1/2 | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257871</a> | STRN540-0.375-E5-R015.0-Z5 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-1/8 | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257872</a> | STRN540-0.375-E5-R030.0-Z5 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-1/8 | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257873</a> | STRN540-0.375-E5-R045.0-Z5 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-1/8 | 5      | ALCRN   | 0.045  | CYLINDRICAL |
| <a href="#">03257874</a> | STRN540-0.375-E5-R060.0-Z5 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-1/8 | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257876</a> | STRN540-0.375-E8-R015.0-Z5 | 3/8       | 3/8       | 1/2           | 6              | 0.360    | 3-1/8 | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257877</a> | STRN540-0.375-E8-R030.0-Z5 | 3/8       | 3/8       | 1/2           | 6              | 0.360    | 3-1/8 | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257878</a> | STRN540-0.375-E8-R045.0-Z5 | 3/8       | 3/8       | 1/2           | 6              | 0.360    | 3-1/8 | 5      | ALCRN   | 0.045  | CYLINDRICAL |
| <a href="#">03257879</a> | STRN540-0.375-E8-R060.0-Z5 | 3/8       | 3/8       | 1/2           | 6              | 0.360    | 3-1/8 | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257910</a> | STRN540-0.500-E6-R015.0-Z5 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3-1/8 | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257911</a> | STRN540-0.500-E6-R030.0-Z5 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3-1/8 | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257912</a> | STRN540-0.500-E6-R060.0-Z5 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3-1/8 | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257913</a> | STRN540-0.500-E6-R120.0-Z5 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3-1/8 | 5      | ALCRN   | 0.120  | CYLINDRICAL |
| <a href="#">03257915</a> | STRN540-0.500-E8-R015.0-Z5 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257916</a> | STRN540-0.500-E8-R030.0-Z5 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257917</a> | STRN540-0.500-E8-R060.0-Z5 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257918</a> | STRN540-0.500-E8-R120.0-Z5 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 5      | ALCRN   | 0.120  | CYLINDRICAL |
| <a href="#">03257905</a> | STRN540-0.500-E4-R015.0-Z5 | 1/2       | 1/2       | 1             | 4              | 0.480    | 2     | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257906</a> | STRN540-0.500-E4-R030.0-Z5 | 1/2       | 1/2       | 1             | 4              | 0.480    | 2     | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257907</a> | STRN540-0.500-E4-R060.0-Z5 | 1/2       | 1/2       | 1             | 4              | 0.480    | 2     | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257908</a> | STRN540-0.500-E4-R120.0-Z5 | 1/2       | 1/2       | 1             | 4              | 0.480    | 2     | 5      | ALCRN   | 0.120  | CYLINDRICAL |
| <a href="#">03257938</a> | STRN540-0.625-E5-R030.0-Z5 | 5/8       | 5/8       | 3/4           | 6              | 0.060    | 3-3/8 | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257939</a> | STRN540-0.625-E5-R060.0-Z5 | 5/8       | 5/8       | 3/4           | 6              | 0.060    | 3-3/8 | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257935</a> | STRN540-0.625-E4-R030.0-Z5 | 5/8       | 5/8       | 1-1/4         | 5              | 0.060    | 2-1/2 | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257936</a> | STRN540-0.625-E4-R060.0-Z5 | 5/8       | 5/8       | 1-1/4         | 5              | 0.060    | 2-1/2 | 5      | ALCRN   | 0.060  | CYLINDRICAL |

## STABILIZER™ - STRN540 (CON'T)



- Asymmetrical cutting edges
- US Patent # 6,991,409
- Ideal for profiling, high speed and trochoidal milling, stainless, titanium, high temperature alloys, carbon, alloy and tool steels
- Full Eccentric Relief
- Cutting Data STRN540 - Page 50 - 55
- Tolerance Specs STRN540 - Page 323

| PRODUCT NUMBER           | DESCRIPTION                | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|--------------------------|----------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|--------|-------------|
| <a href="#">03257952</a> | STRN540-0.750-E3-R030.0-Z5 | 3/4       | 3/4       | 1-1/8         | 5              | 0.720    | 2-1/2 | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257953</a> | STRN540-0.750-E3-R060.0-Z5 | 3/4       | 3/4       | 1-1/8         | 5              | 0.720    | 2-1/2 | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257954</a> | STRN540-0.750-E3-R120.0-Z5 | 3/4       | 3/4       | 1-1/8         | 5              | 0.720    | 2-1/2 | 5      | ALCRN   | 0.120  | CYLINDRICAL |
| <a href="#">03257960</a> | STRN540-0.750-E5-R030.0-Z5 | 3/4       | 3/4       | 1-1/8         | 6              | 0.720    | 4-1/8 | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257961</a> | STRN540-0.750-E5-R060.0-Z5 | 3/4       | 3/4       | 1-1/8         | 6              | 0.720    | 4-1/8 | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257962</a> | STRN540-0.750-E5-R120.0-Z5 | 3/4       | 3/4       | 1-1/8         | 6              | 0.720    | 4-1/8 | 5      | ALCRN   | 0.120  | CYLINDRICAL |
| <a href="#">03257956</a> | STRN540-0.750-E4-R030.0-Z5 | 3/4       | 3/4       | 1-1/2         | 5              | 0.720    | 3     | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257957</a> | STRN540-0.750-E4-R060.0-Z5 | 3/4       | 3/4       | 1-1/2         | 5              | 0.720    | 3     | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257958</a> | STRN540-0.750-E4-R120.0-Z5 | 3/4       | 3/4       | 1-1/2         | 5              | 0.720    | 3     | 5      | ALCRN   | 0.120  | CYLINDRICAL |
| <a href="#">03257963</a> | STRN540-1.000-E3-R030.0-Z5 | 1         | 1         | 1-1/4         | 6              | 0.960    | 3-1/2 | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257964</a> | STRN540-1.000-E3-R060.0-Z5 | 1         | 1         | 1-1/4         | 6              | 0.960    | 3-1/2 | 5      | ALCRN   | 0.060  | CYLINDRICAL |
| <a href="#">03257965</a> | STRN540-1.000-E3-R120.0-Z5 | 1         | 1         | 1-1/4         | 6              | 0.960    | 3-1/2 | 5      | ALCRN   | 0.120  | CYLINDRICAL |

## STABILIZER™ - STRCS540



- Asymmetrical cutting edges
- US Patent # 6,991,409
- Ideal for profiling, high speed and trochoidal milling, stainless, titanium, high temperature alloys, carbon, alloy and tool steels
- Full Eccentric Relief
- Advanced chip splitter design for increased chip control and management
- Cutting Data STRCS540 - Page 60
- Tolerance Specs STRCS540 - Page 323

| PRODUCT NUMBER           | DESCRIPTION                 | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|--------------------------|-----------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">03257847</a> | STRCS540-0.250-D3-R015.0-Z5 | 1/4       | 1/4       | 3/4           | 2-1/2          | 5      | ALCRN   | 0.015  | CYLINDRICAL |
| <a href="#">03257864</a> | STRCS540-0.375-D3-R030.0-Z5 | 3/8       | 3/8       | 1-1/4         | 3              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257900</a> | STRCS540-0.500-D3-R030.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257901</a> | STRCS540-0.500-D3-R030.3-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALCRN   | 0.030  | WELDON      |
| <a href="#">03257902</a> | STRCS540-0.500-D4-R030.0-Z5 | 1/2       | 1/2       | 1-5/8         | 4              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257903</a> | STRCS540-0.500-D4-R030.3-Z5 | 1/2       | 1/2       | 1-5/8         | 4              | 5      | ALCRN   | 0.030  | WELDON      |
| <a href="#">03257931</a> | STRCS540-0.625-D3-R030.0-Z5 | 5/8       | 5/8       | 1-3/8         | 3-1/2          | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257932</a> | STRCS540-0.625-D5-R030.0-Z5 | 5/8       | 5/8       | 2-1/8         | 4              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257933</a> | STRCS540-0.625-D5-R030.3-Z5 | 5/8       | 5/8       | 2-1/8         | 4              | 5      | ALCRN   | 0.030  | WELDON      |
| <a href="#">03257948</a> | STRCS540-0.750-D3-R030.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALCRN   | 0.030  | CYLINDRICAL |
| <a href="#">03257949</a> | STRCS540-0.750-D3-R030.3-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALCRN   | 0.030  | WELDON      |
| <a href="#">03257950</a> | STRCS540-0.750-D4-R030.0-Z5 | 3/4       | 3/4       | 2-1/4         | 5              | 5      | ALCRN   | 0.030  | CYLINDRICAL |

## STS430.2, STR430.2, STB430.2 - SLOTING - INCH - START VALUES

| ISO GROUP | SMG     | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |           | SLOTING   |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
|-----------|---------|---------------------------------------|---------------------------------------|---------------------------|-----------|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|           |         |                                       |                                       |                           |           | Zn = 4    |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
|           |         |                                       |                                       |                           |           | 1/8       | 5/32   | 3/16   | 7/32   | 1/4    | 9/32   | 5/16   | 3/8    | 7/16   | 1/2    | 5/8    | 3/4    | 7/8    | 1      |        |
| P         | E 1-2   | 1.00                                  | 1.00                                  | 425                       | n [min-1] | 12988     | 10390  | 8659   | 7422   | 6494   | 5772   | 5195   | 4329   | 3711   | 3247   | 2598   | 2165   | 1855   | 1624   |        |
|           |         |                                       |                                       |                           | fz [in]   | 0.0008    | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0018 | 0.0020 | 0.0024 | 0.0028 | 0.0032 | 0.0039 | 0.0047 | 0.0055 | 0.0063 |        |
|           | E 3-4   | 1.00                                  | 1.00                                  | 400                       | n [min-1] | 12224     | 9779   | 8149   | 6985   | 6112   | 5433   | 4890   | 4075   | 3493   | 3056   | 2445   | 2037   | 1746   | 1528   |        |
|           |         |                                       |                                       |                           | fz [in]   | 0.0007    | 0.0009 | 0.0011 | 0.0012 | 0.0014 | 0.0016 | 0.0018 | 0.0021 | 0.0025 | 0.0029 | 0.0036 | 0.0043 | 0.0050 | 0.0057 |        |
|           | E 5-6   | 1.00                                  | 1.00                                  | 350                       | n [min-1] | 10696     | 8557   | 7131   | 6112   | 5348   | 4754   | 4278   | 3565   | 3056   | 2674   | 2139   | 1783   | 1528   | 1337   |        |
|           |         |                                       |                                       |                           | fz [in]   | 0.0006    | 0.0008 | 0.0009 | 0.0011 | 0.0013 | 0.0014 | 0.0016 | 0.0019 | 0.0022 | 0.0025 | 0.0031 | 0.0038 | 0.0044 | 0.0050 |        |
| K         | E 12-13 | 1.00                                  | 1.00                                  | 350                       | n [min-1] | 10696     | 8557   | 7131   | 6112   | 5348   | 4754   | 4278   | 3565   | 3056   | 2674   | 2139   | 1783   | 1528   | 1337   |        |
|           |         |                                       |                                       |                           | fz [in]   | 0.0007    | 0.0009 | 0.0010 | 0.0012 | 0.0014 | 0.0015 | 0.0017 | 0.0021 | 0.0024 | 0.0028 | 0.0034 | 0.0041 | 0.0048 | 0.0055 |        |
|           | E 14-15 | 1.00                                  | 1.00                                  | 325                       | n [min-1] | 9932      | 7946   | 6621   | 5675   | 4966   | 4414   | 3973   | 3311   | 2838   | 2483   | 1986   | 1655   | 1419   | 1242   |        |
|           |         |                                       |                                       |                           | fz [in]   | 0.0006    | 0.0007 | 0.0008 | 0.0010 | 0.0011 | 0.0013 | 0.0014 | 0.0017 | 0.0020 | 0.0023 | 0.0028 | 0.0034 | 0.0039 | 0.0045 |        |
|           | N       | 18                                    | 1.00                                  | 1.00                      | 500       | n [min-1] | 15280  | 12224  | 10187  | 8731   | 7640   | 6791   | 6112   | 5093   | 4366   | 3820   | 3056   | 2547   | 2183   | 1910   |
|           |         |                                       |                                       |                           |           | fz [in]   | 0.0005 | 0.0006 | 0.0008 | 0.0009 | 0.0010 | 0.0011 | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0025 | 0.0030 | 0.0035 | 0.0040 |

## STS430.2, STR430.2, STB430.2 - SIDE MILLING/ROUGHING - INCH - START VALUES

| ISO GROUP | SMG     | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |           | SIDE MILLING ROUGHING |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
|-----------|---------|---------------------------------------|---------------------------------------|---------------------------|-----------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|           |         |                                       |                                       |                           |           | Zn = 4                |        |        |        |        |        |        |        |        |        |        |        |        |        |        |
|           |         |                                       |                                       |                           |           | 1/8                   | 5/32   | 3/16   | 7/32   | 1/4    | 9/32   | 5/16   | 3/8    | 7/16   | 1/2    | 5/8    | 3/4    | 7/8    | 1      |        |
| P         | E 1-2   | 1.50                                  | 0.25                                  | 425                       | n [min-1] | 12988                 | 10390  | 8659   | 7422   | 6494   | 5772   | 5195   | 4329   | 3711   | 3247   | 2598   | 2165   | 1855   | 1624   |        |
|           |         |                                       |                                       |                           | fz [in]   | 0.0009                | 0.0011 | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0022 | 0.0026 | 0.0031 | 0.0035 | 0.0044 | 0.0053 | 0.0061 | 0.0070 |        |
|           | E 3-4   | 1.50                                  | 0.25                                  | 400                       | n [min-1] | 12224                 | 9779   | 8149   | 6985   | 6112   | 5433   | 4890   | 4075   | 3493   | 3056   | 2445   | 2037   | 1746   | 1528   |        |
|           |         |                                       |                                       |                           | fz [in]   | 0.0008                | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0018 | 0.0020 | 0.0024 | 0.0028 | 0.0032 | 0.0040 | 0.0048 | 0.0056 | 0.0064 |        |
|           | E 5-6   | 1.00                                  | 0.25                                  | 350                       | n [min-1] | 10696                 | 8557   | 7131   | 6112   | 5348   | 4754   | 4278   | 3565   | 3056   | 2674   | 2139   | 1783   | 1528   | 1337   |        |
|           |         |                                       |                                       |                           | fz [in]   | 0.0008                | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0017 | 0.0019 | 0.0023 | 0.0026 | 0.0030 | 0.0038 | 0.0045 | 0.0053 | 0.0060 |        |
| K         | E 12-13 | 1.50                                  | 0.25                                  | 350                       | n [min-1] | 10696                 | 8557   | 7131   | 6112   | 5348   | 4754   | 4278   | 3565   | 3056   | 2674   | 2139   | 1783   | 1528   | 1337   |        |
|           |         |                                       |                                       |                           | fz [in]   | 0.0008                | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0017 | 0.0019 | 0.0023 | 0.0026 | 0.0030 | 0.0038 | 0.0045 | 0.0053 | 0.0060 |        |
|           | E 14-15 | 1.00                                  | 0.25                                  | 325                       | n [min-1] | 9932                  | 7946   | 6621   | 5675   | 4966   | 4414   | 3973   | 3311   | 2838   | 2483   | 1986   | 1655   | 1419   | 1242   |        |
|           |         |                                       |                                       |                           | fz [in]   | 0.0006                | 0.0008 | 0.0009 | 0.0011 | 0.0013 | 0.0014 | 0.0016 | 0.0019 | 0.0022 | 0.0025 | 0.0031 | 0.0038 | 0.0044 | 0.0050 |        |
|           | N       | 18                                    | 1.50                                  | 0.25                      | 500       | n [min-1]             | 15280  | 12224  | 10187  | 8731   | 7640   | 6791   | 6112   | 5093   | 4366   | 3820   | 3056   | 2547   | 2183   | 1910   |
|           |         |                                       |                                       |                           |           | fz [in]               | 0.0006 | 0.0007 | 0.0008 | 0.0010 | 0.0011 | 0.0012 | 0.0014 | 0.0017 | 0.0019 | 0.0022 | 0.0028 | 0.0033 | 0.0039 | 0.0044 |



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SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
vf [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

## STS430M.2, STR430M.2, STB430M.2 - SLOTING - METRIC - START VALUES

| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) | SLOTING     |        |        |        |        |        |        |        |        |        |        |        |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|           |           |                                       |                                       |                           | Zn = 4      |        |        |        |        |        |        |        |        |        |        |        |
|           |           |                                       |                                       |                           | 3           | 4      | 5      | 6      | 8      | 10     | 12     | 14     | 16     | 20     | 25     |        |
| P         | E 1 - 2   | 1.00                                  | 1.00                                  | 425                       | n [min-1]   | 13790  | 10350  | 8280   | 6900   | 5170   | 4140   | 3450   | 2960   | 2590   | 2070   | 1660   |
|           |           |                                       |                                       |                           | fz [in]     | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0035 | 0.0040 | 0.0050 | 0.0062 |
|           |           |                                       |                                       |                           | vf [in/min] | 41.0   | 41.1   | 41.1   | 41.1   | 41.0   | 41.1   | 41.1   | 41.1   | 41.1   | 41.1   | 41.1   |
|           | E 3 - 4   | 1.00                                  | 1.00                                  | 400                       | n [min-1]   | 12940  | 9710   | 7770   | 6470   | 4850   | 3880   | 3240   | 2770   | 2430   | 1940   | 1550   |
|           |           |                                       |                                       |                           | fz [in]     | 0.0007 | 0.0009 | 0.0011 | 0.0013 | 0.0018 | 0.0022 | 0.0027 | 0.0031 | 0.0036 | 0.0045 | 0.0056 |
|           |           |                                       |                                       |                           | vf [in/min] | 34.8   | 34.9   | 34.9   | 34.8   | 34.8   | 34.8   | 34.9   | 34.8   | 34.9   | 34.8   | 34.9   |
|           | E 5 - 6   | 1.00                                  | 1.00                                  | 350                       | n [min-1]   | 11350  | 8510   | 6810   | 5680   | 4260   | 3410   | 2840   | 2430   | 2130   | 1700   | 1360   |
|           |           |                                       |                                       |                           | fz [in]     | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0028 | 0.0031 | 0.0039 | 0.0049 |
|           |           |                                       |                                       |                           | vf [in/min] | 26.8   | 26.8   | 26.8   | 26.8   | 26.8   | 26.9   | 26.8   | 26.8   | 26.8   | 26.8   | 26.8   |
| K         | E 12 - 13 | 1.00                                  | 1.00                                  | 350                       | n [min-1]   | 11350  | 8510   | 6810   | 5680   | 4260   | 3410   | 2840   | 2430   | 2130   | 1700   | 1360   |
|           |           |                                       |                                       |                           | fz [in]     | 0.0006 | 0.0009 | 0.0011 | 0.0013 | 0.0017 | 0.0022 | 0.0026 | 0.0030 | 0.0035 | 0.0043 | 0.0054 |
|           |           |                                       |                                       |                           | vf [in/min] | 29.5   | 29.5   | 29.5   | 29.5   | 29.5   | 29.5   | 29.5   | 29.5   | 29.5   | 29.4   | 29.4   |
|           | E 14 - 15 | 1.00                                  | 1.00                                  | 325                       | n [min-1]   | 10500  | 7880   | 6300   | 5250   | 3940   | 3150   | 2630   | 2250   | 1970   | 1580   | 1260   |
|           |           |                                       |                                       |                           | fz [in]     | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 | 0.0044 |
|           |           |                                       |                                       |                           | vf [in/min] | 22.3   | 22.3   | 22.3   | 22.3   | 22.3   | 22.4   | 22.3   | 22.3   | 22.4   | 22.3   | 22.4   |
| N         | 18        | 1.00                                  | 1.00                                  | 500                       | n [min-1]   | 16130  | 12100  | 9680   | 8060   | 6050   | 4840   | 4030   | 3460   | 3020   | 2420   | 1940   |
|           |           |                                       |                                       |                           | fz [in]     | 0.0005 | 0.0006 | 0.0008 | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0022 | 0.0025 | 0.0031 | 0.0039 |
|           |           |                                       |                                       | 400 - 600                 | vf [in/min] | 30.5   | 30.5   | 30.5   | 30.5   | 30.5   | 30.5   | 30.5   | 30.5   | 30.4   | 30.5   | 30.6   |

## STS430M.2, STR430M.2, STB430M.2 - SIDE MILLING/ROUGHING - METRIC - START VALUES

| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | V <sub>c</sub> (sf / min) | SIDE MILLING ROUGHING |        |        |        |        |        |        |        |        |        |        |        |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|           |           |                                       |                                       |                           | Zn = 4                |        |        |        |        |        |        |        |        |        |        |        |
|           |           |                                       |                                       |                           | 3                     | 4      | 5      | 6      | 8      | 10     | 12     | 14     | 16     | 20     | 25     |        |
| P         | E 1 - 2   | 1.50                                  | 0.25                                  | 425                       | n [min-1]             | 13790  | 10350  | 8280   | 6900   | 5170   | 4140   | 3450   | 2960   | 2590   | 2070   | 1660   |
|           |           |                                       |                                       |                           | fz [in]               | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 | 0.0028 | 0.0033 | 0.0039 | 0.0044 | 0.0055 | 0.0069 |
|           |           |                                       |                                       |                           | vf [in/min]           | 45.6   | 45.6   | 45.6   | 45.6   | 45.6   | 45.6   | 45.7   | 45.7   | 45.7   | 45.6   | 45.7   |
|           | E 3 - 4   | 1.50                                  | 0.25                                  | 400                       | n [min-1]             | 12940  | 9710   | 7770   | 6470   | 4850   | 3880   | 3240   | 2770   | 2430   | 1940   | 1550   |
|           |           |                                       |                                       |                           | fz [in]               | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0035 | 0.0040 | 0.0050 | 0.0063 |
|           |           |                                       |                                       |                           | vf [in/min]           | 39.1   | 39.1   | 39.2   | 39.1   | 39.1   | 39.1   | 39.2   | 39.1   | 39.2   | 39.1   | 39.1   |
|           | E 5 - 6   | 1.00                                  | 0.25                                  | 350                       | n [min-1]             | 11350  | 8510   | 6810   | 5680   | 4260   | 3410   | 2840   | 2430   | 2130   | 1700   | 1360   |
|           |           |                                       |                                       |                           | fz [in]               | 0.0007 | 0.0009 | 0.0012 | 0.0014 | 0.0019 | 0.0024 | 0.0028 | 0.0033 | 0.0038 | 0.0047 | 0.0059 |
|           |           |                                       |                                       |                           | vf [in/min]           | 32.2   | 32.2   | 32.2   | 32.2   | 32.2   | 32.2   | 32.2   | 32.1   | 32.2   | 32.1   | 32.1   |
| K         | E 12 - 13 | 1.50                                  | 0.25                                  | 350                       | n [min-1]             | 11350  | 8510   | 6810   | 5680   | 4260   | 3410   | 2840   | 2430   | 2130   | 1700   | 1360   |
|           |           |                                       |                                       |                           | fz [in]               | 0.0007 | 0.0009 | 0.0012 | 0.0014 | 0.0019 | 0.0024 | 0.0028 | 0.0033 | 0.0038 | 0.0047 | 0.0059 |
|           |           |                                       |                                       |                           | vf [in/min]           | 32.2   | 32.2   | 32.2   | 32.2   | 32.2   | 32.2   | 32.1   | 32.2   | 32.1   | 32.1   | 32.1   |
|           | E 14 - 15 | 1.00                                  | 0.25                                  | 325                       | n [min-1]             | 10500  | 7880   | 6300   | 5250   | 3940   | 3150   | 2630   | 2250   | 1970   | 1580   | 1260   |
|           |           |                                       |                                       |                           | fz [in]               | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0028 | 0.0031 | 0.0039 | 0.0049 |
|           |           |                                       |                                       |                           | vf [in/min]           | 24.8   | 24.8   | 24.8   | 24.8   | 24.8   | 24.8   | 24.9   | 24.8   | 24.8   | 24.9   | 24.8   |
| N         | 18        | 1.50                                  | 0.25                                  | 500                       | n [min-1]             | 16130  | 12100  | 9680   | 8060   | 6050   | 4840   | 4030   | 3460   | 3020   | 2420   | 1940   |
|           |           |                                       |                                       |                           | fz [in]               | 0.0005 | 0.0007 | 0.0009 | 0.0010 | 0.0014 | 0.0017 | 0.0021 | 0.0024 | 0.0028 | 0.0035 | 0.0043 |
|           |           |                                       |                                       | 400 - 600                 | vf [in/min]           | 33.5   | 33.5   | 33.5   | 33.5   | 33.5   | 33.5   | 33.5   | 33.6   | 33.5   | 33.6   |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## STRN430.2, STBN430.2 - SLOTTING - INCH - START VALUES

| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | SLOTTING                  |           |           |        |        |        |        |        |        |        |        |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-----------|-----------|--------|--------|--------|--------|--------|--------|--------|--------|
|           |           |                                       |                                       | v <sub>c</sub> (sf / min) | Zn = 4    |           |        |        |        |        |        |        |        |        |
|           |           |                                       |                                       |                           | 1/4       | 5/16      | 3/8    | 7/16   | 1/2    | 5/8    | 3/4    | 1      |        |        |
| P         | E 1 - 2   | 0.50                                  | 1.00                                  | 425                       | n [min-1] | 6494      | 5195   | 4329   | 3711   | 3247   | 2598   | 2165   | 1624   |        |
|           |           |                                       |                                       |                           | fz [in]   | 0.0008    | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |        |
|           | E 3 - 4   | 0.50                                  | 1.00                                  | 400                       | n [min-1] | 6112      | 4890   | 4075   | 3493   | 3056   | 2445   | 2037   | 1528   |        |
|           |           |                                       |                                       |                           | fz [in]   | 0.0006    | 0.0008 | 0.0009 | 0.0011 | 0.0013 | 0.0016 | 0.0019 | 0.0025 |        |
|           | E 5 - 6   | 0.50                                  | 1.00                                  | 350                       | n [min-1] | 5348      | 4278   | 3565   | 3056   | 2674   | 2139   | 1783   | 1337   |        |
|           |           |                                       |                                       |                           | fz [in]   | 0.0006    | 0.0007 | 0.0009 | 0.0010 | 0.0012 | 0.0014 | 0.0017 | 0.0023 |        |
| K         | E 12 - 13 | 0.50                                  | 1.00                                  | 350                       | n [min-1] | 5348      | 4278   | 3565   | 3056   | 2674   | 2139   | 1783   | 1337   |        |
|           |           |                                       |                                       |                           | fz [in]   | 0.0010    | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |        |
|           | E 14 - 15 | 0.50                                  | 1.00                                  | 325                       | n [min-1] | 4966      | 3973   | 3311   | 2838   | 2483   | 1986   | 1655   | 1242   |        |
|           |           |                                       |                                       |                           | fz [in]   | 0.0008    | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |        |
|           | N         | 18                                    | 0.50                                  | 1.00                      | 500       | n [min-1] | 7640   | 6112   | 5093   | 4366   | 3820   | 3056   | 2547   | 1910   |
|           |           |                                       |                                       |                           |           | fz [in]   | 0.0006 | 0.0008 | 0.0009 | 0.0011 | 0.0013 | 0.0016 | 0.0019 | 0.0025 |

## STRN430.2, STBN430.2 - SIDE MILLING ROUGHING - INCH - START VALUES

| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | SIDE MILLING ROUGHING     |           |           |        |        |        |        |        |        |        |        |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-----------|-----------|--------|--------|--------|--------|--------|--------|--------|--------|
|           |           |                                       |                                       | v <sub>c</sub> (sf / min) | Zn = 4    |           |        |        |        |        |        |        |        |        |
|           |           |                                       |                                       |                           | 1/4       | 5/16      | 3/8    | 7/16   | 1/2    | 5/8    | 3/4    | 1      |        |        |
| P         | E 1 - 2   | 1.00                                  | 0.25                                  | 425                       | n [min-1] | 6494      | 5195   | 4329   | 3711   | 3247   | 2598   | 2165   | 1624   |        |
|           |           |                                       |                                       |                           | fz [in]   | 0.0009    | 0.0011 | 0.0013 | 0.0015 | 0.0018 | 0.0022 | 0.0026 | 0.0035 |        |
|           | E 3 - 4   | 1.00                                  | 0.25                                  | 400                       | n [min-1] | 6112      | 4890   | 4075   | 3493   | 3056   | 2445   | 2037   | 1528   |        |
|           |           |                                       |                                       |                           | fz [in]   | 0.0008    | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |        |
|           | E 5 - 6   | 1.00                                  | 0.25                                  | 350                       | n [min-1] | 5348      | 4278   | 3565   | 3056   | 2674   | 2139   | 1783   | 1337   |        |
|           |           |                                       |                                       |                           | fz [in]   | 0.0007    | 0.0009 | 0.0011 | 0.0012 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |        |
| K         | E 12 - 13 | 1.00                                  | 0.25                                  | 350                       | n [min-1] | 5348      | 4278   | 3565   | 3056   | 2674   | 2139   | 1783   | 1337   |        |
|           |           |                                       |                                       |                           | fz [in]   | 0.0011    | 0.0014 | 0.0017 | 0.0020 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |        |
|           | E 14 - 15 | 1.00                                  | 0.25                                  | 325                       | n [min-1] | 4966      | 3973   | 3311   | 2838   | 2483   | 1986   | 1655   | 1242   |        |
|           |           |                                       |                                       |                           | fz [in]   | 0.0009    | 0.0011 | 0.0013 | 0.0015 | 0.0018 | 0.0022 | 0.0026 | 0.0035 |        |
|           | N         | 18                                    | 1.00                                  | 0.25                      | 500       | n [min-1] | 7640   | 6112   | 5093   | 4366   | 3820   | 3056   | 2547   | 1910   |
|           |           |                                       |                                       |                           |           | fz [in]   | 0.0008 | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |



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SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
vf [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.



## STR440.2 - STB440.2 - SLOTTING - INCH - START VALUES

| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) | SLOTTING    |             |        |        |        |        |        |        |        |        |        |        |        |        |      |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
|           |           |                                       |                                       |                           | Zn = 4      |             |        |        |        |        |        |        |        |        |        |        |        |        |      |
|           |           |                                       |                                       |                           | 1/8         | 5/32        | 3/16   | 7/32   | 1/4    | 9/32   | 5/16   | 3/8    | 7/16   | 1/2    | 5/8    | 3/4    | 1      |        |      |
| M         | E 8 - 9   | 1.00                                  | 1.00                                  | 370                       | n [min-1]   | 11307       | 9046   | 7538   | 6461   | 5654   | 5025   | 4523   | 3769   | 3231   | 2827   | 2261   | 1885   | 1413   |      |
|           |           |                                       |                                       |                           | fz [in]     | 0.0008      | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0017 | 0.0019 | 0.0023 | 0.0026 | 0.0030 | 0.0038 | 0.0045 | 0.0060 |      |
|           |           |                                       |                                       |                           | vf [in/min] | 33.9        | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9 |
|           | E 10 - 11 | 1.00                                  | 1.00                                  | 300                       | n [min-1]   | 9168        | 7334   | 6112   | 5239   | 4584   | 4075   | 3667   | 3056   | 2619   | 2292   | 1834   | 1528   | 1146   |      |
|           |           |                                       |                                       |                           | fz [in]     | 0.0008      | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0017 | 0.0019 | 0.0023 | 0.0026 | 0.0030 | 0.0038 | 0.0045 | 0.0060 |      |
|           |           |                                       |                                       |                           | vf [in/min] | 27.5        | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5 |
| S         | E 19      | 1.00                                  | 1.00                                  | 90                        | n [min-1]   | 2750        | 2200   | 1834   | 1572   | 1375   | 1222   | 1100   | 917    | 786    | 688    | 550    | 458    | 344    |      |
|           |           |                                       |                                       |                           | fz [in]     | 0.0004      | 0.0005 | 0.0006 | 0.0007 | 0.0008 | 0.0009 | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0020 | 0.0024 | 0.0032 |      |
|           | E 20      | 1.00                                  | 1.00                                  | 90                        | n [min-1]   | 2750        | 2200   | 1834   | 1572   | 1375   | 1222   | 1100   | 917    | 786    | 688    | 550    | 458    | 344    |      |
|           |           |                                       |                                       |                           | fz [in]     | 0.0004      | 0.0005 | 0.0006 | 0.0007 | 0.0008 | 0.0009 | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0020 | 0.0024 | 0.0032 |      |
|           | E 21      | 1.00                                  | 1.00                                  | 90                        | n [min-1]   | 2750        | 2200   | 1834   | 1572   | 1375   | 1222   | 1100   | 917    | 786    | 688    | 550    | 458    | 344    |      |
|           |           |                                       |                                       |                           | fz [in]     | 0.0004      | 0.0005 | 0.0006 | 0.0007 | 0.0008 | 0.0009 | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0020 | 0.0024 | 0.0032 |      |
|           | E 22      | 1.00                                  | 1.00                                  | 185                       | n [min-1]   | 5654        | 4523   | 3769   | 3231   | 2827   | 2513   | 2261   | 1885   | 1615   | 1413   | 1131   | 942    | 707    |      |
|           |           |                                       |                                       |                           | fz [in]     | 0.0006      | 0.0008 | 0.0009 | 0.0011 | 0.0013 | 0.0014 | 0.0016 | 0.0019 | 0.0022 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |      |
|           |           |                                       |                                       |                           |             | vf [in/min] | 14.1   | 14.1   | 14.1   | 14.1   | 14.1   | 14.1   | 14.1   | 14.1   | 14.1   | 14.1   | 14.1   | 14.1   | 14.1 |

## STR440.2 - STB440.2 - SIDE MILLING/ROUGHING - INCH - START VALUES

| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) | SIDE MILLING ROUGHING |             |        |        |        |        |        |        |        |        |        |        |        |        |      |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-----------------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
|           |           |                                       |                                       |                           | Zn = 4                |             |        |        |        |        |        |        |        |        |        |        |        |        |      |
|           |           |                                       |                                       |                           | 1/8                   | 5/32        | 3/16   | 7/32   | 1/4    | 9/32   | 5/16   | 3/8    | 7/16   | 1/2    | 5/8    | 3/4    | 1      |        |      |
| H         | E 7       | 1.00                                  | 0.15                                  | 150                       | n [min-1]             | 4584        | 3667   | 3056   | 2619   | 2292   | 2037   | 1834   | 1528   | 1310   | 1146   | 917    | 764    | 573    |      |
|           |           |                                       |                                       |                           | fz [in]               | 0.0003      | 0.0004 | 0.0004 | 0.0005 | 0.0006 | 0.0006 | 0.0007 | 0.0009 | 0.0010 | 0.0012 | 0.0014 | 0.0017 | 0.0023 |      |
|           |           |                                       |                                       |                           | vf [in/min]           | 5.3         | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    |      |
| M         | E 8 - 9   | 1.00                                  | 0.25                                  | 370                       | n [min-1]             | 11307       | 9046   | 7538   | 6461   | 5654   | 5025   | 4523   | 3769   | 3231   | 2827   | 2261   | 1885   | 1413   |      |
|           |           |                                       |                                       |                           | fz [in]               | 0.0008      | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0017 | 0.0019 | 0.0023 | 0.0026 | 0.0030 | 0.0038 | 0.0045 | 0.0060 |      |
|           |           |                                       |                                       |                           | vf [in/min]           | 33.9        | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9   | 33.9 |
|           | E 10 - 11 | 1.00                                  | 0.25                                  | 300                       | n [min-1]             | 9168        | 7334   | 6112   | 5239   | 4584   | 4075   | 3667   | 3056   | 2619   | 2292   | 1834   | 1528   | 1146   |      |
|           |           |                                       |                                       |                           | fz [in]               | 0.0008      | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0017 | 0.0019 | 0.0023 | 0.0026 | 0.0030 | 0.0038 | 0.0045 | 0.0060 |      |
|           |           |                                       |                                       |                           | vf [in/min]           | 27.5        | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5 |
| S         | E 19      | 1.00                                  | 0.15                                  | 90                        | n [min-1]             | 2750        | 2200   | 1834   | 1572   | 1375   | 1222   | 1100   | 917    | 786    | 688    | 550    | 458    | 344    |      |
|           |           |                                       |                                       |                           | fz [in]               | 0.0005      | 0.0006 | 0.0008 | 0.0009 | 0.0010 | 0.0011 | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |      |
|           | E 20      | 1.00                                  | 0.15                                  | 90                        | n [min-1]             | 2750        | 2200   | 1834   | 1572   | 1375   | 1222   | 1100   | 917    | 786    | 688    | 550    | 458    | 344    |      |
|           |           |                                       |                                       |                           | fz [in]               | 0.0005      | 0.0006 | 0.0008 | 0.0009 | 0.0010 | 0.0011 | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |      |
|           | E 21      | 1.00                                  | 0.15                                  | 90                        | n [min-1]             | 2750        | 2200   | 1834   | 1572   | 1375   | 1222   | 1100   | 917    | 786    | 688    | 550    | 458    | 344    |      |
|           |           |                                       |                                       |                           | fz [in]               | 0.0005      | 0.0006 | 0.0008 | 0.0009 | 0.0010 | 0.0011 | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |      |
|           | E 22      | 1.00                                  | 0.25                                  | 185                       | n [min-1]             | 5654        | 4523   | 3769   | 3231   | 2827   | 2513   | 2261   | 1885   | 1615   | 1413   | 1131   | 942    | 707    |      |
|           |           |                                       |                                       |                           | fz [in]               | 0.0008      | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0017 | 0.0019 | 0.0023 | 0.0026 | 0.0030 | 0.0038 | 0.0045 | 0.0060 |      |
|           |           |                                       |                                       |                           |                       | vf [in/min] | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0 |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## STR440M.2 - STB440M.2 - SLOTTING - METRIC - START VALUES

| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | SLOTTING                  |           |        |        |        |        |        |        |        |        |        |        |      |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
|           |           |                                       |                                       | v <sub>c</sub> (sf / min) | n [min-1] | Zn = 4 |        |        |        |        |        |        |        |        |        |      |
|           |           |                                       |                                       |                           |           | 3      | 4      | 5      | 6      | 8      | 10     | 12     | 14     | 16     | 20     | 25   |
| M         | E 8 - 9   | 1.00                                  | 1.00                                  | 370                       | n [min-1] | 11990  | 8990   | 7190   | 5990   | 4500   | 3600   | 3000   | 2570   | 2250   | 1800   | 1440 |
|           |           |                                       |                                       | fz [in]                   | 0.0007    | 0.0009 | 0.0012 | 0.0014 | 0.0019 | 0.0024 | 0.0028 | 0.0033 | 0.0038 | 0.0047 | 0.0059 |      |
|           | 270 - 470 | vf [in/min]                           | 34.0                                  | 34.0                      | 34.0      | 34.0   | 34.0   | 34.0   | 34.0   | 34.0   | 34.0   | 34.0   | 34.0   | 34.0   | 34.0   | 34.0 |
|           | E 10 - 11 | 1.00                                  | 1.00                                  | 300                       | n [min-1] | 9660   | 7240   | 5790   | 4830   | 3620   | 2900   | 2410   | 2070   | 1810   | 1450   | 1160 |
| fz [in]   |           |                                       |                                       | 0.0007                    | 0.0009    | 0.0012 | 0.0014 | 0.0019 | 0.0024 | 0.0028 | 0.0033 | 0.0038 | 0.0047 | 0.0059 |        |      |
| S         | E 19      | 1.00                                  | 1.00                                  | 90                        | n [min-1] | 2860   | 2150   | 1720   | 1430   | 1070   | 860    | 720    | 610    | 540    | 430    | 340  |
|           |           |                                       |                                       | fz [in]                   | 0.0004    | 0.0005 | 0.0006 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0025 | 0.0031 |      |
|           | 70 - 110  | vf [in/min]                           | 4.3                                   | 4.3                       | 4.3       | 4.3    | 4.3    | 4.3    | 4.3    | 4.4    | 4.3    | 4.4    | 4.3    | 4.3    |        |      |
|           | E 20      | 1.00                                  | 1.00                                  | 90                        | n [min-1] | 2860   | 2150   | 1720   | 1430   | 1070   | 860    | 720    | 610    | 540    | 430    | 340  |
|           |           |                                       |                                       | fz [in]                   | 0.0004    | 0.0005 | 0.0006 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0025 | 0.0031 |      |
|           | 70 - 110  | vf [in/min]                           | 4.3                                   | 4.3                       | 4.3       | 4.3    | 4.3    | 4.3    | 4.3    | 4.4    | 4.3    | 4.4    | 4.3    | 4.3    |        |      |
|           | E 21      | 1.00                                  | 1.00                                  | 90                        | n [min-1] | 2860   | 2150   | 1720   | 1430   | 1070   | 860    | 720    | 610    | 540    | 430    | 340  |
|           |           |                                       |                                       | fz [in]                   | 0.0004    | 0.0005 | 0.0006 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0025 | 0.0031 |      |
|           | 70 - 110  | vf [in/min]                           | 4.3                                   | 4.3                       | 4.3       | 4.3    | 4.3    | 4.3    | 4.3    | 4.4    | 4.3    | 4.4    | 4.3    | 4.3    |        |      |
|           | E 22      | 1.00                                  | 1.00                                  | 185                       | n [min-1] | 5940   | 4460   | 3570   | 2970   | 2230   | 1780   | 1490   | 1270   | 1110   | 890    | 710  |
|           |           |                                       |                                       | fz [in]                   | 0.0006    | 0.0008 | 0.0010 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0028 | 0.0031 | 0.0039 | 0.0049 |      |
|           | 165 - 205 | vf [in/min]                           | 14.0                                  | 14.0                      | 14.1      | 14.0   | 14.0   | 14.0   | 14.0   | 14.1   | 14.0   | 14.0   | 14.0   | 14.0   | 14.0   |      |

## STR440M.2 - STB440M.2 - SIDE MILLING/ROUGHING - METRIC - START VALUES

| ISO GROUP | SMG         | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | SIDE MILLING ROUGHING     |           |        |        |        |        |        |        |        |        |        |        |      |
|-----------|-------------|---------------------------------------|---------------------------------------|---------------------------|-----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
|           |             |                                       |                                       | v <sub>c</sub> (sf / min) | n [min-1] | Zn = 4 |        |        |        |        |        |        |        |        |        |      |
|           |             |                                       |                                       |                           |           | 3      | 4      | 5      | 6      | 8      | 10     | 12     | 14     | 16     | 20     | 25   |
| H         | E 7         | 1.00                                  | 0.15                                  | 150                       | n [min-1] | 4880   | 3660   | 2930   | 2440   | 1830   | 1460   | 1220   | 1050   | 920    | 730    | 590  |
|           |             |                                       |                                       | fz [in]                   | 0.0003    | 0.0004 | 0.0005 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0013 | 0.0014 | 0.0018 | 0.0023 |      |
| M         | E 8 - 9     | 1.00                                  | 0.25                                  | 370                       | n [min-1] | 11990  | 8990   | 7190   | 5990   | 4500   | 3600   | 3000   | 2570   | 2250   | 1800   | 1440 |
|           |             |                                       |                                       | fz [in]                   | 0.0007    | 0.0009 | 0.0012 | 0.0014 | 0.0019 | 0.0024 | 0.0028 | 0.0033 | 0.0038 | 0.0047 | 0.0059 |      |
|           | 270 - 470   | vf [in/min]                           | 34.0                                  | 34.0                      | 34.0      | 34.0   | 34.0   | 34.0   | 34.0   | 34.0   | 34.0   | 34.0   | 34.0   | 34.0   | 34.0   |      |
|           | E 10 - 11   | 1.00                                  | 0.25                                  | 300                       | n [min-1] | 9660   | 7240   | 5790   | 4830   | 3620   | 2900   | 2410   | 2070   | 1810   | 1450   | 1160 |
| fz [in]   |             |                                       |                                       | 0.0007                    | 0.0009    | 0.0012 | 0.0014 | 0.0019 | 0.0024 | 0.0028 | 0.0033 | 0.0038 | 0.0047 | 0.0059 |        |      |
| 250 - 350 | vf [in/min] | 27.4                                  | 27.4                                  | 27.4                      | 27.4      | 27.4   | 27.4   | 27.4   | 27.3   | 27.4   | 27.4   | 27.4   | 27.4   | 27.4   |        |      |
| S         | E 19        | 1.00                                  | 0.15                                  | 90                        | n [min-1] | 2860   | 2150   | 1720   | 1430   | 1070   | 860    | 720    | 610    | 540    | 430    | 340  |
|           |             |                                       |                                       | fz [in]                   | 0.0005    | 0.0006 | 0.0008 | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0022 | 0.0025 | 0.0031 | 0.0039 |      |
|           | 70 - 110    | vf [in/min]                           | 5.4                                   | 5.4                       | 5.4       | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    |        |      |
|           | E 20        | 1.00                                  | 0.15                                  | 90                        | n [min-1] | 2860   | 2150   | 1720   | 1430   | 1070   | 860    | 720    | 610    | 540    | 430    | 340  |
|           |             |                                       |                                       | fz [in]                   | 0.0005    | 0.0006 | 0.0008 | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0022 | 0.0025 | 0.0031 | 0.0039 |      |
|           | 70 - 110    | vf [in/min]                           | 5.4                                   | 5.4                       | 5.4       | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    |        |      |
|           | E 21        | 1.00                                  | 0.15                                  | 90                        | n [min-1] | 2860   | 2150   | 1720   | 1430   | 1070   | 860    | 720    | 610    | 540    | 430    | 340  |
|           |             |                                       |                                       | fz [in]                   | 0.0005    | 0.0006 | 0.0008 | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0022 | 0.0025 | 0.0031 | 0.0039 |      |
| 70 - 110  | vf [in/min] | 5.4                                   | 5.4                                   | 5.4                       | 5.4       | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    |        |        |      |
| E 22      | 1.00        | 0.25                                  | 185                                   | n [min-1]                 | 5940      | 4460   | 3570   | 2970   | 2230   | 1780   | 1490   | 1270   | 1110   | 890    | 710    |      |
|           |             |                                       | fz [in]                               | 0.0007                    | 0.0009    | 0.0012 | 0.0014 | 0.0019 | 0.0024 | 0.0028 | 0.0033 | 0.0038 | 0.0047 | 0.0059 |        |      |
| 165 - 205 | vf [in/min] | 16.8                                  | 16.9                                  | 16.9                      | 16.8      | 16.9   | 16.8   | 16.9   | 16.8   | 16.9   | 16.8   | 16.8   | 16.8   | 16.8   |        |      |



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SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
vf [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

## STRN440.2 - STBN440.2 - SLOTTING - INCH - START VALUES

| ISO GROUP | SMG       | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) | SLOTTING    |        |        |        |        |        |        |        |        |
|-----------|-----------|---------------------------|---------------------------|---------------------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
|           |           |                           |                           |                           | Zn = 4      |        |        |        |        |        |        |        |        |
|           |           |                           |                           |                           | 1/4         | 5/16   | 3/8    | 7/16   | 1/2    | 5/8    | 3/4    | 1      |        |
| M         | E 8 - 9   | 0.50                      | 1.00                      | 370                       | n [min-1]   | 5654   | 4523   | 3769   | 3231   | 2827   | 2261   | 1885   | 1413   |
|           |           |                           |                           |                           | fz [in]     | 0.0008 | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|           |           |                           |                           | 340 - 400                 | vf [in/min] | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   |
|           | E 10 - 11 | 0.50                      | 1.00                      | 300                       | n [min-1]   | 4584   | 3667   | 3056   | 2619   | 2292   | 1834   | 1528   | 1146   |
|           |           |                           |                           |                           | fz [in]     | 0.0008 | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|           |           |                           |                           | 270 - 330                 | vf [in/min] | 13.8   | 13.8   | 13.8   | 13.8   | 13.8   | 13.8   | 13.8   | 13.8   |
| S         | E 19      | 0.50                      | 1.00                      | 90                        | n [min-1]   | 1375   | 1100   | 917    | 786    | 688    | 550    | 458    | 344    |
|           |           |                           |                           |                           | fz [in]     | 0.0004 | 0.0005 | 0.0006 | 0.0007 | 0.0008 | 0.0009 | 0.0011 | 0.0015 |
|           | E 20      | 0.50                      | 1.00                      | 90                        | n [min-1]   | 1375   | 1100   | 917    | 786    | 688    | 550    | 458    | 344    |
|           |           |                           |                           |                           | fz [in]     | 0.0004 | 0.0005 | 0.0006 | 0.0007 | 0.0008 | 0.0009 | 0.0011 | 0.0015 |
|           | E 21      | 0.50                      | 1.00                      | 90                        | n [min-1]   | 1375   | 1100   | 917    | 786    | 688    | 550    | 458    | 344    |
|           |           |                           |                           |                           | fz [in]     | 0.0004 | 0.0005 | 0.0006 | 0.0007 | 0.0008 | 0.0009 | 0.0011 | 0.0015 |
|           | E 22      | 0.50                      | 1.00                      | 185                       | n [min-1]   | 2827   | 2261   | 1885   | 1615   | 1413   | 1131   | 942    | 707    |
|           |           |                           |                           |                           | fz [in]     | 0.0006 | 0.0008 | 0.0009 | 0.0011 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|           |           |                           |                           | 165 - 205                 | vf [in/min] | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    |

## STRN440.2 - STBN440.2 - SIDE MILLING/ROUGHING - INCH - START VALUES

| ISO GROUP | SMG       | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) | SIDE MILLING ROUGHING |        |        |        |        |        |        |        |        |
|-----------|-----------|---------------------------|---------------------------|---------------------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|
|           |           |                           |                           |                           | Zn = 4                |        |        |        |        |        |        |        |        |
|           |           |                           |                           |                           | 1/4                   | 5/16   | 3/8    | 7/16   | 1/2    | 5/8    | 3/4    | 1      |        |
| H         | E 7       | 1.00                      | 0.15                      | 150                       | n [min-1]             | 2292   | 1834   | 1528   | 1310   | 1146   | 917    | 764    | 573    |
|           |           |                           |                           |                           | fz [in]               | 0.0003 | 0.0004 | 0.0005 | 0.0006 | 0.0006 | 0.0008 | 0.0010 | 0.0013 |
|           |           |                           |                           | 120 - 180                 | vf [in/min]           | 2.93   | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    |
| M         | E 8 - 9   | 1.00                      | 0.25                      | 370                       | n [min-1]             | 5654   | 4523   | 3769   | 3231   | 2827   | 2261   | 1885   | 1413   |
|           |           |                           |                           |                           | fz [in]               | 0.0008 | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0020 | 0.0024 | 0.0032 |
|           |           |                           |                           | 340 - 400                 | vf [in/min]           | 18.1   | 18.1   | 18.1   | 18.1   | 18.1   | 18.1   | 18.1   | 18.1   |
|           | E 10 - 11 | 1.00                      | 0.25                      | 300                       | n [min-1]             | 4584   | 3667   | 3056   | 2619   | 2292   | 1834   | 1528   | 1146   |
|           |           |                           |                           |                           | fz [in]               | 0.0008 | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0020 | 0.0024 | 0.0032 |
|           |           |                           |                           | 270 - 330                 | vf [in/min]           | 14.7   | 14.7   | 14.7   | 14.7   | 14.7   | 14.7   | 14.7   | 14.7   |
| S         | E 19      | 1.00                      | 0.15                      | 90                        | n [min-1]             | 1375   | 1100   | 917    | 786    | 688    | 550    | 458    | 344    |
|           |           |                           |                           |                           | fz [in]               | 0.0005 | 0.0006 | 0.0008 | 0.0009 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |
|           | E 20      | 1.00                      | 0.15                      | 90                        | n [min-1]             | 1375   | 1100   | 917    | 786    | 688    | 550    | 458    | 344    |
|           |           |                           |                           |                           | fz [in]               | 0.0005 | 0.0006 | 0.0008 | 0.0009 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |
|           | E 21      | 1.00                      | 0.15                      | 90                        | n [min-1]             | 1375   | 1100   | 917    | 786    | 688    | 550    | 458    | 344    |
|           |           |                           |                           |                           | fz [in]               | 0.0005 | 0.0006 | 0.0008 | 0.0009 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |
|           | E 22      | 1.00                      | 0.25                      | 185                       | n [min-1]             | 2827   | 2261   | 1885   | 1615   | 1413   | 1131   | 942    | 707    |
|           |           |                           |                           |                           | fz [in]               | 0.0007 | 0.0008 | 0.0010 | 0.0011 | 0.0013 | 0.0016 | 0.0020 | 0.0026 |
|           |           |                           |                           | 165 - 205                 | vf [in/min]           | 7.3    | 7.3    | 7.3    | 7.3    | 7.3    | 7.3    | 7.3    | 7.3    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## STS540, STR540, STSN540, STRN540 - SLOTTING - INCH - UP TO 4 X DIAMETER REACH LENGTH - START VALUES

| ISO GROUP      | SMG                       | ap x Dc         | ae x Dc                       | vc (sf / min)                 | SLOTTING    |         |         |         |        |        |        |        |        |        |        |        |
|----------------|---------------------------|-----------------|-------------------------------|-------------------------------|-------------|---------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|
|                |                           |                 |                               |                               | Zn = 5      |         |         |         |        |        |        |        |        |        |        |        |
|                |                           |                 |                               |                               | 1/8         | 5/32    | 3/16    | 7/32    | 1/4    | 5/16   | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |
| P              | E<br>1 - 2                | 1.00<br>x<br>Dc | 1.00<br>x<br>Dc               | 425<br>n (min-1)<br>319 - 531 | n (min-1)   | 12988   | 10390   | 8659    | 7422   | 6494   | 5195   | 4329   | 3247   | 2598   | 2165   | 1624   |
|                |                           |                 |                               |                               | fz (in)     | 0.0006  | 0.0007  | 0.00084 | 0.0010 | 0.0011 | 0.0014 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                |                           |                 |                               |                               | vf (in/min) | 37      | 37      | 37      | 37     | 37     | 37     | 37     | 37     | 37     | 37     | 37     |
|                | A / E<br>3 - 4            | 1.00<br>x<br>Dc | 1.00<br>x<br>Dc               | 400<br>n (min-1)<br>300 - 500 | n (min-1)   | 12224   | 9779    | 8149    | 6985   | 6112   | 4890   | 4075   | 3056   | 2445   | 2037   | 1528   |
|                |                           |                 |                               |                               | fz (in)     | 0.0005  | 0.0006  | 0.00075 | 0.0009 | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                |                           |                 |                               |                               | vf (in/min) | 31      | 31      | 31      | 31     | 31     | 31     | 31     | 31     | 31     | 31     | 31     |
| A / E<br>5 - 6 | 1.00<br>x<br>Dc           | 1.00<br>x<br>Dc | 350<br>n (min-1)<br>263 - 438 | n (min-1)                     | 10696       | 8557    | 7131    | 6112    | 5348   | 4278   | 3565   | 2674   | 2139   | 1783   | 1337   |        |
|                |                           |                 |                               | fz (in)                       | 0.0004      | 0.0005  | 0.00066 | 0.0008  | 0.0009 | 0.0011 | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 |        |
|                |                           |                 |                               | vf (in/min)                   | 23          | 23      | 23      | 23      | 23     | 23     | 23     | 23     | 23     | 23     | 23     | 23     |
| H              | M / A<br>7<br>(48-56 HRc) | 0.50<br>x<br>Dc | 1.00<br>x<br>Dc               | 275<br>n (min-1)<br>206 - 344 | n (min-1)   | 8404    | 6723    | 5603    | 4802   | 4202   | 3362   | 2801   | 2101   | 1681   | 1401   | 1051   |
|                |                           |                 |                               |                               | fz (in)     | 0.00025 | 0.0003  | 0.00038 | 0.0004 | 0.0005 | 0.0006 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |
|                |                           |                 |                               |                               | vf (in/min) | 11      | 11      | 11      | 11     | 11     | 11     | 11     | 11     | 11     | 11     | 11     |
| M              | E<br>8 - 9                | 0.50<br>x<br>Dc | 1.00<br>x<br>Dc               | 325<br>n (min-1)<br>244 - 406 | n (min-1)   | 9932    | 7946    | 6621    | 5675   | 4966   | 3973   | 3311   | 2483   | 1986   | 1655   | 1242   |
|                |                           |                 |                               |                               | fz (in)     | 0.0003  | 0.0004  | 0.00047 | 0.0005 | 0.0006 | 0.0008 | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 |
|                |                           |                 |                               |                               | vf (in/min) | 16      | 16      | 16      | 16     | 16     | 16     | 16     | 16     | 16     | 16     | 16     |
|                | A / E<br>10 - 11          | 0.50<br>x<br>Dc | 1.00<br>x<br>Dc               | 275<br>n (min-1)<br>206 - 344 | n (min-1)   | 8404    | 6723    | 5603    | 4802   | 4202   | 3362   | 2801   | 2101   | 1681   | 1401   | 1051   |
|                |                           |                 |                               |                               | fz (in)     | 0.0003  | 0.0003  | 0.0004  | 0.0004 | 0.0005 | 0.0006 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |
|                |                           |                 |                               |                               | vf (in/min) | 11      | 11      | 11      | 11     | 11     | 11     | 11     | 11     | 11     | 11     | 11     |
| K              | E<br>12 - 13              | 1.00<br>x<br>Dc | 1.00<br>x<br>Dc               | 400<br>n (min-1)<br>300 - 500 | n (min-1)   | 12224   | 9779    | 8149    | 6985   | 6112   | 4890   | 4075   | 3056   | 2445   | 2037   | 1528   |
|                |                           |                 |                               |                               | fz (in)     | 0.0006  | 0.0007  | 0.0008  | 0.0010 | 0.0011 | 0.0014 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                |                           |                 |                               |                               | vf (in/min) | 34      | 34      | 34      | 34     | 34     | 34     | 34     | 34     | 34     | 34     | 34     |
|                | E<br>14 - 15              | 0.50<br>x<br>Dc | 1.00<br>x<br>Dc               | 325<br>n (min-1)<br>244 - 406 | n (min-1)   | 9932    | 7946    | 6621    | 5675   | 4966   | 3973   | 3311   | 2483   | 1986   | 1655   | 1242   |
|                |                           |                 |                               |                               | fz (in)     | 0.00038 | 0.0005  | 0.00056 | 0.0007 | 0.0008 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|                |                           |                 |                               |                               | vf (in/min) | 19      | 19      | 19      | 19     | 19     | 19     | 19     | 19     | 19     | 19     | 19     |
| S              | E<br>19                   | 0.50<br>x<br>Dc | 1.00<br>x<br>Dc               | 90<br>n (min-1)<br>68 - 113   | n (min-1)   | 2750    | 2200    | 1834    | 1572   | 1375   | 1100   | 917    | 688    | 550    | 458    | 344    |
|                |                           |                 |                               |                               | fz (in)     | 0.00028 | 0.0003  | 0.00041 | 0.0005 | 0.0006 | 0.0007 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |
|                | E<br>20                   | 0.25<br>x<br>Dc | 1.00<br>x<br>Dc               | 75<br>n (min-1)<br>56 - 94    | n (min-1)   | 2292    | 1834    | 1528    | 1310   | 1146   | 917    | 764    | 573    | 458    | 382    | 287    |
|                |                           |                 |                               |                               | fz (in)     | 0.00025 | 0.00031 | 0.00038 | 0.0004 | 0.0005 | 0.0006 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |
|                | E<br>21                   | 0.25<br>x<br>Dc | 1.00<br>x<br>Dc               | 65<br>n (min-1)<br>49 - 81    | n (min-1)   | 1986    | 1589    | 1324    | 1135   | 993    | 795    | 662    | 497    | 397    | 331    | 248    |
|                |                           |                 |                               |                               | fz (in)     | 0.00025 | 0.00031 | 0.00038 | 0.0004 | 0.0005 | 0.0006 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |
|                | E<br>22                   | 0.50<br>x<br>Dc | 1.00<br>x<br>Dc               | 170<br>n (min-1)<br>128 - 213 | n (min-1)   | 5195    | 4156    | 3463    | 2969   | 2598   | 2078   | 1732   | 1299   | 1039   | 866    | 649    |
|                |                           |                 |                               |                               | fz (in)     | 0.0004  | 0.0005  | 0.0006  | 0.0007 | 0.0008 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|                |                           |                 |                               | vf (in/min)                   | 10          | 10      | 10      | 10      | 10     | 10     | 10     | 10     | 10     | 10     | 10     |        |



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SMG = Seco Material Group  
 n [min-1] = RPM  
 vc (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 ap/Dc = % of diameter  
 vf [in/min] = Feed rate  
 ae/Dc = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - 5 FLUTE STABILIZER

## STS540, STR540, STSN540, STRN540 - SIDE MILLING LIGHT ROUGHING - INCH - UP TO 4 X DIAMETER REACH LENGTH - START VALUES

| ISO GROUP      | SMG                       | a <sub>p</sub> x D <sub>c</sub> | a <sub>e</sub> x D <sub>c</sub> | v <sub>c</sub> (sf / min) | SIDE MILLING - LIGHT ROUGHING |             |        |        |        |        |        |        |        |        |        |        |
|----------------|---------------------------|---------------------------------|---------------------------------|---------------------------|-------------------------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                |                           |                                 |                                 |                           | Zn = 5                        |             |        |        |        |        |        |        |        |        |        |        |
|                |                           |                                 |                                 |                           | 1/8                           | 5/32        | 3/16   | 7/32   | 1/4    | 5/16   | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |
| P              | E<br>1 - 2                | 2.00                            | 0.15                            | 600                       | n [min-1]                     | 18336       | 14669  | 12224  | 10478  | 9168   | 7334   | 6112   | 4584   | 3667   | 3056   | 2292   |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0010      | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0025 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                |                           |                                 |                                 |                           | 450 - 750                     | vf [in/min] | 92     | 92     | 92     | 92     | 92     | 92     | 92     | 92     | 92     | 92     |
|                | A / E<br>3 - 4            | 2.00                            | 0.15                            | 550                       | n [min-1]                     | 16808       | 13446  | 11205  | 9605   | 8404   | 6723   | 5603   | 4202   | 3362   | 2801   | 2101   |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0010      | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0025 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                |                           |                                 |                                 |                           | 413 - 688                     | vf [in/min] | 84     | 84     | 84     | 84     | 84     | 84     | 84     | 84     | 84     | 84     |
| A / E<br>5 - 6 | 2.00                      | 0.12                            | 450                             | n [min-1]                 | 13752                         | 11002       | 9168   | 7858   | 6876   | 5501   | 4584   | 3438   | 2750   | 2292   | 1719   |        |
|                |                           |                                 |                                 | fz [in]                   | 0.0008                        | 0.0010      | 0.0012 | 0.0014 | 0.0016 | 0.0020 | 0.0024 | 0.0033 | 0.0041 | 0.0049 | 0.0065 |        |
|                |                           |                                 |                                 | 338 - 563                 | vf [in/min]                   | 56          | 56     | 56     | 56     | 56     | 56     | 56     | 56     | 56     | 56     | 56     |
| H              | M / A<br>7<br>(48-56 HRc) | 2.00                            | 0.08                            | 200                       | n [min-1]                     | 6112        | 4890   | 4075   | 3493   | 3056   | 2445   | 2037   | 1528   | 1222   | 1019   | 764    |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0006      | 0.0007 | 0.0008 | 0.0010 | 0.0011 | 0.0014 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                |                           |                                 |                                 |                           | 150 - 250                     | vf [in/min] | 17     | 17     | 17     | 17     | 17     | 17     | 17     | 17     | 17     | 17     |
| M              | E<br>8 - 9                | 2.00                            | 0.15                            | 510                       | n [min-1]                     | 15586       | 12468  | 10390  | 8906   | 7793   | 6234   | 5195   | 3896   | 3117   | 2598   | 1948   |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0009      | 0.0012 | 0.0014 | 0.0016 | 0.0019 | 0.0023 | 0.0028 | 0.0038 | 0.0047 | 0.0056 | 0.0075 |
|                |                           |                                 |                                 |                           | 383 - 638                     | vf [in/min] | 73     | 73     | 73     | 73     | 73     | 73     | 73     | 73     | 73     | 73     |
|                | A / E<br>10 - 11          | 2.00                            | 0.12                            | 480                       | n [min-1]                     | 14669       | 11735  | 9779   | 8382   | 7334   | 5868   | 4890   | 3667   | 2934   | 2445   | 1834   |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0008      | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0020 | 0.0024 | 0.0033 | 0.0041 | 0.0049 | 0.0065 |
|                |                           |                                 |                                 |                           | 250 - 600                     | vf [in/min] | 60     | 60     | 60     | 60     | 60     | 60     | 60     | 60     | 60     | 60     |
| K              | E<br>12 - 13              | 2.00                            | 0.12                            | 420                       | n [min-1]                     | 12835       | 10268  | 8557   | 7334   | 6418   | 5134   | 4278   | 3209   | 2567   | 2139   | 1604   |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0009      | 0.0011 | 0.0013 | 0.0015 | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0070 |
|                |                           |                                 |                                 |                           | 315 - 525                     | vf [in/min] | 56     | 56     | 56     | 56     | 56     | 56     | 56     | 56     | 56     | 56     |
|                | E<br>14 - 15              | 2.00                            | 0.12                            | 360                       | n [min-1]                     | 11002       | 8801   | 7334   | 6287   | 5501   | 4401   | 3667   | 2750   | 2200   | 1834   | 1375   |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0006      | 0.0008 | 0.0009 | 0.0011 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                |                           |                                 |                                 |                           | 270 - 450                     | vf [in/min] | 34     | 34     | 34     | 34     | 34     | 34     | 34     | 34     | 34     | 34     |
| S              | E<br>19                   | 2.00                            | 0.12                            | 130                       | n [min-1]                     | 3973        | 3178   | 2649   | 2270   | 1986   | 1589   | 1324   | 993    | 795    | 662    | 497    |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0006      | 0.0008 | 0.0009 | 0.0011 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                | E<br>20                   | 2.00                            | 0.10                            | 100                       | n [min-1]                     | 3056        | 2445   | 2037   | 1746   | 1528   | 1222   | 1019   | 764    | 611    | 509    | 382    |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0006      | 0.0007 | 0.0008 | 0.0010 | 0.0011 | 0.0014 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                | E<br>21                   | 2.00                            | 0.10                            | 85                        | n [min-1]                     | 2598        | 2078   | 1732   | 1484   | 1299   | 1039   | 866    | 649    | 520    | 433    | 325    |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0006      | 0.0007 | 0.0008 | 0.0010 | 0.0011 | 0.0014 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                | E<br>22                   | 2.00                            | 0.15                            | 230                       | n [min-1]                     | 7029        | 5623   | 4686   | 4016   | 3514   | 2812   | 2343   | 1757   | 1406   | 1171   | 879    |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0008      | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0020 | 0.0024 | 0.0033 | 0.0041 | 0.0049 | 0.0065 |
|                |                           |                                 |                                 | 173 - 288                 | vf [in/min]                   | 29          | 29     | 29     | 29     | 29     | 29     | 29     | 29     | 29     | 29     |        |

SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
vf [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

## STS540, STR540, STSN540, STRN540 - SIDE MILLING HEAVY ROUGHING - INCH - UP TO 4 X DIAMETER REACH LENGTH - START VALUES

| ISO GROUP      | SMG                       | a <sub>p</sub> x D <sub>c</sub> | a <sub>e</sub> x D <sub>c</sub> | v <sub>c</sub> (sf / min) | SIDE MILLING - HEAVY ROUGHING |        |        |        |             |        |        |        |        |        |        |        |        |        |        |        |
|----------------|---------------------------|---------------------------------|---------------------------------|---------------------------|-------------------------------|--------|--------|--------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|                |                           |                                 |                                 |                           | Zn = 5                        |        |        |        |             |        |        |        |        |        |        |        |        |        |        |        |
|                |                           |                                 |                                 |                           | 1/8                           | 5/32   | 3/16   | 7/32   | 1/4         | 5/16   | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |        |        |        |        |
| P              | E<br>1 - 2                | 2.00                            | 0.40                            | 510                       | n [min-1]                     | 15586  | 12468  | 10390  | 8906        | 7793   | 6234   | 5195   | 3896   | 3117   | 2598   | 1948   |        |        |        |        |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0009 | 0.0011 | 0.0013 | 0.0015      | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0070 |        |        |        |        |
|                |                           |                                 |                                 |                           | vf [in/min]                   | 68     | 68     | 68     | 68          | 68     | 68     | 68     | 68     | 68     | 68     | 68     | 68     |        |        |        |
|                | A / E<br>3 - 4            | 2.00                            | 0.40                            | 460                       | n [min-1]                     | 14058  | 11246  | 9372   | 8033        | 7029   | 5623   | 4686   | 3514   | 2812   | 2343   | 1757   |        |        |        |        |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0009 | 0.0011 | 0.0013 | 0.0015      | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0070 |        |        |        |        |
|                |                           |                                 |                                 |                           | vf [in/min]                   | 62     | 62     | 62     | 62          | 62     | 62     | 62     | 62     | 62     | 62     | 62     | 62     |        |        |        |
| A / E<br>5 - 6 | 2.00                      | 0.30                            | 380                             | n [min-1]                 | 11613                         | 9290   | 7742   | 6636   | 5806        | 4645   | 3871   | 2903   | 2323   | 1935   | 1452   |        |        |        |        |        |
|                |                           |                                 |                                 | fz [in]                   | 0.0008                        | 0.0009 | 0.0011 | 0.0013 | 0.0015      | 0.0019 | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 |        |        |        |        |        |
|                |                           |                                 |                                 | vf [in/min]               | 44                            | 44     | 44     | 44     | 44          | 44     | 44     | 44     | 44     | 44     | 44     | 44     |        |        |        |        |
| H              | M / A<br>7<br>(48-56 HRC) | 2.00                            | 0.15                            | 150                       | n [min-1]                     | 4584   | 3667   | 3056   | 2619        | 2292   | 1834   | 1528   | 1146   | 917    | 764    | 573    |        |        |        |        |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0004 | 0.0005 | 0.0007 | 0.0008      | 0.0009 | 0.0011 | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 |        |        |        |        |
|                |                           |                                 |                                 |                           | vf [in/min]                   | 10     | 10     | 10     | 10          | 10     | 10     | 10     | 10     | 10     | 10     | 10     | 10     |        |        |        |
| M              | E<br>8 - 9                | 2.00                            | 0.30                            | 430                       | n [min-1]                     | 13141  | 10513  | 8761   | 7509        | 6570   | 5256   | 4380   | 3285   | 2628   | 2190   | 1643   |        |        |        |        |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0006 | 0.0007 | 0.0008 | 0.0010      | 0.0011 | 0.0014 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |        |        |        |        |
|                |                           |                                 |                                 |                           | vf [in/min]                   | 37     | 37     | 37     | 37          | 37     | 37     | 37     | 37     | 37     | 37     | 37     | 37     |        |        |        |
|                | A / E<br>10 - 11          | 2.00                            | 0.25                            | 400                       | n [min-1]                     | 12224  | 9779   | 8149   | 6985        | 6112   | 4890   | 4075   | 3056   | 2445   | 2037   | 1528   |        |        |        |        |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0005 | 0.0006 | 0.0008 | 0.0009      | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |        |        |        |        |
|                |                           |                                 |                                 |                           | vf [in/min]                   | 31     | 31     | 31     | 31          | 31     | 31     | 31     | 31     | 31     | 31     | 31     | 31     |        |        |        |
| K              | E<br>12 - 13              | 2.00                            | 0.30                            | 350                       | n [min-1]                     | 10696  | 8557   | 7131   | 6112        | 5348   | 4278   | 3565   | 2674   | 2139   | 1783   | 1337   |        |        |        |        |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0008 | 0.0010 | 0.0012 | 0.0014      | 0.0016 | 0.0020 | 0.0024 | 0.0033 | 0.0041 | 0.0049 | 0.0065 |        |        |        |        |
|                |                           |                                 |                                 |                           | vf [in/min]                   | 43     | 43     | 43     | 43          | 43     | 43     | 43     | 43     | 43     | 43     | 43     | 43     |        |        |        |
|                | E<br>14 - 15              | 2.00                            | 0.25                            | 300                       | n [min-1]                     | 9168   | 7334   | 6112   | 5239        | 4584   | 3667   | 3056   | 2292   | 1834   | 1528   | 1146   |        |        |        |        |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0006 | 0.0008 | 0.0009 | 0.0011      | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |        |        |        |        |
|                |                           |                                 |                                 |                           | vf [in/min]                   | 29     | 29     | 29     | 29          | 29     | 29     | 29     | 29     | 29     | 29     | 29     | 29     |        |        |        |
| S              | E<br>19                   | 2.00                            | 0.20                            | 110                       | n [min-1]                     | 3362   | 2689   | 2241   | 1921        | 1681   | 1345   | 1121   | 840    | 672    | 560    | 420    |        |        |        |        |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0006 | 0.0007 | 0.0008 | 0.0010      | 0.0011 | 0.0014 | 0.0017 | 0.0022 | 0.0028 | 0.0033 | 0.0044 |        |        |        |        |
|                |                           |                                 |                                 |                           | vf [in/min]                   | 9      | 9      | 9      | 9           | 9      | 9      | 9      | 9      | 9      | 9      | 9      | 9      |        |        |        |
|                |                           |                                 |                                 |                           | E<br>20                       | 2.00   | 0.20   | 85     | n [min-1]   | 2598   | 2078   | 1732   | 1484   | 1299   | 1039   | 866    | 649    | 520    | 433    | 325    |
|                |                           |                                 |                                 |                           |                               |        |        |        | fz [in]     | 0.0004 | 0.0005 | 0.0007 | 0.0008 | 0.0009 | 0.0011 | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 |
|                |                           |                                 |                                 |                           |                               |        |        |        | vf [in/min] | 6      | 6      | 6      | 6      | 6      | 6      | 6      | 6      | 6      | 6      | 6      |
|                | E<br>21                   | 2.00                            | 0.20                            | 70                        | n [min-1]                     | 2139   | 1711   | 1426   | 1222        | 1070   | 856    | 713    | 535    | 428    | 357    | 267    |        |        |        |        |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0004 | 0.0005 | 0.0007 | 0.0008      | 0.0009 | 0.0011 | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 |        |        |        |        |
|                |                           |                                 |                                 |                           | vf [in/min]                   | 5      | 5      | 5      | 5           | 5      | 5      | 5      | 5      | 5      | 5      | 5      | 5      |        |        |        |
|                | E<br>22                   | 2.00                            | 0.40                            | 190                       | n [min-1]                     | 5806   | 4645   | 3871   | 3318        | 2903   | 2323   | 1935   | 1452   | 1161   | 968    | 726    |        |        |        |        |
|                |                           |                                 |                                 |                           | fz [in]                       | 0.0008 | 0.0010 | 0.0012 | 0.0014      | 0.0016 | 0.0020 | 0.0024 | 0.0033 | 0.0041 | 0.0049 | 0.0065 |        |        |        |        |
|                |                           |                                 |                                 |                           | vf [in/min]                   | 24     | 24     | 24     | 24          | 24     | 24     | 24     | 24     | 24     | 24     | 24     | 24     |        |        |        |



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SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
vf [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

## STS540, STR540, STSN540, STRN540 - SIDE MILLING FINISHING - INCH - UP TO 4 X DIAMETER REACH LENGTH - START VALUES

| ISO GROUP      | SMG                       | a <sub>p</sub> x D <sub>c</sub> | a <sub>e</sub> x D <sub>c</sub> | v <sub>c</sub> (sf / min) | SIDE MILLING - FINISHING |        |        |           |        |        |        |        |        |        |        |        |      |
|----------------|---------------------------|---------------------------------|---------------------------------|---------------------------|--------------------------|--------|--------|-----------|--------|--------|--------|--------|--------|--------|--------|--------|------|
|                |                           |                                 |                                 |                           | Zn = 5                   |        |        |           |        |        |        |        |        |        |        |        |      |
|                |                           |                                 |                                 |                           | 1/8                      | 5/32   | 3/16   | 7/32      | 1/4    | 5/16   | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |      |
| P              | E<br>1 - 2                | 2.00                            | 0.02                            | 750                       | n [min-1]                | 22920  | 18336  | 15280     | 13097  | 11460  | 9168   | 7640   | 5730   | 4584   | 3820   | 2865   |      |
|                |                           |                                 |                                 |                           | fz [in]                  | 0.0006 | 0.0008 | 0.0009    | 0.0011 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |      |
|                |                           |                                 |                                 | 563 - 938                 | vf [in/min]              | 72     | 72     | 72        | 72     | 72     | 72     | 72     | 72     | 72     | 72     | 72     | 72   |
|                | A / E<br>3 - 4            | 2.00                            | 0.02                            | 680                       | n [min-1]                | 20781  | 16625  | 13854     | 11875  | 10390  | 8312   | 6927   | 5195   | 4156   | 3463   | 2598   |      |
|                |                           |                                 |                                 |                           | fz [in]                  | 0.0006 | 0.0008 | 0.0009    | 0.0011 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |      |
|                |                           |                                 |                                 | 510 - 850                 | vf [in/min]              | 65     | 65     | 65        | 65     | 65     | 65     | 65     | 65     | 65     | 65     | 65     | 65   |
| A / E<br>5 - 6 | 2.00                      | 0.02                            | 560                             | n [min-1]                 | 17114                    | 13691  | 11409  | 9779      | 8557   | 6845   | 5705   | 4278   | 3423   | 2852   | 2139   |        |      |
|                |                           |                                 |                                 | fz [in]                   | 0.0006                   | 0.0008 | 0.0009 | 0.0011    | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |        |      |
|                |                           |                                 | 420 - 700                       | vf [in/min]               | 53                       | 53     | 53     | 53        | 53     | 53     | 53     | 53     | 53     | 53     | 53     | 53     |      |
| H              | M / A<br>7<br>(48-56 HRC) | 2.00                            | 0.02                            | 250                       | n [min-1]                | 7640   | 6112   | 5093      | 4366   | 3820   | 3056   | 2547   | 1910   | 1528   | 1273   | 955    |      |
|                |                           |                                 |                                 |                           | fz [in]                  | 0.0005 | 0.0006 | 0.0008    | 0.0009 | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |      |
|                |                           |                                 |                                 | 188 - 313                 | vf [in/min]              | 19     | 19     | 19        | 19     | 19     | 19     | 19     | 19     | 19     | 19     | 19     | 19   |
| M              | E<br>8 - 9                | 2.00                            | 0.02                            | 630                       | n [min-1]                | 19253  | 15402  | 12835     | 11002  | 9626   | 7701   | 6418   | 4813   | 3851   | 3209   | 2407   |      |
|                |                           |                                 |                                 |                           | fz [in]                  | 0.0006 | 0.0008 | 0.0009    | 0.0011 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |      |
|                |                           |                                 |                                 | 473 - 788                 | vf [in/min]              | 60     | 60     | 60        | 60     | 60     | 60     | 60     | 60     | 60     | 60     | 60     | 60   |
|                | A / E<br>10 - 11          | 2.00                            | 0.02                            | 600                       | n [min-1]                | 18336  | 14669  | 12224     | 10478  | 9168   | 7334   | 6112   | 4584   | 3667   | 3056   | 2292   |      |
|                |                           |                                 |                                 |                           | fz [in]                  | 0.0006 | 0.0008 | 0.0009    | 0.0011 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |      |
|                |                           |                                 |                                 | 450 - 750                 | vf [in/min]              | 57     | 57     | 57        | 57     | 57     | 57     | 57     | 57     | 57     | 57     | 57     | 57   |
| K              | E<br>12 - 13              | 2.00                            | 0.02                            | 520                       | n [min-1]                | 15891  | 12713  | 10594     | 9081   | 7946   | 6356   | 5297   | 3973   | 3178   | 2649   | 1986   |      |
|                |                           |                                 |                                 |                           | fz [in]                  | 0.0006 | 0.0008 | 0.0009    | 0.0011 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |      |
|                |                           |                                 |                                 | 390 - 650                 | vf [in/min]              | 50     | 50     | 50        | 50     | 50     | 50     | 50     | 50     | 50     | 50     | 50     | 50   |
|                | E<br>14 - 15              | 2.00                            | 0.02                            | 450                       | n [min-1]                | 13752  | 11002  | 9168      | 7858   | 6876   | 5501   | 4584   | 3438   | 2750   | 2292   | 1719   |      |
|                |                           |                                 |                                 |                           | fz [in]                  | 0.0005 | 0.0006 | 0.0008    | 0.0009 | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |      |
|                |                           |                                 |                                 | 338 - 563                 | vf [in/min]              | 34     | 34     | 34        | 34     | 34     | 34     | 34     | 34     | 34     | 34     | 34     | 34   |
| S              | E<br>19                   | 2.00                            | 0.02                            | 160                       | n [min-1]                | 4890   | 3912   | 3260      | 2794   | 2445   | 1956   | 1630   | 1222   | 978    | 815    | 611    |      |
|                |                           |                                 |                                 |                           | fz [in]                  | 0.0005 | 0.0006 | 0.0008    | 0.0009 | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |      |
|                |                           |                                 |                                 | 120 - 200                 | vf [in/min]              | 12     | 12     | 12        | 12     | 12     | 12     | 12     | 12     | 12     | 12     | 12     | 12   |
|                |                           |                                 |                                 | E<br>20                   | 2.00                     | 0.02   | 125    | n [min-1] | 3820   | 3056   | 2547   | 2183   | 1910   | 1528   | 1273   | 955    | 764  |
|                | fz [in]                   | 0.0005                          | 0.0006                          |                           |                          |        |        | 0.0008    | 0.0009 | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |      |
|                | E<br>21                   | 2.00                            | 0.02                            | 100                       | n [min-1]                | 3056   | 2445   | 2037      | 1746   | 1528   | 1222   | 1019   | 764    | 611    | 509    | 382    |      |
|                |                           |                                 |                                 |                           | fz [in]                  | 0.0005 | 0.0006 | 0.0008    | 0.0009 | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |      |
|                |                           |                                 |                                 | 75 - 125                  | vf [in/min]              | 8      | 8      | 8         | 8      | 8      | 8      | 8      | 8      | 8      | 8      | 8      | 8    |
|                |                           |                                 |                                 | E<br>22                   | 2.00                     | 0.02   | 270    | n [min-1] | 8251   | 6601   | 5501   | 4715   | 4126   | 3300   | 2750   | 2063   | 1650 |
|                | fz [in]                   | 0.0006                          | 0.0008                          |                           |                          |        |        | 0.0009    | 0.0011 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |      |
|                | 203 - 338                 | vf [in/min]                     | 26                              |                           |                          |        | 26     | 26        | 26     | 26     | 26     | 26     | 26     | 26     | 26     | 26     | 26   |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## STSN540, STRN540 - SIDE MILLING FINISHING - INCH - OVER 4 X DIAMETER REACH LENGTH - START VALUES

| ISO GROUP      | SMG                       | ap X Dc | ae X Dc   | vc (sf / min) | SIDE MILLING - FINISHING |             |        |        |        |        |        |    |
|----------------|---------------------------|---------|-----------|---------------|--------------------------|-------------|--------|--------|--------|--------|--------|----|
|                |                           |         |           |               | 1/4                      | 3/8         | 1/2    | 5/8    | 3/4    | 1      |        |    |
| P              | E<br>1 - 2                | 1.00    | 0.01      | 750           | n [min-1]                | 11460       | 7640   | 5730   | 4584   | 3820   | 2865   |    |
|                |                           |         |           |               | fz [in]                  | 0.0013      | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |    |
|                |                           |         |           | 563 - 938     | vf [in/min]              | 72          | 72     | 72     | 72     | 72     | 72     |    |
|                | A / E<br>3 - 4            | 1.00    | 0.01      | 680           | n [min-1]                | 10390       | 6927   | 5195   | 4156   | 3463   | 2598   |    |
|                |                           |         |           |               | fz [in]                  | 0.0013      | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |    |
|                |                           |         |           | 510 - 850     | vf [in/min]              | 65          | 65     | 65     | 65     | 65     | 65     |    |
| A / E<br>5 - 6 | 1.00                      | 0.01    | 560       | n [min-1]     | 8557                     | 5705        | 4278   | 3423   | 2852   | 2139   |        |    |
|                |                           |         |           | fz [in]       | 0.0013                   | 0.0019      | 0.0025 | 0.0031 | 0.0038 | 0.0050 |        |    |
|                |                           |         | 420 - 700 | vf [in/min]   | 53                       | 53          | 53     | 53     | 53     | 53     |        |    |
| H              | M / A<br>7<br>(48-56 HRc) | 1.00    | 0.01      | 250           | n [min-1]                | 3820        | 2547   | 1910   | 1528   | 1273   | 955    |    |
|                |                           |         |           |               | fz [in]                  | 0.0010      | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |    |
|                |                           |         |           | 188 - 313     | vf [in/min]              | 19          | 19     | 19     | 19     | 19     | 19     |    |
| M              | E<br>8 - 9                | 1.00    | 0.01      | 630           | n [min-1]                | 9626        | 6418   | 4813   | 3851   | 3209   | 2407   |    |
|                |                           |         |           |               | fz [in]                  | 0.0013      | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |    |
|                |                           |         |           | 473 - 788     | vf [in/min]              | 60          | 60     | 60     | 60     | 60     | 60     |    |
|                | A / E<br>10 - 11          | 1.00    | 0.01      | 600           | n [min-1]                | 9168        | 6112   | 4584   | 3667   | 3056   | 2292   |    |
|                |                           |         |           |               | fz [in]                  | 0.0013      | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |    |
|                |                           |         |           | 250 - 750     | vf [in/min]              | 57          | 57     | 57     | 57     | 57     | 57     |    |
| K              | E<br>12 - 13              | 1.00    | 0.01      | 525           | n [min-1]                | 8022        | 5348   | 4011   | 3209   | 2674   | 2006   |    |
|                |                           |         |           |               | fz [in]                  | 0.0013      | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |    |
|                |                           |         |           | 394 - 656     | vf [in/min]              | 50          | 50     | 50     | 50     | 50     | 50     |    |
| E<br>14 - 15   | 1.00                      | 0.01    | 450       | n [min-1]     | 6876                     | 4584        | 3438   | 2750   | 2292   | 1719   |        |    |
|                |                           |         |           | fz [in]       | 0.0010                   | 0.0015      | 0.0020 | 0.0025 | 0.0030 | 0.0040 |        |    |
|                |                           |         | 338 - 563 | vf [in/min]   | 34                       | 34          | 34     | 34     | 34     | 34     |        |    |
| S              | E<br>19                   | 1.00    | 0.01      | 160           | n [min-1]                | 2445        | 1630   | 1222   | 978    | 815    | 611    |    |
|                |                           |         |           |               | fz [in]                  | 0.0010      | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |    |
|                | E<br>20                   | 1.00    | 0.01      | 125           | n [min-1]                | 1910        | 1273   | 955    | 764    | 637    | 478    |    |
|                |                           |         |           |               | fz [in]                  | 0.0010      | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |    |
|                | E<br>21                   | 1.00    | 0.01      | 105           | n [min-1]                | 1604        | 1070   | 802    | 642    | 535    | 401    |    |
|                |                           |         |           |               | fz [in]                  | 0.0010      | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |    |
|                | E<br>22                   | 1.00    | 0.01      | 290           | n [min-1]                | 4431        | 2954   | 2216   | 1772   | 1477   | 1108   |    |
|                |                           |         |           |               | fz [in]                  | 0.0013      | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |    |
|                |                           |         |           |               | 218 - 363                | vf [in/min] | 28     | 28     | 28     | 28     | 28     | 28 |



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SMG = Seco Material Group  
n [min-1] = RPM  
vc (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
ap/Dc = % of diameter  
vf [in/min] = Feed rate  
ae/Dc = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.



# CUTTING DATA - 5 FLUTE STABILIZER

## STSN540, STRN540 - SIDE MILLING LIGHT ROUGHING - INCH - OVER 4 X DIAMETER REACH LENGTH - START VALUES

| ISO GROUP      | SMG                       | ap X Dc | ae X Dc   | vc (sf / min) | SIDE MILLING - LIGHT ROUGHING |             |        |        |        |        |        |        |
|----------------|---------------------------|---------|-----------|---------------|-------------------------------|-------------|--------|--------|--------|--------|--------|--------|
|                |                           |         |           |               |                               |             | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
|                |                           |         |           |               | n [min-1]                     | fz [in]     |        |        |        |        |        |        |
| P              | E<br>1 - 2                | 0.50    | 0.10      | 600           | n [min-1]                     | 9168        | 6112   | 4584   | 3667   | 3056   | 2292   |        |
|                |                           |         |           |               | fz [in]                       | 0.0015      | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 |        |
|                |                           |         |           | 450 - 750     | vf [in/min]                   | 69          | 69     | 69     | 69     | 69     | 69     |        |
|                | A / E<br>3 - 4            | 0.50    | 0.10      | 550           | n [min-1]                     | 8404        | 5603   | 4202   | 3362   | 2801   | 2101   |        |
|                |                           |         |           |               | fz [in]                       | 0.0015      | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 |        |
|                |                           |         |           | 413 - 688     | vf [in/min]                   | 63          | 63     | 63     | 63     | 63     | 63     |        |
| A / E<br>5 - 6 | 0.50                      | 0.08    | 450       | n [min-1]     | 6876                          | 4584        | 3438   | 2750   | 2292   | 1719   |        |        |
|                |                           |         |           | fz [in]       | 0.0011                        | 0.0017      | 0.0023 | 0.0028 | 0.0034 | 0.0045 |        |        |
|                |                           |         | 338 - 563 | vf [in/min]   | 39                            | 39          | 39     | 39     | 39     | 39     |        |        |
| H              | M / A<br>7<br>(48-56 HRC) | 0.50    | 0.05      | 200           | n [min-1]                     | 3056        | 2037   | 1528   | 1222   | 1019   | 764    |        |
|                |                           |         |           |               | fz [in]                       | 0.0009      | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 |        |
|                |                           |         |           | 150 - 250     | vf [in/min]                   | 13          | 13     | 13     | 13     | 13     | 13     |        |
| M              | E<br>8 - 9                | 0.50    | 0.10      | 510           | n [min-1]                     | 7793        | 5195   | 3896   | 3117   | 2598   | 1948   |        |
|                |                           |         |           |               | fz [in]                       | 0.0014      | 0.0021 | 0.0028 | 0.0034 | 0.0041 | 0.0055 |        |
|                |                           |         |           | 383 - 638     | vf [in/min]                   | 54          | 54     | 54     | 54     | 54     | 54     |        |
|                | A / E<br>10 - 11          | 0.50    | 0.08      | 480           | n [min-1]                     | 7334        | 4890   | 3667   | 2934   | 2445   | 1834   |        |
|                |                           |         |           |               | fz [in]                       | 0.0013      | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |        |
|                |                           |         |           | 250 - 600     | vf [in/min]                   | 46          | 46     | 46     | 46     | 46     | 46     |        |
| K              | E<br>12 - 13              | 0.50    | 0.08      | 420           | n [min-1]                     | 6418        | 4278   | 3209   | 2567   | 2139   | 1604   |        |
|                |                           |         |           |               | fz [in]                       | 0.0013      | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |        |
|                |                           |         |           | 315 - 525     | vf [in/min]                   | 40          | 40     | 40     | 40     | 40     | 40     |        |
|                | E<br>14 - 15              | 0.50    | 0.08      | 360           | n [min-1]                     | 5501        | 3667   | 2750   | 2200   | 1834   | 1375   |        |
|                |                           |         |           |               | fz [in]                       | 0.0010      | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |        |
|                |                           |         |           | 270 - 450     | vf [in/min]                   | 28          | 28     | 28     | 28     | 28     | 28     |        |
| S              | E<br>19                   | 0.50    | 0.08      | 130           | n [min-1]                     | 1986        | 1324   | 993    | 795    | 662    | 497    |        |
|                |                           |         |           |               | fz [in]                       | 0.0010      | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |        |
|                |                           |         |           | 98 - 163      | vf [in/min]                   | 10          | 10     | 10     | 10     | 10     | 10     |        |
|                |                           |         |           | 100           | n [min-1]                     | 1528        | 1019   | 764    | 611    | 509    | 382    |        |
|                | E<br>20                   | 0.50    | 0.06      | 0.06          | 75 - 125                      | vf [in/min] | 7      | 7      | 7      | 7      | 7      | 7      |
|                |                           |         |           |               | 85                            | n [min-1]   | 1299   | 866    | 649    | 520    | 433    | 325    |
|                |                           |         |           |               |                               | fz [in]     | 0.0009 | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 |
|                |                           |         |           |               | 64 - 106                      | vf [in/min] | 6      | 6      | 6      | 6      | 6      | 6      |
|                | E<br>22                   | 0.50    | 0.10      | 0.10          | 230                           | n [min-1]   | 3514   | 2343   | 1757   | 1406   | 1171   | 879    |
|                |                           |         |           |               |                               | fz [in]     | 0.0013 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                |                           |         |           |               | 173 - 288                     | vf [in/min] | 22     | 22     | 22     | 22     | 22     | 22     |

SMG = Seco Material Group  
 n [min-1] = RPM  
 vc (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 ap/Dc = % of diameter  
 vf [in/min] = Feed rate  
 ae/Dc = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## STS540M, STR540M - SLOTTING - METRIC - START VALUES

| ISO GROUP      | SMG                         | a <sub>p</sub> x D <sub>c</sub> | a <sub>e</sub> x D <sub>c</sub> | SLOTTING                  |             |             |        |        |        |        |        |
|----------------|-----------------------------|---------------------------------|---------------------------------|---------------------------|-------------|-------------|--------|--------|--------|--------|--------|
|                |                             |                                 |                                 | v <sub>c</sub> (sf / min) |             | Zn = 5      |        |        |        |        |        |
|                |                             |                                 |                                 |                           |             | 6           | 8      | 10     | 12     | 16     |        |
| P              | E<br>1 - 2                  | 1.00<br>x<br>D <sub>c</sub>     | 1.00<br>x<br>D <sub>c</sub>     | 425                       |             | n (min-1)   | 6873   | 5155   | 4124   | 3436   | 2577   |
|                |                             |                                 |                                 | 319 - 531                 |             | fz (in)     | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |
|                |                             |                                 |                                 |                           |             | vf (in/min) | 37     | 37     | 37     | 37     | 37     |
|                | A / E<br>3 - 4              | 1.00<br>x<br>D <sub>c</sub>     | 1.00<br>x<br>D <sub>c</sub>     | 400                       |             | n (min-1)   | 6469   | 4851   | 3881   | 3234   | 2426   |
|                |                             |                                 |                                 | 300 - 500                 |             | fz (in)     | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 |
|                |                             |                                 |                                 |                           |             | vf (in/min) | 31     | 31     | 31     | 31     | 31     |
| A / E<br>5 - 6 | 1.00<br>x<br>D <sub>c</sub> | 1.00<br>x<br>D <sub>c</sub>     | 350                             |                           | n (min-1)   | 5660        | 4245   | 3396   | 2830   | 2122   |        |
|                |                             |                                 | 263 - 438                       |                           | fz (in)     | 0.0008      | 0.0011 | 0.0014 | 0.0017 | 0.0022 |        |
|                |                             |                                 |                                 |                           | vf (in/min) | 23          | 23     | 23     | 23     | 23     |        |
| H              | M / A<br>7<br>(48-56 HRC)   | 0.50<br>x<br>D <sub>c</sub>     | 1.00<br>x<br>D <sub>c</sub>     | 275                       |             | n (min-1)   | 4447   | 3335   | 2668   | 2224   | 1668   |
|                |                             |                                 |                                 | 206 - 344                 |             | fz (in)     | 0.0005 | 0.0006 | 0.0008 | 0.0009 | 0.0013 |
|                |                             |                                 |                                 |                           |             | vf (in/min) | 11     | 11     | 11     | 11     | 11     |
| M              | E<br>8 - 9                  | 0.50<br>x<br>D <sub>c</sub>     | 1.00<br>x<br>D <sub>c</sub>     | 325                       |             | n (min-1)   | 5256   | 3942   | 3153   | 2628   | 1971   |
|                |                             |                                 |                                 | 244 - 406                 |             | fz (in)     | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0016 |
|                |                             |                                 |                                 |                           |             | vf (in/min) | 16     | 16     | 16     | 16     | 16     |
|                | A / E<br>10 - 11            | 0.50<br>x<br>D <sub>c</sub>     | 1.00<br>x<br>D <sub>c</sub>     | 275                       |             | n (min-1)   | 4447   | 3335   | 2668   | 2224   | 1668   |
|                |                             |                                 |                                 | 206 - 344                 |             | fz (in)     | 0.0005 | 0.0006 | 0.0008 | 0.0009 | 0.0013 |
|                |                             |                                 |                                 |                           |             | vf (in/min) | 11     | 11     | 11     | 11     | 11     |
| K              | E<br>12 - 13                | 1.00<br>x<br>D <sub>c</sub>     | 1.00<br>x<br>D <sub>c</sub>     | 400                       |             | n (min-1)   | 6469   | 4851   | 3881   | 3234   | 2426   |
|                |                             |                                 |                                 | 300 - 500                 |             | fz (in)     | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |
|                |                             |                                 |                                 |                           |             | vf (in/min) | 34     | 34     | 34     | 34     | 34     |
|                | E<br>14 - 15                | 0.50<br>x<br>D <sub>c</sub>     | 1.00<br>x<br>D <sub>c</sub>     | 325                       |             | n (min-1)   | 5256   | 3942   | 3153   | 2628   | 1971   |
|                |                             |                                 |                                 | 244 - 406                 |             | fz (in)     | 0.0007 | 0.0009 | 0.0012 | 0.0014 | 0.0019 |
|                |                             |                                 |                                 |                           |             | vf (in/min) | 19     | 19     | 19     | 19     | 19     |
| S              | E<br>19                     | 0.50<br>x<br>D <sub>c</sub>     | 1.00<br>x<br>D <sub>c</sub>     | 90                        |             | n (min-1)   | 1455   | 1092   | 873    | 728    | 546    |
|                |                             |                                 |                                 | 68 - 113                  |             | fz (in)     | 0.0005 | 0.0007 | 0.0009 | 0.0010 | 0.0014 |
|                |                             |                                 |                                 |                           |             | vf (in/min) | 4      | 4      | 4      | 4      | 4      |
|                | E<br>20                     | 0.25<br>x<br>D <sub>c</sub>     | 1.00<br>x<br>D <sub>c</sub>     | 75                        |             | n (min-1)   | 1213   | 910    | 728    | 606    | 455    |
|                |                             |                                 |                                 | 56 - 94                   |             | fz (in)     | 0.0005 | 0.0006 | 0.0008 | 0.0009 | 0.0013 |
|                |                             |                                 |                                 |                           |             | vf (in/min) | 3      | 3      | 3      | 3      | 3      |
|                | E<br>21                     | 0.25<br>x<br>D <sub>c</sub>     | 1.00<br>x<br>D <sub>c</sub>     | 65                        |             | n (min-1)   | 1051   | 788    | 631    | 526    | 394    |
|                |                             |                                 |                                 | 49 - 81                   |             | fz (in)     | 0.0005 | 0.0006 | 0.0008 | 0.0009 | 0.0013 |
|                |                             |                                 |                                 |                           |             | vf (in/min) | 2      | 2      | 2      | 2      | 2      |
|                | E<br>22                     | 0.50<br>x<br>D <sub>c</sub>     | 1.00<br>x<br>D <sub>c</sub>     | 170                       |             | n (min-1)   | 2749   | 2062   | 1649   | 1375   | 1031   |
|                |                             |                                 |                                 | 128 - 213                 |             | fz (in)     | 0.0007 | 0.0009 | 0.0012 | 0.0014 | 0.0019 |
|                |                             |                                 |                                 |                           |             | vf (in/min) | 10     | 10     | 10     | 10     | 10     |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - 5 FLUTE STABILIZER

## STS540M, STR540M - SIDE MILLING LIGHT ROUGHING - METRIC - START VALUES

| ISO GROUP      | SMG                       | a <sub>p</sub> X D <sub>c</sub> | a <sub>e</sub> X D <sub>c</sub> | SIDE MILLING - LIGHT ROUGHING |             |         |        |        |        |        |
|----------------|---------------------------|---------------------------------|---------------------------------|-------------------------------|-------------|---------|--------|--------|--------|--------|
|                |                           |                                 |                                 | v <sub>c</sub> (sf / min)     | n [min-1]   | Zn = 5  |        |        |        |        |
|                |                           |                                 |                                 |                               |             | fz [in] | 6      | 8      | 10     | 12     |
| P              | E<br>1 - 2                | 2.00                            | 0.15                            | 600                           | n [min-1]   | 9703    | 7277   | 5822   | 4851   | 3639   |
|                |                           |                                 |                                 |                               | fz [in]     | 0.0019  | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                |                           |                                 |                                 | 450 - 750                     | vf [in/min] | 92      | 92     | 92     | 92     | 92     |
|                | A / E<br>3 - 4            | 2.00                            | 0.15                            | 550                           | n [min-1]   | 8894    | 6671   | 5337   | 4447   | 3335   |
|                |                           |                                 |                                 |                               | fz [in]     | 0.0019  | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                |                           |                                 |                                 | 413 - 688                     | vf [in/min] | 84      | 84     | 84     | 84     | 84     |
| A / E<br>5 - 6 | 2.00                      | 0.12                            | 450                             | n [min-1]                     | 7277        | 5458    | 4366   | 3639   | 2729   |        |
|                |                           |                                 |                                 | fz [in]                       | 0.0015      | 0.0020  | 0.0026 | 0.0031 | 0.0041 |        |
|                |                           |                                 | 338 - 563                       | vf [in/min]                   | 56          | 56      | 56     | 56     | 56     |        |
| H              | M / A<br>7<br>(48-56 HRc) | 2.00                            | 0.08                            | 200                           | n [min-1]   | 3234    | 2426   | 1941   | 1617   | 1213   |
|                |                           |                                 |                                 |                               | fz [in]     | 0.0011  | 0.0014 | 0.0018 | 0.0021 | 0.0028 |
|                |                           |                                 |                                 | 150 - 250                     | vf [in/min] | 17      | 17     | 17     | 17     | 17     |
| M              | E<br>8 - 9                | 2.00                            | 0.15                            | 510                           | n [min-1]   | 8247    | 6186   | 4948   | 4124   | 3093   |
|                |                           |                                 |                                 |                               | fz [in]     | 0.0018  | 0.0024 | 0.0030 | 0.0035 | 0.0047 |
|                |                           |                                 |                                 | 383 - 638                     | vf [in/min] | 73      | 73     | 73     | 73     | 73     |
|                | A / E<br>10 - 11          | 2.00                            | 0.12                            | 480                           | n [min-1]   | 7762    | 5822   | 4657   | 3881   | 2911   |
|                |                           |                                 |                                 |                               | fz [in]     | 0.0015  | 0.0020 | 0.0026 | 0.0031 | 0.0041 |
|                |                           |                                 |                                 | 250 - 600                     | vf [in/min] | 60      | 60     | 60     | 60     | 60     |
| K              | E<br>12 - 13              | 2.00                            | 0.12                            | 420                           | n [min-1]   | 6792    | 5094   | 4075   | 3396   | 2547   |
|                |                           |                                 |                                 |                               | fz [in]     | 0.0017  | 0.0022 | 0.0028 | 0.0033 | 0.0044 |
|                |                           |                                 |                                 | 315 - 525                     | vf [in/min] | 56      | 56     | 56     | 56     | 56     |
|                | E<br>14 - 15              | 2.00                            | 0.12                            | 360                           | n [min-1]   | 5822    | 4366   | 3493   | 2911   | 2183   |
|                |                           |                                 |                                 |                               | fz [in]     | 0.0012  | 0.0016 | 0.0020 | 0.0024 | 0.0031 |
|                |                           |                                 |                                 | 270 - 450                     | vf [in/min] | 34      | 34     | 34     | 34     | 34     |
| S              | E<br>19                   | 2.00                            | 0.12                            | 130                           | n [min-1]   | 2102    | 1577   | 1261   | 1051   | 788    |
|                |                           |                                 |                                 |                               | fz [in]     | 0.0012  | 0.0016 | 0.0020 | 0.0024 | 0.0031 |
|                |                           |                                 |                                 | 98 - 163                      | vf [in/min] | 12      | 12     | 12     | 12     | 12     |
|                |                           |                                 |                                 |                               | n [min-1]   | 1617    | 1213   | 970    | 809    | 606    |
|                | E<br>20                   | 2.00                            | 0.10                            |                               | fz [in]     | 0.0011  | 0.0014 | 0.0018 | 0.0021 | 0.0028 |
|                |                           |                                 |                                 | 75 - 125                      | vf [in/min] | 9       | 9      | 9      | 9      | 9      |
|                |                           |                                 |                                 |                               | n [min-1]   | 1375    | 1031   | 825    | 687    | 515    |
|                |                           |                                 |                                 |                               | fz [in]     | 0.0011  | 0.0014 | 0.0018 | 0.0021 | 0.0028 |
|                | E<br>21                   | 2.00                            | 0.10                            | 85                            | n [min-1]   | 3719    | 2790   | 2232   | 1860   | 1395   |
|                |                           |                                 |                                 |                               | fz [in]     | 0.0015  | 0.0020 | 0.0026 | 0.0031 | 0.0041 |
|                |                           |                                 |                                 | 64 - 106                      | vf [in/min] | 7       | 7      | 7      | 7      | 7      |
|                |                           |                                 |                                 |                               | n [min-1]   | 3719    | 2790   | 2232   | 1860   | 1395   |
| E<br>22        | 2.00                      | 0.15                            | 230                             | n [min-1]                     | 3719        | 2790    | 2232   | 1860   | 1395   |        |
|                |                           |                                 |                                 | fz [in]                       | 0.0015      | 0.0020  | 0.0026 | 0.0031 | 0.0041 |        |
|                |                           |                                 | 173 - 288                       | vf [in/min]                   | 29          | 29      | 29     | 29     | 29     |        |
|                |                           |                                 |                                 | n [min-1]                     | 3719        | 2790    | 2232   | 1860   | 1395   |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## STS540M, STR540M - SIDE MILLING HEAVY ROUGHING - METRIC - START VALUES

| ISO GROUP      | SMG                       | $a_p \times D_c$ | $a_e \times D_c$ | SIDE MILLING - HEAVY ROUGHING |  |             |             |             |        |        |        |        |    |
|----------------|---------------------------|------------------|------------------|-------------------------------|--|-------------|-------------|-------------|--------|--------|--------|--------|----|
|                |                           |                  |                  | $v_c$ (sf / min)              |  |             | Zn = 5      |             |        |        |        |        |    |
|                |                           |                  |                  |                               |  |             | 6           | 8           | 10     | 12     | 16     |        |    |
| P              | E<br>1 - 2                | 2.00             | 0.40             | 510                           |  |             | n [min-1]   | 8247        | 6186   | 4948   | 4124   | 3093   |    |
|                |                           |                  |                  | 383 - 638                     |  |             | fz [in]     | 0.0017      | 0.0022 | 0.0028 | 0.0033 | 0.0044 |    |
|                |                           |                  |                  |                               |  |             | vf [in/min] | 68          | 68     | 68     | 68     | 68     |    |
|                | A / E<br>3 - 4            | 2.00             | 0.40             | 460                           |  |             | n [min-1]   | 7439        | 5579   | 4463   | 3719   | 2790   |    |
|                |                           |                  |                  | 345 - 575                     |  |             | fz [in]     | 0.0017      | 0.0022 | 0.0028 | 0.0033 | 0.0044 |    |
|                |                           |                  |                  |                               |  |             | vf [in/min] | 62          | 62     | 62     | 62     | 62     |    |
| A / E<br>5 - 6 | 2.00                      | 0.30             | 380              |                               |  | n [min-1]   | 6145        | 4609        | 3687   | 3073   | 2304   |        |    |
|                |                           |                  | 285 - 475        |                               |  | fz [in]     | 0.0014      | 0.0019      | 0.0024 | 0.0028 | 0.0038 |        |    |
|                |                           |                  |                  |                               |  | vf [in/min] | 44          | 44          | 44     | 44     | 44     |        |    |
| H              | M / A<br>7<br>(48-56 HRC) | 2.00             | 0.15             | 150                           |  |             | n [min-1]   | 2426        | 1819   | 1455   | 1213   | 910    |    |
|                |                           |                  |                  | 113 - 188                     |  |             | fz [in]     | 0.0008      | 0.0011 | 0.0014 | 0.0017 | 0.0022 |    |
|                |                           |                  |                  |                               |  |             | vf [in/min] | 10          | 10     | 10     | 10     | 10     |    |
| M              | E<br>8 - 9                | 2.00             | 0.30             | 430                           |  |             | n [min-1]   | 6954        | 5215   | 4172   | 3477   | 2608   |    |
|                |                           |                  |                  | 323 - 538                     |  |             | fz [in]     | 0.0011      | 0.0014 | 0.0018 | 0.0021 | 0.0028 |    |
|                |                           |                  |                  |                               |  |             | vf [in/min] | 37          | 37     | 37     | 37     | 37     |    |
|                | A / E<br>10 - 11          | 2.00             | 0.25             | 400                           |  |             | n [min-1]   | 6469        | 4851   | 3881   | 3234   | 2426   |    |
|                |                           |                  |                  | 250 - 500                     |  |             | fz [in]     | 0.0009      | 0.0013 | 0.0016 | 0.0019 | 0.0025 |    |
|                |                           |                  |                  |                               |  |             | vf [in/min] | 31          | 31     | 31     | 31     | 31     |    |
| K              | E<br>12 - 13              | 2.00             | 0.30             | 350                           |  |             | n [min-1]   | 5660        | 4245   | 3396   | 2830   | 2122   |    |
|                |                           |                  |                  | 263 - 438                     |  |             | fz [in]     | 0.0015      | 0.0020 | 0.0026 | 0.0031 | 0.0041 |    |
|                | E<br>14 - 15              | 2.00             | 0.25             | 300                           |  |             | n [min-1]   | 4851        | 3639   | 2911   | 2426   | 1819   |    |
|                |                           |                  |                  | 225 - 375                     |  |             | fz [in]     | 0.0012      | 0.0016 | 0.0020 | 0.0024 | 0.0031 |    |
| S              | E<br>19                   | 2.00             | 0.20             | 110                           |  |             | n [min-1]   | 1779        | 1334   | 1067   | 889    | 667    |    |
|                |                           |                  |                  | 83 - 138                      |  |             | fz [in]     | 0.0010      | 0.0014 | 0.0017 | 0.0021 | 0.0028 |    |
|                | E<br>20                   | 2.00             | 0.20             | 85                            |  |             | n [min-1]   | 1375        | 1031   | 825    | 687    | 515    |    |
|                |                           |                  |                  | 64 - 106                      |  |             | fz [in]     | 0.0008      | 0.0011 | 0.0014 | 0.0017 | 0.0022 |    |
|                | E<br>21                   | 2.00             | 0.20             | 70                            |  |             | n [min-1]   | 1132        | 849    | 679    | 566    | 424    |    |
|                |                           |                  |                  | 53 - 88                       |  |             | fz [in]     | 0.0008      | 0.0011 | 0.0014 | 0.0017 | 0.0022 |    |
|                | E<br>22                   | 2.00             | 0.40             | 190                           |  |             | n [min-1]   | 3073        | 2304   | 1844   | 1536   | 1152   |    |
|                |                           |                  |                  | 143 - 238                     |  |             | fz [in]     | 0.0015      | 0.0020 | 0.0026 | 0.0031 | 0.0041 |    |
|                |                           |                  |                  |                               |  |             |             | vf [in/min] | 24     | 24     | 24     | 24     | 24 |

SMG = Seco Material Group  
 n [min-1] = RPM  
 $v_c$  (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 $a_p/D_c$  = % of diameter  
 $a_e/D_c$  = % of diameter  
 $v_f$  [in/min] = Feed rate  
 $a_p/D_c$  = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## STS540M, STR540M - SIDE MILLING FINISHING - METRIC - START VALUES

| ISO GROUP      | SMG                       | $a_p \times D_c$ | $a_e \times D_c$ | SIDE MILLING - FINISHING |  |             |             |        |        |        |        |        |
|----------------|---------------------------|------------------|------------------|--------------------------|--|-------------|-------------|--------|--------|--------|--------|--------|
|                |                           |                  |                  | $v_c$ (sf / min)         |  |             | Zn = 5      |        |        |        |        |        |
|                |                           |                  |                  |                          |  |             | 6           | 8      | 10     | 12     | 16     |        |
| P              | E<br>1 - 2                | 2.00             | 0.02             | 750                      |  |             | n [min-1]   | 12129  | 9096   | 7277   | 6064   | 4548   |
|                |                           |                  |                  | 563 - 938                |  |             | fz [in]     | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0031 |
|                |                           |                  |                  |                          |  |             | vf [in/min] | 72     | 72     | 72     | 72     | 72     |
|                | A / E<br>3 - 4            | 2.00             | 0.02             | 680                      |  |             | n [min-1]   | 10997  | 8247   | 6598   | 5498   | 4124   |
|                |                           |                  |                  | 510 - 850                |  |             | fz [in]     | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0031 |
|                |                           |                  |                  |                          |  |             | vf [in/min] | 65     | 65     | 65     | 65     | 65     |
| A / E<br>5 - 6 | 2.00                      | 0.02             | 560              |                          |  | n [min-1]   | 9056        | 6792   | 5434   | 4528   | 3396   |        |
|                |                           |                  | 420 - 700        |                          |  | fz [in]     | 0.0012      | 0.0016 | 0.0020 | 0.0024 | 0.0031 |        |
|                |                           |                  |                  |                          |  | vf [in/min] | 53          | 53     | 53     | 53     | 53     |        |
| H              | M / A<br>7<br>(48-56 HRC) | 2.00             | 0.02             | 250                      |  |             | n [min-1]   | 4043   | 3032   | 2426   | 2021   | 1516   |
|                |                           |                  |                  | 188 - 313                |  |             | fz [in]     | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 |
|                |                           |                  |                  |                          |  |             | vf [in/min] | 19     | 19     | 19     | 19     | 19     |
| M              | E<br>8 - 9                | 2.00             | 0.02             | 630                      |  |             | n [min-1]   | 10188  | 7641   | 6113   | 5094   | 3820   |
|                |                           |                  |                  | 473 - 788                |  |             | fz [in]     | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0031 |
|                |                           |                  |                  |                          |  |             | vf [in/min] | 60     | 60     | 60     | 60     | 60     |
|                | A / E<br>10 - 11          | 2.00             | 0.02             | 600                      |  |             | n [min-1]   | 9703   | 7277   | 5822   | 4851   | 3639   |
|                |                           |                  |                  | 450 - 750                |  |             | fz [in]     | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0031 |
|                |                           |                  |                  |                          |  |             | vf [in/min] | 57     | 57     | 57     | 57     | 57     |
| K              | E<br>12 - 13              | 2.00             | 0.02             | 520                      |  |             | n [min-1]   | 8409   | 6307   | 5045   | 4205   | 3153   |
|                |                           |                  |                  | 390 - 650                |  |             | fz [in]     | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0031 |
|                |                           |                  |                  |                          |  |             | vf [in/min] | 50     | 50     | 50     | 50     | 50     |
|                | E<br>14 - 15              | 2.00             | 0.02             | 450                      |  |             | n [min-1]   | 7277   | 5458   | 4366   | 3639   | 2729   |
|                |                           |                  |                  | 338 - 563                |  |             | fz [in]     | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 |
|                |                           |                  |                  |                          |  |             | vf [in/min] | 34     | 34     | 34     | 34     | 34     |
| S              | E<br>19                   | 2.00             | 0.02             | 160                      |  |             | n [min-1]   | 2587   | 1941   | 1552   | 1294   | 970    |
|                |                           |                  |                  | 120 - 200                |  |             | fz [in]     | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 |
|                |                           |                  |                  |                          |  |             | vf [in/min] | 12     | 12     | 12     | 12     | 12     |
|                | E<br>20                   | 2.00             | 0.02             | 125                      |  |             | n [min-1]   | 2021   | 1516   | 1213   | 1011   | 758    |
|                |                           |                  |                  | 94 - 156                 |  |             | fz [in]     | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 |
|                |                           |                  |                  |                          |  |             | vf [in/min] | 10     | 10     | 10     | 10     | 10     |
|                | E<br>21                   | 2.00             | 0.02             | 100                      |  |             | n [min-1]   | 1617   | 1213   | 970    | 809    | 606    |
|                |                           |                  |                  | 75 - 125                 |  |             | fz [in]     | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 |
|                |                           |                  |                  |                          |  |             | vf [in/min] | 8      | 8      | 8      | 8      | 8      |
|                | E<br>22                   | 2.00             | 0.02             | 270                      |  |             | n [min-1]   | 4366   | 3275   | 2620   | 2183   | 1637   |
|                |                           |                  |                  | 203 - 338                |  |             | fz [in]     | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0031 |
|                |                           |                  |                  |                          |  |             | vf [in/min] | 26     | 26     | 26     | 26     | 26     |

SMG = Seco Material Group  
 n [min-1] = RPM  
 $v_c$  (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 $a_p/D_c$  = % of diameter  
 $a_e/D_c$  = % of diameter  
 vf [in/min] = Feed rate  
 $a_p/D_c$  = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## STRCS540 - SIDE MILLING SEMI ROUGHING - INCH - START VALUES

| ISO GROUP      | SMG                       | ap X Dc     | ae X Dc   | vc (sf / min) |             | SIDE MILLING - SEMI ROUGHING |        |           |        |        |        |
|----------------|---------------------------|-------------|-----------|---------------|-------------|------------------------------|--------|-----------|--------|--------|--------|
|                |                           |             |           |               |             | 1/4                          | 3/8    | 1/2       | 5/8    | 3/4    | 1      |
| P              | E<br>1 - 2                | 3.00        | 0.10      | 700           | n [min-1]   | 10696                        | 7131   | 5348      | 4278   | 3565   | 2674   |
|                |                           |             |           |               | fz [in]     | 0.0020                       | 0.0030 | 0.0040    | 0.0050 | 0.0060 | 0.0080 |
|                |                           |             |           | 525 - 875     | vf [in/min] | 107                          | 107    | 107       | 107    | 107    | 107    |
|                | A / E<br>3 - 4            | 3.00        | 0.10      | 645           | n [min-1]   | 9856                         | 6570   | 4928      | 3942   | 3285   | 2464   |
|                |                           |             |           |               | fz [in]     | 0.0020                       | 0.0030 | 0.0040    | 0.0050 | 0.0060 | 0.0080 |
|                |                           |             |           | 484 - 806     | vf [in/min] | 99                           | 99     | 99        | 99     | 99     | 99     |
| A / E<br>5 - 6 | 3.00                      | 0.08        | 525       | n [min-1]     | 8022        | 5348                         | 4011   | 3209      | 2674   | 2006   |        |
|                |                           |             |           | fz [in]       | 0.0016      | 0.0024                       | 0.0033 | 0.0041    | 0.0049 | 0.0065 |        |
|                |                           |             | 394 - 656 | vf [in/min]   | 65          | 65                           | 65     | 65        | 65     | 65     |        |
| H              | M / A<br>7<br>(48-56 HRC) | 3.00        | 0.04      | 220           | n [min-1]   | 3362                         | 2241   | 1681      | 1345   | 1121   | 840    |
|                |                           |             |           |               | fz [in]     | 0.0010                       | 0.0015 | 0.0020    | 0.0025 | 0.0030 | 0.0040 |
|                |                           |             |           | 165 - 275     | vf [in/min] | 17                           | 17     | 17        | 17     | 17     | 17     |
| M              | E<br>8 - 9                | 3.00        | 0.10      | 600           | n [min-1]   | 9168                         | 6112   | 4584      | 3667   | 3056   | 2292   |
|                |                           |             |           |               | fz [in]     | 0.0019                       | 0.0028 | 0.0038    | 0.0047 | 0.0056 | 0.0075 |
|                |                           |             |           | 450 - 750     | vf [in/min] | 86                           | 86     | 86        | 86     | 86     | 86     |
|                | A / E<br>10 - 11          | 3.00        | 0.08      | 565           | n [min-1]   | 8633                         | 5755   | 4317      | 3453   | 2878   | 2158   |
|                |                           |             |           |               | fz [in]     | 0.0016                       | 0.0024 | 0.0033    | 0.0041 | 0.0049 | 0.0065 |
|                |                           |             |           | 250 - 706     | vf [in/min] | 70                           | 70     | 70        | 70     | 70     | 70     |
| K              | E<br>12 - 13              | 3.00        | 0.08      | 495           | n [min-1]   | 7564                         | 5042   | 3782      | 3025   | 2521   | 1891   |
|                |                           |             |           |               | fz [in]     | 0.0018                       | 0.0026 | 0.0035    | 0.0044 | 0.0053 | 0.0070 |
|                |                           |             |           | 371 - 619     | vf [in/min] | 66                           | 66     | 66        | 66     | 66     | 66     |
|                | E<br>14 - 15              | 3.00        | 0.08      | 430           | n [min-1]   | 6570                         | 4380   | 3285      | 2628   | 2190   | 1643   |
|                |                           |             |           |               | fz [in]     | 0.0013                       | 0.0019 | 0.0025    | 0.0031 | 0.0038 | 0.0050 |
|                |                           |             |           | 323 - 538     | vf [in/min] | 41                           | 41     | 41        | 41     | 41     | 41     |
| S              | E<br>19                   | 3.00        | 0.06      | 150           | n [min-1]   | 2292                         | 1528   | 1146      | 917    | 764    | 573    |
|                |                           |             |           |               | fz [in]     | 0.0013                       | 0.0019 | 0.0025    | 0.0031 | 0.0038 | 0.0050 |
|                |                           |             |           | 113 - 188     | vf [in/min] | 14                           | 14     | 14        | 14     | 14     | 14     |
|                |                           |             |           | E<br>20       | 3.00        | 0.05                         | 120    | n [min-1] | 1834   | 1222   | 917    |
|                | fz [in]                   | 0.0012      | 0.0017    |               |             |                              |        | 0.0023    | 0.0029 | 0.0035 | 0.0046 |
|                | 90 - 150                  | vf [in/min] | 11        |               |             |                              | 11     | 11        | 11     | 11     | 11     |
|                | E<br>21                   | 3.00        | 0.05      |               |             |                              | 100    | n [min-1] | 1528   | 1019   | 764    |
|                |                           |             |           | fz [in]       | 0.0012      | 0.0017                       |        | 0.0023    | 0.0029 | 0.0035 | 0.0046 |
|                |                           |             |           | 75 - 125      | vf [in/min] | 9                            | 9      | 9         | 9      | 9      | 9      |
|                |                           |             |           | E<br>22       | 3.00        | 0.08                         | 270    | n [min-1] | 4126   | 2750   | 2063   |
|                | fz [in]                   | 0.0016      | 0.0024    |               |             |                              |        | 0.0033    | 0.0041 | 0.0049 | 0.0065 |
|                | 203 - 338                 | vf [in/min] | 34        |               |             |                              | 34     | 34        | 34     | 34     | 34     |

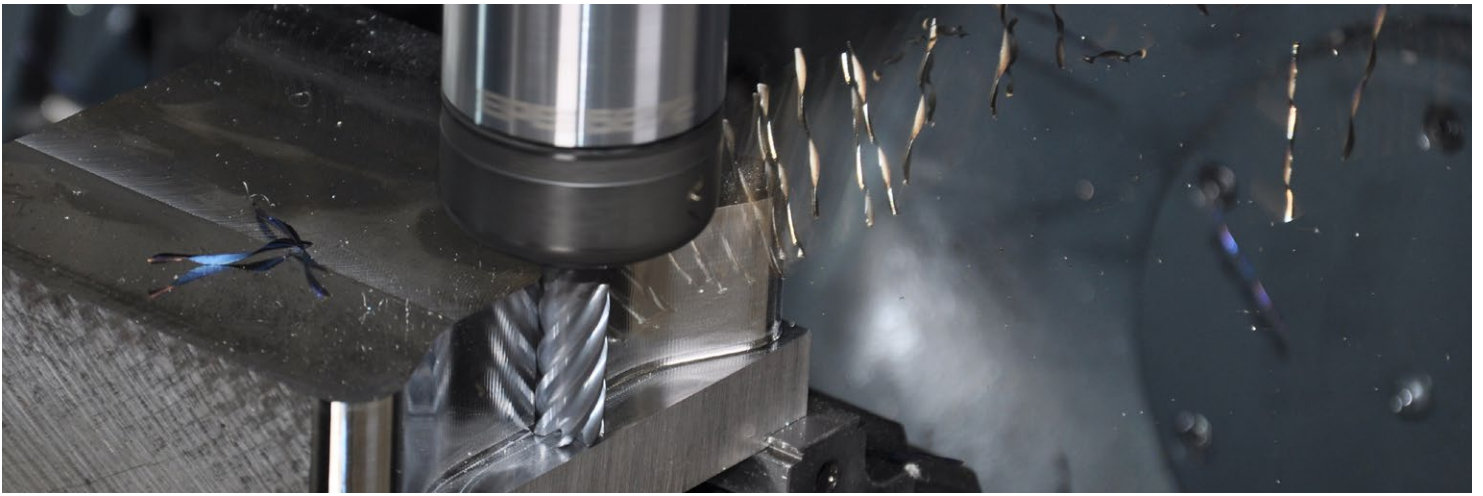


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GET CUTTING DATA RECOMMENDATIONS/CALCULATIONS, TIPS & TRICKS, TECHNICAL VIDEOS, AND MORE!

SMG = Seco Material Group  
n [min-1] = RPM  
vc (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
ap/Dc = % of diameter  
vf [in/min] = Feed rate  
ae/Dc = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.



# ACHIEVE EFFICIENT OPTIMIZED ROUGHING MULTI FLUTE

Reducing cycle times, increasing throughput and extending tool life have never been easier with the Niagara Cutter™ Multi Flute family of end mills. This product series now offers smaller diameters down to 1/8", necked versions with extended reaches and even a new ball nose option for those demanding 3D applications that require optimal performance and tool life. The most unique addition to these products is the advanced chip splitter design. This innovative engineering allows for unsurpassed chip control in applications requiring depths of cut up to 3 times the diameter of the tool.

## RANGE OVERVIEW

### S638/S638R - 6-FLUTE - SQUARE & RADIUS

- 2 and 2.5 x D flute length 0.125" - 1.00"
- Cylindrical shank, dead sharp and radius 0.010", 0.015", 0.030", 0.060", 0.090", 0.120" & 0.190"

### SN638/SN638R - 6-FLUTE - NECKED SERIES

- 2 x D flute length and 4 x D reach length 0.375" - 1.000"
- Cylindrical shank, standard aerospace radii 0.015", 0.030", 0.060", 0.120" & 0.250"

### SB638/SBN638 - 6-FLUTE - BALL NOSE SERIES

- 1 and approx 2.5 x D flute length 0.250" - 1.000"
- Necked version - 1 x D flute length and 3 x D reach length
- Cylindrical shank

### S738/S738R - 7-FLUTE - CHAMFER & RADIUS

- 1.5, 2.5 and 4 x D flute length 0.250" - 0.500"
- Cylindrical shank, chamfer and radius 0.015", 0.030" & 0.060"

### S938/S938R - 7-FLUTE - CHAMFER & RADIUS

- 1.5, 2.5 and 4 x D flute length 0.250" - 0.500"
- Cylindrical shank, chamfer and radius 0.015", 0.030" & 0.060"

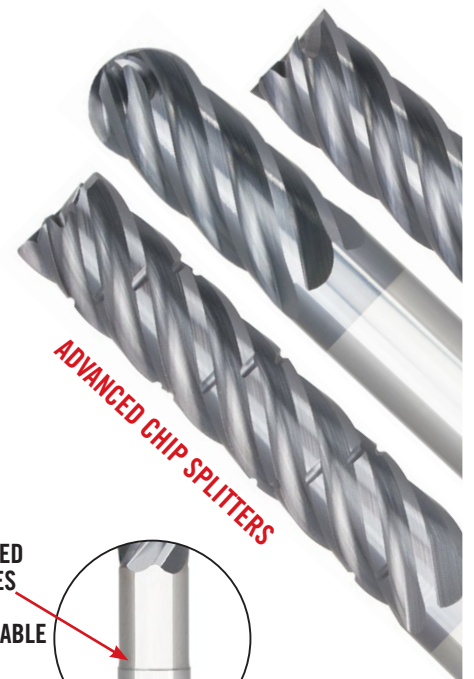
### SCS638/SCS638R, SCS738R, SCS938R - 9-FLUTE - ADVANCED CHIP SPLITTERS

- Approx. 3.2 x D flute length
- Cylindrical shank 0.250" - 1.000"

| MATERIAL GROUPS      |
|----------------------|
| Steel 1-6            |
| Stainless Steel 8-11 |
| Cast Iron 12-15      |
| Superalloys 19-22    |

## YOUR BENEFITS

- Increased chip evacuation in deep pocket applications
- AlTiN coating increases tool life
- Smoother cutting for an improved surface finish
- High heat abrasion resistance
- Stronger cutting edge



# 6 TIPS

## OPTIMIZED ROUGHING

Optimized roughing can be highly effective for machining part features such as pockets with challenging corners as well as any straight walls two times the diameter of your end mill and require long axial depths of cuts. This strategy enables you to machine pockets three to four times faster than conventional methods while also dramatically extending the life of your tools. Achieving the best possible results with today's optimized roughing strategy does require adhering to a few specific guidelines.

### 1. CHOOSE AN APPROPRIATE STEPOVER

Optimized roughing typically employs end mills with 5- to 9-flutes. End mills with fewer flutes have more space for chip formation, thus can utilize larger step-overs. Although the step-over of tools with fewer flutes can be higher, the traverse rate of the tool will decrease because of the fewer flutes. Therefore, a balance must be struck where the optimum step-over and feed rate are utilized for each type of tool. The cutting data in this brochure has been specified based on extensive testing and experience and should serve as a good starting point for your application.

### 2. USE STRONG, SECURE TOOLHOLDERS & FIXTURING

High-precision holders are crucial when optimized roughing to achieve maximum tool life. Run-out needs to be kept to less than 0.0004" to maximize tool life. This type of precision can be achieved by most shrink fit holders, milling chucks, high precision collet chucks and select manufacturer's end mill holders. A precise holder ensures the accuracy of the process, whereas a less secure holder will cause undesirable levels of vibration while optimized roughing at high feed rates.

### 3. MAKE SURE YOUR MACHINE IS CAPABLE OF PERFORMING

Machine tools used for optimized roughing not only need to be able to achieve extremely high feed rates, but also need to be able to process thousands of lines of code in a matter of seconds. This requires advanced look-ahead capabilities and processing systems found in newer machine tools. Rigidity throughout the machine tool from the spindle bearings all the way through to the ball screws ensures smooth cutting, consistent tool life and unsurpassed part quality.

### 4. CHOOSE A SUITABLE PROGRAMMING METHOD

It is nearly impossible to program an optimized roughing strategy manually. Many companies provide state-of-the-art programming software. Careful consideration must be made when choosing the right software or software add on. Not all software is created equal. For example, a programming software designed only for complex 3D high speed milling may not be able to perform the complex radial moves inside of tight corners to maintain a consistent angle of engagement. This is one of the many keys to successful optimized roughing strategies.

### 5. SELECT THE RIGHT DEPTH OF CUT

Take advantage of the full flute length of the tool selected for the specific application. Maximizing depth of cuts above 2 times the diameter of the tool is common when optimized roughing. Smaller radial step-overs make such depths of the cut possible. A larger step-over would increase the amount of heat in the cut, which in-turn will have a negative effect on tool life and performance. Therefore, rpm and feed rates must be reduced. A cut that is too deep, over 3 x D for instance, can create cutting pressures greater than what the tool can bear and possibly cause deflection. In this circumstance, chip splitters can minimize radial cutting pressure reducing deflection and aiding in chip control.

### 6. FOLLOW RECOMMENDED CUTTING PARAMETERS

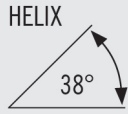
After meticulous research and years of firsthand experience, we have developed specific recommended cutting parameters. Always to be used as a starting point, cutting data is optimized per tool design, specifications and material groups. Modifications can be made depending on the application.





## MULTI FLUTE-S638 & S638R

SOLID CARBIDE



CENTER CUTTING

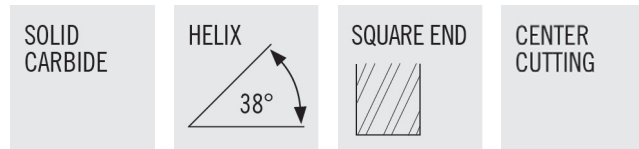


- Eccentric O.D. relief creating a stronger cutting edge
- Variable indexing to reduce harmonics providing smoother cutting and improved surface finish
- Designed for peripheral roughing and finishing for stainless steel, titanium, and high temperature alloys
- Excellent in high speed milling and optimized roughing techniques
- Designed for increased radial depths as compared to the S738 and S938
- High performance with minimal deflection
- Cutting Data - Page 71-73
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N15378</a> | S638-0.125-F3-S.0-Z6     | 1/8       | 1/4       | 5/16          | 2              | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N15379</a> | S638R-0.125-F3-R010.0-Z6 | 1/8       | 1/4       | 5/16          | 2              | 6      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N15380</a> | S638-0.188-F3-S.0-Z6     | 3/16      | 1/4       | 1/2           | 2              | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N15381</a> | S638R-0.188-F3-R010.0-Z6 | 3/16      | 1/4       | 1/2           | 2              | 6      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N15382</a> | S638-0.250-D3-S.0-Z6     | 1/4       | 1/4       | 5/8           | 2              | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N15383</a> | S638R-0.250-D3-R015.0-Z6 | 1/4       | 1/4       | 5/8           | 2              | 6      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N15384</a> | S638R-0.250-D3-R030.0-Z6 | 1/4       | 1/4       | 5/8           | 2              | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15388</a> | S638-0.313-D2-S.0-Z6     | 5/16      | 5/16      | 3/4           | 2              | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N15389</a> | S638R-0.313-D2-R015.0-Z6 | 5/16      | 5/16      | 3/4           | 2              | 6      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N15390</a> | S638R-0.313-D2-R030.0-Z6 | 5/16      | 5/16      | 3/4           | 2              | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N00524</a> | S638-0.375-D1-S.0-Z6     | 3/8       | 3/8       | 1             | 2-1/2          | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N00455</a> | S638R-0.375-D1-R015.0-Z6 | 3/8       | 3/8       | 1             | 2-1/2          | 6      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N00456</a> | S638R-0.375-D1-R030.0-Z6 | 3/8       | 3/8       | 1             | 2-1/2          | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N00457</a> | S638-0.500-D1-S.0-Z6     | 1/2       | 1/2       | 1-1/4         | 3              | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N00458</a> | S638R-0.500-D1-R015.0-Z6 | 1/2       | 1/2       | 1-1/4         | 3              | 6      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N00459</a> | S638R-0.500-D1-R030.0-Z6 | 1/2       | 1/2       | 1-1/4         | 3              | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N00462</a> | S638R-0.500-D1-R060.0-Z6 | 1/2       | 1/2       | 1-1/4         | 3              | 6      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N00463</a> | S638R-0.500-D1-R090.0-Z6 | 1/2       | 1/2       | 1-1/4         | 3              | 6      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N00464</a> | S638R-0.500-D1-R120.0-Z6 | 1/2       | 1/2       | 1-1/4         | 3              | 6      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N00465</a> | S638-0.625-D1-S.0-Z6     | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N00466</a> | S638R-0.625-D1-R015.0-Z6 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 6      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N00467</a> | S638R-0.625-D1-R030.0-Z6 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N00468</a> | S638R-0.625-D1-R060.0-Z6 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 6      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N00469</a> | S638R-0.625-D1-R090.0-Z6 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 6      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N00472</a> | S638R-0.625-D1-R120.0-Z6 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 6      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N00473</a> | S638-0.750-D1-S.0-Z6     | 3/4       | 3/4       | 1-3/4         | 4              | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N00474</a> | S638R-0.750-D1-R030.0-Z6 | 3/4       | 3/4       | 1-3/4         | 4              | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N00475</a> | S638R-0.750-D1-R060.0-Z6 | 3/4       | 3/4       | 1-3/4         | 4              | 6      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N00476</a> | S638R-0.750-D1-R090.0-Z6 | 3/4       | 3/4       | 1-3/4         | 4              | 6      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N00477</a> | S638R-0.750-D1-R120.0-Z6 | 3/4       | 3/4       | 1-3/4         | 4              | 6      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N00478</a> | S638R-0.750-D1-R190.0-Z6 | 3/4       | 3/4       | 1-3/4         | 4              | 6      | ALTIN   | 0.190  | CYLINDRICAL |
| <a href="#">N00479</a> | S638-1.000-D1-S.0-Z6     | 1         | 1         | 2             | 5              | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N00482</a> | S638R-1.000-D1-R030.0-Z6 | 1         | 1         | 2             | 5              | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N00483</a> | S638R-1.000-D1-R060.0-Z6 | 1         | 1         | 2             | 5              | 6      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N00484</a> | S638R-1.000-D1-R090.0-Z6 | 1         | 1         | 2             | 5              | 6      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N00485</a> | S638R-1.000-D1-R120.0-Z6 | 1         | 1         | 2             | 5              | 6      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N00486</a> | S638R-1.000-D1-R190.0-Z6 | 1         | 1         | 2             | 5              | 6      | ALTIN   | 0.190  | CYLINDRICAL |
| <a href="#">N00487</a> | S638R-1.000-D1-R250.0-Z6 | 1         | 1         | 2             | 5              | 6      | ALTIN   | 0.250  | CYLINDRICAL |

DISCOUNT CODE D43

## MULTI FLUTE-SN638 & SN638R

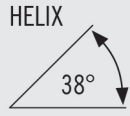


- Eccentric O.D. relief creating a stronger cutting edge
- Variable indexing to reduce harmonics providing smoother cutting and improved surface finish
- Designed for peripheral roughing and finishing for stainless steel, titanium, and high temperature alloys
- Excellent in high speed milling and optimized roughing techniques
- High performance with minimal deflection
- Cutting Data - Page 71-73
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|--------|-------------|
| <a href="#">N15397</a> | SN638-0.375-E3-S.0-Z6     | 3/8       | 3/8       | 1             | 3              | 0.360    | 1-1/2 | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N15398</a> | SN638R-0.375-E3-R015.0-Z6 | 3/8       | 3/8       | 1             | 3              | 0.360    | 1-1/2 | 6      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N15399</a> | SN638R-0.375-E3-R030.0-Z6 | 3/8       | 3/8       | 1             | 3              | 0.360    | 1-1/2 | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15406</a> | SN638-0.500-E2-S.0-Z6     | 1/2       | 1/2       | 1-1/8         | 4              | 0.480    | 2     | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N15407</a> | SN638R-0.500-E2-R030.0-Z6 | 1/2       | 1/2       | 1-1/8         | 4              | 0.480    | 2     | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15408</a> | SN638R-0.500-E2-R060.0-Z6 | 1/2       | 1/2       | 1-1/8         | 4              | 0.480    | 2     | 6      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N15409</a> | SN638R-0.500-E2-R120.0-Z6 | 1/2       | 1/2       | 1-1/8         | 4              | 0.480    | 2     | 6      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N15418</a> | SN638-0.625-E2-S.0-Z6     | 5/8       | 5/8       | 1-3/8         | 5              | 0.600    | 2-1/2 | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N15419</a> | SN638R-0.625-E2-R015.0-Z6 | 5/8       | 5/8       | 1-3/8         | 5              | 0.600    | 2-1/2 | 6      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N15420</a> | SN638R-0.625-E2-R030.0-Z6 | 5/8       | 5/8       | 1-3/8         | 5              | 0.600    | 2-1/2 | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15421</a> | SN638R-0.625-E2-R060.0-Z6 | 5/8       | 5/8       | 1-3/8         | 5              | 0.600    | 2-1/2 | 6      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N15430</a> | SN638-0.750-E2-S.0-Z6     | 3/4       | 3/4       | 1-3/4         | 6              | 0.720    | 3     | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N15431</a> | SN638R-0.750-E2-R030.0-Z6 | 3/4       | 3/4       | 1-3/4         | 6              | 0.720    | 3     | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15432</a> | SN638R-0.750-E2-R060.0-Z6 | 3/4       | 3/4       | 1-3/4         | 6              | 0.720    | 3     | 6      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N15433</a> | SN638R-0.750-E2-R120.0-Z6 | 3/4       | 3/4       | 1-3/4         | 6              | 0.720    | 3     | 6      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N15441</a> | SN638R-1.000-E2-R030.0-Z6 | 1         | 1         | 2-1/4         | 7              | 0.960    | 4-1/8 | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15442</a> | SN638R-1.000-E2-R060.0-Z6 | 1         | 1         | 2-1/4         | 7              | 0.960    | 4-1/8 | 6      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N15443</a> | SN638R-1.000-E2-R090.0-Z6 | 1         | 1         | 2-1/4         | 7              | 0.960    | 4-1/8 | 6      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N15444</a> | SN638R-1.000-E2-R120.0-Z6 | 1         | 1         | 2-1/4         | 7              | 0.960    | 4-1/8 | 6      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N15445</a> | SN638R-1.000-E2-R250.0-Z6 | 1         | 1         | 2-1/4         | 7              | 0.960    | 4-1/8 | 6      | ALTIN   | 0.250  | CYLINDRICAL |

## MULTI FLUTE-SB638

SOLID CARBIDE



CENTER CUTTING



- Eccentric O.D. relief creating a stronger cutting edge
- Variable indexing to reduce harmonics providing smoother cutting and improved surface finish
- Designed for peripheral roughing and finishing for stainless steel, titanium, and high temperature alloys
- Excellent in high speed milling and optimized roughing techniques
- High performance with minimal deflection
- Cutting Data - Page 71-75
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N15385</a> | SB638-0.250-D1-B.0-Z6 | 1/4       | 1/4       | 1/4           | 2              | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15386</a> | SB638-0.250-D3-B.0-Z6 | 1/4       | 1/4       | 5/8           | 2              | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15391</a> | SB638-0.313-D1-B.0-Z6 | 5/16      | 5/16      | 5/16          | 2              | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15392</a> | SB638-0.313-D2-B.0-Z6 | 5/16      | 5/16      | 3/4           | 2              | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15394</a> | SB638-0.375-D1-B.0-Z6 | 3/8       | 3/8       | 3/8           | 2              | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15395</a> | SB638-0.375-D3-B.0-Z6 | 3/8       | 3/8       | 1             | 2-1/2          | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15403</a> | SB638-0.500-D1-B.0-Z6 | 1/2       | 1/2       | 1/2           | 2-1/2          | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15404</a> | SB638-0.500-D3-B.0-Z6 | 1/2       | 1/2       | 1-1/4         | 3              | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15415</a> | SB638-0.625-D1-B.0-Z6 | 5/8       | 5/8       | 5/8           | 3              | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15416</a> | SB638-0.625-D3-B.0-Z6 | 5/8       | 5/8       | 1-5/8         | 4              | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15427</a> | SB638-0.750-D1-B.0-Z6 | 3/4       | 3/4       | 3/4           | 3              | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15428</a> | SB638-0.750-D2-B.0-Z6 | 3/4       | 3/4       | 1-3/4         | 4              | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15438</a> | SB638-1.000-D1-B.0-Z6 | 1         | 1         | 1             | 4              | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15439</a> | SB638-1.000-D2-B.0-Z6 | 1         | 1         | 2             | 5              | 6      | ALTIN   | CYLINDRICAL |

## MULTI FLUTE-SBN638

SOLID CARBIDE



CENTER CUTTING

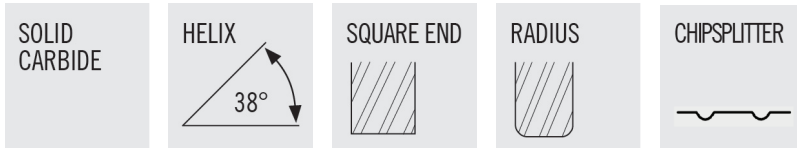


- Eccentric O.D. relief creating a stronger cutting edge
- Variable indexing to reduce harmonics providing smoother cutting and improved surface finish
- Designed for peripheral roughing and finishing for stainless steel, titanium, and high temperature alloys
- Excellent in high speed milling and optimized roughing techniques
- High performance with minimal deflection
- Cutting Data - Page 71-75
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | SHANK TYPE  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|-------------|
| <a href="#">N15387</a> | SBN638-0.250-E1-B.0-Z6 | 1/4       | 1/4       | 1/4           | 2              | 0.240    | 3/4   | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15393</a> | SBN638-0.313-E1-B.0-Z6 | 5/16      | 5/16      | 5/16          | 2-1/2          | 0.300    | 1     | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15396</a> | SBN638-0.375-E1-B.0-Z6 | 3/8       | 3/8       | 3/8           | 2-1/2          | 0.360    | 1-1/4 | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15405</a> | SBN638-0.500-E1-B.0-Z6 | 1/2       | 1/2       | 1/2           | 3              | 0.480    | 1-1/2 | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15417</a> | SBN638-0.625-E1-B.0-Z6 | 5/8       | 5/8       | 5/8           | 4              | 0.600    | 1-7/8 | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15429</a> | SBN638-0.750-E1-B.0-Z6 | 3/4       | 3/4       | 3/4           | 5              | 0.720    | 2-1/4 | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N15440</a> | SBN638-1.000-E1-B.0-Z6 | 1         | 1         | 1             | 6              | 0.960    | 3     | 6      | ALTIN   | CYLINDRICAL |

DISCOUNT CODE D43

## MULTI FLUTE-SCS638 & SCS638R

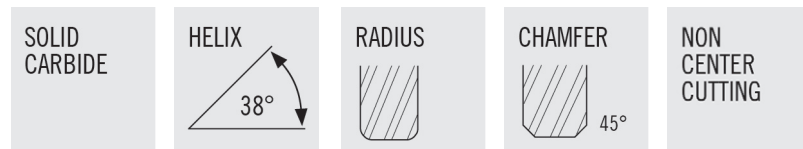


- Eccentric O.D. relief creating a stronger cutting edge
- Variable indexing to reduce harmonics providing smoother cutting and improved surface finish
- Designed for peripheral roughing and finishing for stainless steel, titanium, and high temperature alloys
- Excellent in high speed milling and optimized roughing techniques
- Designed for increased radial depths as compared to the SCS738 and SCS938
- High performance with minimal deflection
- Advanced chip splitter design for increased chip control and management

- Cutting Data - Page 76
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION                | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|----------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N15400</a> | SCS638-0.375-D3-S.0-Z6     | 3/8       | 3/8       | 1-1/4         | 3              | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N15401</a> | SCS638R-0.375-D3-R015.0-Z6 | 3/8       | 3/8       | 1-1/4         | 3              | 6      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N15402</a> | SCS638R-0.375-D3-R030.0-Z6 | 3/8       | 3/8       | 1-1/4         | 3              | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15410</a> | SCS638-0.500-D3-S.0-Z6     | 1/2       | 1/2       | 1-5/8         | 4              | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N15411</a> | SCS638R-0.500-D3-R015.0-Z6 | 1/2       | 1/2       | 1-5/8         | 4              | 6      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N15412</a> | SCS638R-0.500-D3-R030.0-Z6 | 1/2       | 1/2       | 1-5/8         | 4              | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15413</a> | SCS638R-0.500-D3-R060.0-Z6 | 1/2       | 1/2       | 1-5/8         | 4              | 6      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N15414</a> | SCS638R-0.500-D3-R120.0-Z6 | 1/2       | 1/2       | 1-5/8         | 4              | 6      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N15422</a> | SCS638-0.625-D3-S.0-Z6     | 5/8       | 5/8       | 2             | 4              | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N15423</a> | SCS638R-0.625-D3-R015.0-Z6 | 5/8       | 5/8       | 2             | 4              | 6      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N15424</a> | SCS638R-0.625-D3-R030.0-Z6 | 5/8       | 5/8       | 2             | 4              | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15425</a> | SCS638R-0.625-D3-R060.0-Z6 | 5/8       | 5/8       | 2             | 4              | 6      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N15426</a> | SCS638R-0.625-D3-R120.0-Z6 | 5/8       | 5/8       | 2             | 4              | 6      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N15434</a> | SCS638-0.750-D3-S.0-Z6     | 3/4       | 3/4       | 2-1/2         | 5              | 6      | ALTIN   | -      | CYLINDRICAL |
| <a href="#">N15435</a> | SCS638R-0.750-D3-R030.0-Z6 | 3/4       | 3/4       | 2-1/2         | 5              | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15436</a> | SCS638R-0.750-D3-R060.0-Z6 | 3/4       | 3/4       | 2-1/2         | 5              | 6      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N15437</a> | SCS638R-0.750-D3-R120.0-Z6 | 3/4       | 3/4       | 2-1/2         | 5              | 6      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N15446</a> | SCS638R-1.000-D3-R030.0-Z6 | 1         | 1         | 3-1/8         | 6              | 6      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15447</a> | SCS638R-1.000-D3-R120.0-Z6 | 1         | 1         | 3-1/8         | 6              | 6      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N15448</a> | SCS638R-1.000-D3-R250.0-Z6 | 1         | 1         | 3-1/8         | 6              | 6      | ALTIN   | 0.250  | CYLINDRICAL |

## MULTI FLUTE-S738 & S738R

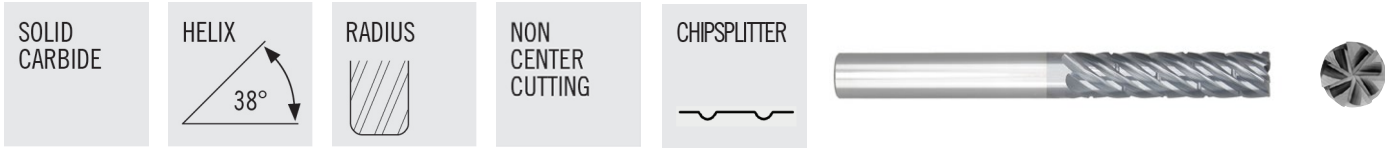


- Eccentric O.D. relief creating a stronger cutting edge
- Variable indexing to reduce harmonics providing smoother cutting and improved surface finish
- Designed for peripheral roughing and finishing for stainless steel, titanium, and high temperature alloys
- Excellent in high speed milling and optimized roughing techniques
- High performance with minimal deflection

- Cutting Data - Page 77-78
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | CHAMFER | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|---------|-------------|
| <a href="#">N58244</a> | S738-0.250-D2-C003.0-Z7  | 1/4       | 1/4       | 3/8           | 2              | 7      | ALTIN   | -      | 0.003   | CYLINDRICAL |
| <a href="#">N58245</a> | S738R-0.250-D2-R015.0-Z7 | 1/4       | 1/4       | 3/8           | 2              | 7      | ALTIN   | 0.015  | -       | CYLINDRICAL |
| <a href="#">N58246</a> | S738R-0.250-D2-R030.0-Z7 | 1/4       | 1/4       | 3/8           | 2              | 7      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58247</a> | S738-0.250-D3-C003.0-Z7  | 1/4       | 1/4       | 3/4           | 2-1/2          | 7      | ALTIN   | -      | 0.003   | CYLINDRICAL |
| <a href="#">N58248</a> | S738R-0.250-D3-R015.0-Z7 | 1/4       | 1/4       | 3/4           | 2-1/2          | 7      | ALTIN   | 0.015  | -       | CYLINDRICAL |
| <a href="#">N58249</a> | S738R-0.250-D3-R030.0-Z7 | 1/4       | 1/4       | 3/4           | 2-1/2          | 7      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58250</a> | S738-0.250-D5-C003.0-Z7  | 1/4       | 1/4       | 1-1/4         | 3              | 7      | ALTIN   | -      | 0.003   | CYLINDRICAL |
| <a href="#">N58251</a> | S738R-0.250-D5-R015.0-Z7 | 1/4       | 1/4       | 1-1/4         | 3              | 7      | ALTIN   | 0.015  | -       | CYLINDRICAL |
| <a href="#">N58252</a> | S738R-0.250-D5-R030.0-Z7 | 1/4       | 1/4       | 1-1/4         | 3              | 7      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58253</a> | S738-0.375-D1-C005.0-Z7  | 3/8       | 3/8       | 1/2           | 2-1/2          | 7      | ALTIN   | -      | 0.005   | CYLINDRICAL |
| <a href="#">N58254</a> | S738R-0.375-D1-R015.0-Z7 | 3/8       | 3/8       | 1/2           | 2-1/2          | 7      | ALTIN   | 0.015  | -       | CYLINDRICAL |
| <a href="#">N58255</a> | S738R-0.375-D1-R030.0-Z7 | 3/8       | 3/8       | 1/2           | 2-1/2          | 7      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58256</a> | S738-0.375-D3-C005.0-Z7  | 3/8       | 3/8       | 1             | 3              | 7      | ALTIN   | -      | 0.005   | CYLINDRICAL |
| <a href="#">N58257</a> | S738R-0.375-D3-R015.0-Z7 | 3/8       | 3/8       | 1             | 3              | 7      | ALTIN   | 0.015  | -       | CYLINDRICAL |
| <a href="#">N58258</a> | S738R-0.375-D3-R030.0-Z7 | 3/8       | 3/8       | 1             | 3              | 7      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58259</a> | S738-0.375-D4-C005.0-Z7  | 3/8       | 3/8       | 1-1/2         | 3-1/2          | 7      | ALTIN   | -      | 0.005   | CYLINDRICAL |
| <a href="#">N58260</a> | S738R-0.375-D4-R015.0-Z7 | 3/8       | 3/8       | 1-1/2         | 3-1/2          | 7      | ALTIN   | 0.015  | -       | CYLINDRICAL |
| <a href="#">N58261</a> | S738R-0.375-D4-R030.0-Z7 | 3/8       | 3/8       | 1-1/2         | 3-1/2          | 7      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58262</a> | S738-0.500-D2-C006.0-Z7  | 1/2       | 1/2       | 3/4           | 3              | 7      | ALTIN   | -      | 0.006   | CYLINDRICAL |
| <a href="#">N58263</a> | S738R-0.500-D2-R015.0-Z7 | 1/2       | 1/2       | 3/4           | 3              | 7      | ALTIN   | 0.015  | -       | CYLINDRICAL |
| <a href="#">N58264</a> | S738R-0.500-D2-R030.0-Z7 | 1/2       | 1/2       | 3/4           | 3              | 7      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58265</a> | S738R-0.500-D2-R060.0-Z7 | 1/2       | 1/2       | 3/4           | 3              | 7      | ALTIN   | 0.060  | -       | CYLINDRICAL |
| <a href="#">N58266</a> | S738-0.500-D3-C006.0-Z7  | 1/2       | 1/2       | 1-1/4         | 3              | 7      | ALTIN   | -      | 0.006   | CYLINDRICAL |
| <a href="#">N58267</a> | S738R-0.500-D3-R015.0-Z7 | 1/2       | 1/2       | 1-1/4         | 3              | 7      | ALTIN   | 0.015  | -       | CYLINDRICAL |
| <a href="#">N58268</a> | S738R-0.500-D3-R030.0-Z7 | 1/2       | 1/2       | 1-1/4         | 3              | 7      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58269</a> | S738R-0.500-D3-R060.0-Z7 | 1/2       | 1/2       | 1-1/4         | 3              | 7      | ALTIN   | 0.060  | -       | CYLINDRICAL |
| <a href="#">N58270</a> | S738-0.500-D4-C006.0-Z7  | 1/2       | 1/2       | 2             | 4              | 7      | ALTIN   | -      | 0.006   | CYLINDRICAL |
| <a href="#">N58271</a> | S738R-0.500-D4-R015.0-Z7 | 1/2       | 1/2       | 2             | 4              | 7      | ALTIN   | 0.015  | -       | CYLINDRICAL |
| <a href="#">N58272</a> | S738R-0.500-D4-R030.0-Z7 | 1/2       | 1/2       | 2             | 4              | 7      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58273</a> | S738R-0.500-D4-R060.0-Z7 | 1/2       | 1/2       | 2             | 4              | 7      | ALTIN   | 0.060  | -       | CYLINDRICAL |

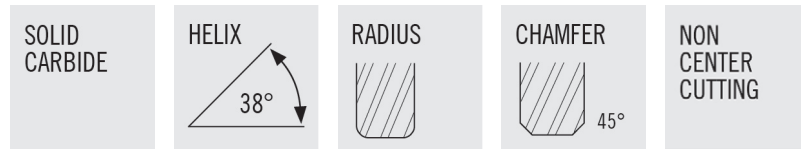
**MULTI FLUTE-SCS738R**



- Eccentric O.D. relief creating a stronger cutting edge
- Variable indexing to reduce harmonics providing smoother cutting and improved surface finish
- Designed for peripheral roughing and finishing for stainless steel, titanium, and high temperature alloys
- Excellent in high speed milling and optimized roughing techniques
- High performance with minimal deflection
- Advanced chip splitter design for increased chip control and management
- Cutting Data - Page 79
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION                | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|----------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N15449</a> | SCS738R-0.250-D3-R015.0-Z7 | 1/4       | 1/4       | 3/4           | 2-1/2          | 7      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N15450</a> | SCS738R-0.250-D5-R015.0-Z7 | 1/4       | 1/4       | 1-1/4         | 3              | 7      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N15451</a> | SCS738R-0.375-D3-R015.0-Z7 | 3/8       | 3/8       | 1             | 3              | 7      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N15452</a> | SCS738R-0.375-D4-R015.0-Z7 | 3/8       | 3/8       | 1-1/2         | 3-1/2          | 7      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N15453</a> | SCS738R-0.500-D3-R030.0-Z7 | 1/2       | 1/2       | 1-1/4         | 3              | 7      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15454</a> | SCS738R-0.500-D4-R030.0-Z7 | 1/2       | 1/2       | 2             | 4              | 7      | ALTIN   | 0.030  | CYLINDRICAL |

## MULTI FLUTE-S938 & S938R



- Eccentric O.D. relief creating a stronger cutting edge
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- Designed for peripheral roughing and finishing for stainless steel, titanium, and high temperature alloys
- Excellent in high speed milling and optimized roughing techniques
- High performance with minimal deflection
- Cutting Data - Page 77-78
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | CHAMFER | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|---------|-------------|
| <a href="#">N58274</a> | S938-0.625-D1-C008.0-Z9  | 5/8       | 5/8       | 3/4           | 3              | 9      | ALTIN   | -      | 0.008   | CYLINDRICAL |
| <a href="#">N58275</a> | S938R-0.625-D1-R030.0-Z9 | 5/8       | 5/8       | 3/4           | 3              | 9      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58276</a> | S938R-0.625-D1-R060.0-Z9 | 5/8       | 5/8       | 3/4           | 3              | 9      | ALTIN   | 0.060  | -       | CYLINDRICAL |
| <a href="#">N58277</a> | S938R-0.625-D1-R090.0-Z9 | 5/8       | 5/8       | 3/4           | 3              | 9      | ALTIN   | 0.090  | -       | CYLINDRICAL |
| <a href="#">N58278</a> | S938R-0.625-D1-R120.0-Z9 | 5/8       | 5/8       | 3/4           | 3              | 9      | ALTIN   | 0.120  | -       | CYLINDRICAL |
| <a href="#">N58279</a> | S938-0.625-D3-C008.0-Z9  | 5/8       | 5/8       | 1-5/8         | 4              | 9      | ALTIN   | -      | 0.008   | CYLINDRICAL |
| <a href="#">N58280</a> | S938R-0.625-D3-R030.0-Z9 | 5/8       | 5/8       | 1-5/8         | 4              | 9      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58281</a> | S938R-0.625-D3-R060.0-Z9 | 5/8       | 5/8       | 1-5/8         | 4              | 9      | ALTIN   | 0.060  | -       | CYLINDRICAL |
| <a href="#">N58282</a> | S938R-0.625-D3-R090.0-Z9 | 5/8       | 5/8       | 1-5/8         | 4              | 9      | ALTIN   | 0.090  | -       | CYLINDRICAL |
| <a href="#">N58283</a> | S938R-0.625-D3-R120.0-Z9 | 5/8       | 5/8       | 1-5/8         | 4              | 9      | ALTIN   | 0.120  | -       | CYLINDRICAL |
| <a href="#">N58284</a> | S938-0.625-D4-C008.0-Z9  | 5/8       | 5/8       | 2-1/2         | 5              | 9      | ALTIN   | -      | 0.008   | CYLINDRICAL |
| <a href="#">N58285</a> | S938R-0.625-D4-R030.0-Z9 | 5/8       | 5/8       | 2-1/2         | 5              | 9      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58286</a> | S938R-0.625-D4-R060.0-Z9 | 5/8       | 5/8       | 2-1/2         | 5              | 9      | ALTIN   | 0.060  | -       | CYLINDRICAL |
| <a href="#">N58287</a> | S938R-0.625-D4-R090.0-Z9 | 5/8       | 5/8       | 2-1/2         | 5              | 9      | ALTIN   | 0.090  | -       | CYLINDRICAL |
| <a href="#">N58288</a> | S938R-0.625-D4-R120.0-Z9 | 5/8       | 5/8       | 2-1/2         | 5              | 9      | ALTIN   | 0.120  | -       | CYLINDRICAL |
| <a href="#">N58289</a> | S938-0.750-D2-C010.0-Z9  | 3/4       | 3/4       | 1-5/8         | 4              | 9      | ALTIN   | -      | 0.010   | CYLINDRICAL |
| <a href="#">N58290</a> | S938R-0.750-D2-R030.0-Z9 | 3/4       | 3/4       | 1-5/8         | 4              | 9      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58291</a> | S938R-0.750-D2-R060.0-Z9 | 3/4       | 3/4       | 1-5/8         | 4              | 9      | ALTIN   | 0.060  | -       | CYLINDRICAL |
| <a href="#">N58292</a> | S938R-0.750-D2-R090.0-Z9 | 3/4       | 3/4       | 1-5/8         | 4              | 9      | ALTIN   | 0.090  | -       | CYLINDRICAL |
| <a href="#">N58293</a> | S938R-0.750-D2-R120.0-Z9 | 3/4       | 3/4       | 1-5/8         | 4              | 9      | ALTIN   | 0.120  | -       | CYLINDRICAL |
| <a href="#">N58294</a> | S938-0.750-D3-C010.0-Z9  | 3/4       | 3/4       | 2-1/4         | 5              | 9      | ALTIN   | -      | 0.010   | CYLINDRICAL |
| <a href="#">N58295</a> | S938R-0.750-D3-R030.0-Z9 | 3/4       | 3/4       | 2-1/4         | 5              | 9      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58296</a> | S938R-0.750-D3-R060.0-Z9 | 3/4       | 3/4       | 2-1/4         | 5              | 9      | ALTIN   | 0.060  | -       | CYLINDRICAL |
| <a href="#">N58297</a> | S938R-0.750-D3-R090.0-Z9 | 3/4       | 3/4       | 2-1/4         | 5              | 9      | ALTIN   | 0.090  | -       | CYLINDRICAL |
| <a href="#">N58298</a> | S938R-0.750-D3-R120.0-Z9 | 3/4       | 3/4       | 2-1/4         | 5              | 9      | ALTIN   | 0.120  | -       | CYLINDRICAL |
| <a href="#">N58299</a> | S938-0.750-D4-C010.0-Z9  | 3/4       | 3/4       | 3-1/4         | 6              | 9      | ALTIN   | -      | 0.010   | CYLINDRICAL |
| <a href="#">N58300</a> | S938R-0.750-D4-R030.0-Z9 | 3/4       | 3/4       | 3-1/4         | 6              | 9      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58301</a> | S938R-0.750-D4-R060.0-Z9 | 3/4       | 3/4       | 3-1/4         | 6              | 9      | ALTIN   | 0.060  | -       | CYLINDRICAL |
| <a href="#">N58302</a> | S938R-0.750-D4-R090.0-Z9 | 3/4       | 3/4       | 3-1/4         | 6              | 9      | ALTIN   | 0.090  | -       | CYLINDRICAL |
| <a href="#">N58303</a> | S938R-0.750-D4-R120.0-Z9 | 3/4       | 3/4       | 3-1/4         | 6              | 9      | ALTIN   | 0.120  | -       | CYLINDRICAL |
| <a href="#">N58304</a> | S938-1.000-D2-C012.0-Z9  | 1         | 1         | 2             | 5              | 9      | ALTIN   | -      | 0.012   | CYLINDRICAL |
| <a href="#">N58305</a> | S938R-1.000-D2-R030.0-Z9 | 1         | 1         | 2             | 5              | 9      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58306</a> | S938R-1.000-D2-R060.0-Z9 | 1         | 1         | 2             | 5              | 9      | ALTIN   | 0.060  | -       | CYLINDRICAL |

## MULTI FLUTE-S938 & S938R (CONT'D)

SOLID CARBIDE

HELIX

CHAMFER

RADIUS

NON CENTER CUTTING



- Eccentric O.D. relief creating a stronger cutting edge
  - Variable indexing to reduce harmonics providing smoother cutting and improved surface finish
  - Designed for peripheral roughing and finishing for stainless steel, titanium, and high temperature alloys
  - Excellent in high speed milling and optimized roughing techniques
  - High performance with minimal deflection
- Cutting Data - Page 77-78
  - Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | CHAMFER | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|---------|-------------|
| <a href="#">N58307</a> | S938R-1.000-D2-R090.0-Z9 | 1         | 1         | 2             | 5              | 9      | ALTIN   | 0.090  | -       | CYLINDRICAL |
| <a href="#">N58308</a> | S938R-1.000-D2-R120.0-Z9 | 1         | 1         | 2             | 5              | 9      | ALTIN   | 0.120  | -       | CYLINDRICAL |
| <a href="#">N58309</a> | S938-1.000-D3-C012.0-Z9  | 1         | 1         | 3-1/4         | 6              | 9      | ALTIN   | -      | 0.012   | CYLINDRICAL |
| <a href="#">N58310</a> | S938R-1.000-D3-R030.0-Z9 | 1         | 1         | 3-1/4         | 6              | 9      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58311</a> | S938R-1.000-D3-R060.0-Z9 | 1         | 1         | 3-1/4         | 6              | 9      | ALTIN   | 0.060  | -       | CYLINDRICAL |
| <a href="#">N58312</a> | S938R-1.000-D3-R090.0-Z9 | 1         | 1         | 3-1/4         | 6              | 9      | ALTIN   | 0.090  | -       | CYLINDRICAL |
| <a href="#">N58313</a> | S938R-1.000-D3-R120.0-Z9 | 1         | 1         | 3-1/4         | 6              | 9      | ALTIN   | 0.120  | -       | CYLINDRICAL |
| <a href="#">N58314</a> | S938-1.000-D4-C012.0-Z9  | 1         | 1         | 4-1/8         | 7              | 9      | ALTIN   | -      | 0.012   | CYLINDRICAL |
| <a href="#">N58315</a> | S938R-1.000-D4-R030.0-Z9 | 1         | 1         | 4-1/8         | 7              | 9      | ALTIN   | 0.030  | -       | CYLINDRICAL |
| <a href="#">N58316</a> | S938R-1.000-D4-R060.0-Z9 | 1         | 1         | 4-1/8         | 7              | 9      | ALTIN   | 0.060  | -       | CYLINDRICAL |
| <a href="#">N58317</a> | S938R-1.000-D4-R090.0-Z9 | 1         | 1         | 4-1/8         | 7              | 9      | ALTIN   | 0.090  | -       | CYLINDRICAL |
| <a href="#">N58318</a> | S938R-1.000-D4-R120.0-Z9 | 1         | 1         | 4-1/8         | 7              | 9      | ALTIN   | 0.120  | -       | CYLINDRICAL |

## MULTI FLUTE-SCS938R

SOLID CARBIDE

HELIX

RADIUS

NON CENTER CUTTING

CHIPSPLITTER



- Eccentric O.D. relief creating a stronger cutting edge
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  - Designed for peripheral roughing and finishing for stainless steel, titanium, and high temperature alloys
  - Excellent in high speed milling and optimized roughing techniques
  - High performance with minimal deflection
  - Advanced chip splitter design for increased chip control and management
- Cutting Data - Page 79
  - Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION                | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|----------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N15455</a> | SCS938R-0.625-D3-R030.0-Z9 | 5/8       | 5/8       | 1-5/8         | 4              | 9      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15456</a> | SCS938R-0.625-D4-R030.0-Z9 | 5/8       | 5/8       | 2-1/2         | 5              | 9      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15457</a> | SCS938R-0.750-D3-R030.0-Z9 | 3/4       | 3/4       | 2-1/4         | 5              | 9      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15458</a> | SCS938R-0.750-D4-R030.0-Z9 | 3/4       | 3/4       | 3-1/4         | 6              | 9      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15459</a> | SCS938R-1.000-D3-R030.0-Z9 | 1         | 1         | 3-1/4         | 6              | 9      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N15460</a> | SCS938R-1.000-D4-R030.0-Z9 | 1         | 1         | 4-1/8         | 7              | 9      | ALTIN   | 0.030  | CYLINDRICAL |



## S638 / S638R / SN638 / SN638R - START VALUES

| SIDE MILLING - ROUGHING |           |                           |                           |                           |             |                    |        |        |        |        |        |        |        |        |
|-------------------------|-----------|---------------------------|---------------------------|---------------------------|-------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG       | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | V <sub>C</sub> (sf / min) |             | Z <sub>n</sub> = 6 |        |        |        |        |        |        |        |        |
|                         |           |                           |                           |                           |             | 1/8                | 3/16   | 1/4    | 5/16   | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E 1 - 2   | 2.00                      | 0.12                      | 700                       | n [min-1]   | 21392              | 14261  | 10696  | 8557   | 7131   | 5348   | 4278   | 3565   | 2674   |
|                         |           |                           |                           |                           | fz [in]     | 0.0010             | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                         |           |                           |                           | 525 - 875                 | vf [in/min] | 128                | 128    | 128    | 128    | 128    | 128    | 128    | 128    | 128    |
|                         | E 3 - 4   | 2.00                      | 0.12                      | 645                       | n [min-1]   | 19711              | 13141  | 9856   | 7884   | 6570   | 4928   | 3942   | 3285   | 2464   |
|                         |           |                           |                           |                           | fz [in]     | 0.0010             | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                         |           |                           |                           | 484 - 806                 | vf [in/min] | 118                | 118    | 118    | 118    | 118    | 118    | 118    | 118    | 118    |
|                         | E 5 - 6   | 2.00                      | 0.10                      | 525                       | n [min-1]   | 16044              | 10696  | 8022   | 6418   | 5348   | 4011   | 3209   | 2674   | 2006   |
|                         |           |                           |                           |                           | fz [in]     | 0.0008             | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0033 | 0.0041 | 0.0049 | 0.0065 |
|                         |           |                           |                           | 394 - 656                 | vf [in/min] | 78                 | 78     | 78     | 78     | 78     | 78     | 78     | 78     | 78     |
| M                       | E 8 - 9   | 2.00                      | 0.12                      | 600                       | n [min-1]   | 18336              | 12224  | 9168   | 7334   | 6112   | 4584   | 3667   | 3056   | 2292   |
|                         |           |                           |                           |                           | fz [in]     | 0.0009             | 0.0014 | 0.0019 | 0.0023 | 0.0028 | 0.0038 | 0.0047 | 0.0056 | 0.0075 |
|                         | E 10 - 11 | 2.00                      | 0.10                      | 565                       | n [min-1]   | 17266              | 11511  | 8633   | 6907   | 5755   | 4317   | 3453   | 2878   | 2158   |
|                         |           |                           |                           |                           | fz [in]     | 0.0008             | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0033 | 0.0041 | 0.0049 | 0.0065 |
| K                       | E 12 - 13 | 2.00                      | 0.10                      | 495                       | n [min-1]   | 15127              | 10085  | 7564   | 6051   | 5042   | 3782   | 3025   | 2521   | 1891   |
|                         |           |                           |                           |                           | fz [in]     | 0.0009             | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0070 |
|                         |           |                           |                           | 371 - 619                 | vf [in/min] | 79                 | 79     | 79     | 79     | 79     | 79     | 79     | 79     | 79     |
|                         | E 14 - 15 | 2.00                      | 0.10                      | 430                       | n [min-1]   | 13141              | 8761   | 6570   | 5256   | 4380   | 3285   | 2628   | 2190   | 1643   |
|                         |           |                           |                           |                           | fz [in]     | 0.0006             | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                         |           |                           |                           | 323 - 538                 | vf [in/min] | 49                 | 49     | 49     | 49     | 49     | 49     | 49     | 49     | 49     |
| S                       | E 19      | 2.00                      | 0.07                      | 150                       | n [min-1]   | 4584               | 3056   | 2292   | 1834   | 1528   | 1146   | 917    | 764    | 573    |
|                         |           |                           |                           |                           | fz [in]     | 0.0006             | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                         |           |                           |                           | 113 - 188                 | vf [in/min] | 17                 | 17     | 17     | 17     | 17     | 17     | 17     | 17     | 17     |
|                         | E 20      | 2.00                      | 0.06                      | 120                       | n [min-1]   | 3667               | 2445   | 1834   | 1467   | 1222   | 917    | 733    | 611    | 458    |
|                         |           |                           |                           |                           | fz [in]     | 0.0006             | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                         |           |                           |                           | 90 - 150                  | vf [in/min] | 12                 | 12     | 12     | 12     | 12     | 12     | 12     | 12     | 12     |
|                         | E 21      | 2.00                      | 0.06                      | 100                       | n [min-1]   | 3056               | 2037   | 1528   | 1222   | 1019   | 764    | 611    | 509    | 382    |
|                         |           |                           |                           |                           | fz [in]     | 0.0006             | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                         |           |                           |                           | 75 - 125                  | vf [in/min] | 10                 | 10     | 10     | 10     | 10     | 10     | 10     | 10     | 10     |
|                         | E 22      | 2.00                      | 0.10                      | 270                       | n [min-1]   | 8251               | 5501   | 4126   | 3300   | 2750   | 2063   | 1650   | 1375   | 1031   |
| fz [in]                 |           |                           |                           |                           | 0.0008      | 0.0012             | 0.0016 | 0.0020 | 0.0024 | 0.0033 | 0.0041 | 0.0049 | 0.0065 |        |
| 203 - 338               |           |                           |                           | vf [in/min]               | 40          | 40                 | 40     | 40     | 40     | 40     | 40     | 40     | 40     |        |

**NOTE: Optimized roughing is an excellent strategy for achieving quality parts and extending tool life, but requires use of the right equipment and cutting parameters. If you are having problems implementing the approach or want to learn more about how to use the strategy to process a part, contact the Technical Support Team at 1-800-TEC-TEAM (1-800-832-8326).**

SMG = Seco Material Group  
 n [min-1] = RPM  
 V<sub>C</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## SN638 / SN638R - START VALUES

| SIDE MILLING - ROUGHING |              |                           |                           |                     |             |           |        |        |        |        |
|-------------------------|--------------|---------------------------|---------------------------|---------------------|-------------|-----------|--------|--------|--------|--------|
| ISO GROUP               | SMG          | $a_p \times D_c$<br>(max) | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |             | $Z_n = 6$ |        |        |        |        |
|                         |              |                           |                           |                     |             | 3/8       | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E<br>1 - 2   | 2.00                      | 0.08                      | 700                 | n [min-1]   | 7131      | 5348   | 4278   | 3565   | 2674   |
|                         |              |                           |                           |                     | fz [in]     | 0.0030    | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                         |              |                           |                           | 525 - 875           | vf [in/min] | 128       | 128    | 128    | 128    | 128    |
|                         | E<br>3 - 4   | 2.00                      | 0.08                      | 645                 | n [min-1]   | 6570      | 4928   | 3942   | 3285   | 2464   |
|                         |              |                           |                           |                     | fz [in]     | 0.0030    | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                         |              |                           |                           | 484 - 806           | vf [in/min] | 118       | 118    | 118    | 118    | 118    |
|                         | E<br>5 - 6   | 2.00                      | 0.07                      | 525                 | n [min-1]   | 5348      | 4011   | 3209   | 2674   | 2006   |
|                         |              |                           |                           |                     | fz [in]     | 0.0024    | 0.0033 | 0.0041 | 0.0049 | 0.0065 |
|                         |              |                           |                           | 394 - 656           | vf [in/min] | 78        | 78     | 78     | 78     | 78     |
| M                       | E<br>8 - 9   | 2.00                      | 0.08                      | 600                 | n [min-1]   | 6112      | 4584   | 3667   | 3056   | 2292   |
|                         |              |                           |                           |                     | fz [in]     | 0.0028    | 0.0038 | 0.0047 | 0.0056 | 0.0075 |
|                         | E<br>10 - 11 | 2.00                      | 0.07                      | 565                 | n [min-1]   | 5755      | 4317   | 3453   | 2878   | 2158   |
|                         |              |                           |                           |                     | fz [in]     | 0.0024    | 0.0033 | 0.0041 | 0.0049 | 0.0065 |
| K                       | E<br>12 - 13 | 2.00                      | 0.07                      | 495                 | n [min-1]   | 5042      | 3782   | 3025   | 2521   | 1891   |
|                         |              |                           |                           |                     | fz [in]     | 0.0026    | 0.0035 | 0.0044 | 0.0053 | 0.0070 |
|                         | E<br>14 - 15 | 2.00                      | 0.07                      | 430                 | n [min-1]   | 4380      | 3285   | 2628   | 2190   | 1643   |
|                         |              |                           |                           |                     | fz [in]     | 0.0019    | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
| S                       | E<br>19      | 2.00                      | 0.05                      | 150                 | n [min-1]   | 1528      | 1146   | 917    | 764    | 573    |
|                         |              |                           |                           |                     | fz [in]     | 0.0019    | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                         |              |                           |                           | 113 - 188           | vf [in/min] | 17        | 17     | 17     | 17     | 17     |
|                         | E<br>20      | 2.00                      | 0.04                      | 120                 | n [min-1]   | 1222      | 917    | 733    | 611    | 458    |
|                         |              |                           |                           |                     | fz [in]     | 0.0017    | 0.0023 | 0.0029 | 0.0035 | 0.0046 |
|                         |              |                           |                           | 90 - 150            | vf [in/min] | 13        | 13     | 13     | 13     | 13     |
|                         | E<br>21      | 2.00                      | 0.04                      | 100                 | n [min-1]   | 1019      | 764    | 611    | 509    | 382    |
|                         |              |                           |                           |                     | fz [in]     | 0.0017    | 0.0023 | 0.0029 | 0.0035 | 0.0046 |
| E<br>22                 | 2.00         | 0.07                      | 270                       | n [min-1]           | 2750        | 2063      | 1650   | 1375   | 1031   |        |
|                         |              |                           |                           | fz [in]             | 0.0024      | 0.0033    | 0.0041 | 0.0049 | 0.0065 |        |
|                         |              |                           | 203 - 338                 | vf [in/min]         | 40          | 40        | 40     | 40     | 40     |        |



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SMG = Seco Material Group  
 n [min-1] = RPM  
 $v_c$  (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 $a_p/D_c$  = % of diameter  
 $a_e/D_c$  = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## S638 / S638R / SN638 / SN638R / SB638 / SBN638 - START VALUES

| SIDE MILLING - FINISHING |           |                                       |                                       |                           |             |                    |        |        |        |        |        |        |        |        |
|--------------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP                | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |             | Z <sub>n</sub> = 6 |        |        |        |        |        |        |        |        |
|                          |           |                                       |                                       |                           |             | 1/8                | 3/16   | 1/4    | 5/16   | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                        | E 1 - 2   | 2.00                                  | 0.02                                  | 805                       | n [min-1]   | 24601              | 16401  | 12300  | 9840   | 8200   | 6150   | 4920   | 4100   | 3075   |
|                          |           |                                       |                                       |                           | fz [in]     | 0.0006             | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                          |           |                                       |                                       |                           | vf [in/min] | 92                 | 92     | 92     | 92     | 92     | 92     | 92     | 92     | 92     |
|                          | E 3 - 4   | 2.00                                  | 0.02                                  | 742                       | n [min-1]   | 22676              | 15117  | 11338  | 9070   | 7559   | 5669   | 4535   | 3779   | 2834   |
|                          |           |                                       |                                       |                           | fz [in]     | 0.0006             | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                          |           |                                       |                                       |                           | vf [in/min] | 85                 | 85     | 85     | 85     | 85     | 85     | 85     | 85     | 85     |
|                          | E 5 - 6   | 2.00                                  | 0.02                                  | 604                       | n [min-1]   | 18458              | 12305  | 9229   | 7383   | 6153   | 4615   | 3692   | 3076   | 2307   |
|                          |           |                                       |                                       |                           | fz [in]     | 0.0006             | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                          |           |                                       |                                       |                           | vf [in/min] | 69                 | 69     | 69     | 69     | 69     | 69     | 69     | 69     | 69     |
| M                        | E 8 - 9   | 2.00                                  | 0.02                                  | 690                       | n [min-1]   | 21086              | 14058  | 10543  | 8435   | 7029   | 5272   | 4217   | 3514   | 2636   |
|                          |           |                                       |                                       |                           | fz [in]     | 0.0006             | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                          |           |                                       |                                       |                           | vf [in/min] | 79                 | 79     | 79     | 79     | 79     | 79     | 79     | 79     | 79     |
|                          | E 10 - 11 | 2.00                                  | 0.02                                  | 650                       | n [min-1]   | 19864              | 13243  | 9932   | 7946   | 6621   | 4966   | 3973   | 3311   | 2483   |
|                          |           |                                       |                                       |                           | fz [in]     | 0.0006             | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                          |           |                                       |                                       |                           | vf [in/min] | 74                 | 74     | 74     | 74     | 74     | 74     | 74     | 74     | 74     |
| K                        | E 12 - 13 | 2.00                                  | 0.02                                  | 569                       | n [min-1]   | 17389              | 11592  | 8694   | 6955   | 5796   | 4347   | 3478   | 2898   | 2174   |
|                          |           |                                       |                                       |                           | fz [in]     | 0.0006             | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                          |           |                                       |                                       |                           | vf [in/min] | 65                 | 65     | 65     | 65     | 65     | 65     | 65     | 65     | 65     |
|                          | E 14 - 15 | 2.00                                  | 0.02                                  | 495                       | n [min-1]   | 15127              | 10085  | 7564   | 6051   | 5042   | 3782   | 3025   | 2521   | 1891   |
|                          |           |                                       |                                       |                           | fz [in]     | 0.0005             | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                          |           |                                       |                                       |                           | vf [in/min] | 45                 | 45     | 45     | 45     | 45     | 45     | 45     | 45     | 45     |
| S                        | E 19      | 2.00                                  | 0.02                                  | 173                       | n [min-1]   | 5287               | 3525   | 2643   | 2115   | 1762   | 1322   | 1057   | 881    | 661    |
|                          |           |                                       |                                       |                           | fz [in]     | 0.0005             | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                          |           |                                       |                                       |                           | vf [in/min] | 16                 | 16     | 16     | 16     | 16     | 16     | 16     | 16     | 16     |
|                          | E 20      | 2.00                                  | 0.02                                  | 138                       | n [min-1]   | 4217               | 2812   | 2109   | 1687   | 1406   | 1054   | 843    | 703    | 527    |
|                          |           |                                       |                                       |                           | fz [in]     | 0.0005             | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                          |           |                                       |                                       |                           | vf [in/min] | 13                 | 13     | 13     | 13     | 13     | 13     | 13     | 13     | 13     |
|                          | E 21      | 2.00                                  | 0.02                                  | 115                       | n [min-1]   | 3514               | 2343   | 1757   | 1406   | 1171   | 879    | 703    | 586    | 439    |
|                          |           |                                       |                                       |                           | fz [in]     | 0.0005             | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                          |           |                                       |                                       |                           | vf [in/min] | 11                 | 11     | 11     | 11     | 11     | 11     | 11     | 11     | 11     |
|                          | E 22      | 2.00                                  | 0.02                                  | 311                       | n [min-1]   | 9504               | 6336   | 4752   | 3802   | 3168   | 2376   | 1901   | 1584   | 1188   |
|                          |           |                                       |                                       |                           | fz [in]     | 0.0006             | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                          |           |                                       |                                       |                           | vf [in/min] | 36                 | 36     | 36     | 36     | 36     | 36     | 36     | 36     | 36     |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## SB638 / SBN638 - START VALUES

| COPY MILLING - ROUGHING |           |                                       |                                       |                           |             |                    |        |        |        |        |        |        |
|-------------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------|--------------------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |             | Z <sub>n</sub> = 6 |        |        |        |        |        |        |
|                         |           |                                       |                                       |                           |             | 1/4                | 5/16   | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E 1 - 2   | 0.05                                  | 0.05                                  | 950                       | n [min-1]   | 14516              | 11613  | 9677   | 7258   | 5806   | 4839   | 3629   |
|                         |           |                                       |                                       |                           | fz [in]     | 0.0033             | 0.0041 | 0.0049 | 0.0065 | 0.0081 | 0.0098 | 0.0130 |
|                         |           |                                       |                                       | 713 - 1188                | vf [in/min] | 283                | 283    | 283    | 283    | 283    | 283    | 283    |
|                         | E 3 - 4   | 0.05                                  | 0.05                                  | 820                       | n [min-1]   | 12530              | 10024  | 8353   | 6265   | 5012   | 4177   | 3132   |
|                         |           |                                       |                                       |                           | fz [in]     | 0.0030             | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 |
|                         |           |                                       |                                       | 615 - 1025                | vf [in/min] | 226                | 226    | 226    | 226    | 226    | 226    | 226    |
|                         | E 5 - 6   | 0.04                                  | 0.04                                  | 705                       | n [min-1]   | 10772              | 8618   | 7182   | 5386   | 4309   | 3591   | 2693   |
|                         |           |                                       |                                       |                           | fz [in]     | 0.0030             | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 |
|                         |           |                                       |                                       | 529 - 881                 | vf [in/min] | 194                | 194    | 194    | 194    | 194    | 194    | 194    |
| M                       | E 8 - 9   | 0.05                                  | 0.05                                  | 360                       | n [min-1]   | 5501               | 4401   | 3667   | 2750   | 2200   | 1834   | 1375   |
|                         |           |                                       |                                       |                           | fz [in]     | 0.0030             | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 |
|                         | E 10 - 11 | 0.04                                  | 0.04                                  | 230                       | n [min-1]   | 3514               | 2812   | 2343   | 1757   | 1406   | 1171   | 879    |
|                         |           |                                       |                                       |                           | fz [in]     | 0.0030             | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 |
|                         |           |                                       |                                       | 173 - 288                 | vf [in/min] | 63                 | 63     | 63     | 63     | 63     | 63     | 63     |
| K                       | E 12 - 13 | 0.05                                  | 0.05                                  | 900                       | n [min-1]   | 13752              | 11002  | 9168   | 6876   | 5501   | 4584   | 3438   |
|                         |           |                                       |                                       |                           | fz [in]     | 0.0028             | 0.0034 | 0.0041 | 0.0055 | 0.0069 | 0.0083 | 0.0110 |
|                         | E 14 - 15 | 0.05                                  | 0.05                                  | 740                       | n [min-1]   | 11307              | 9046   | 7538   | 5654   | 4523   | 3769   | 2827   |
|                         |           |                                       |                                       |                           | fz [in]     | 0.0025             | 0.0031 | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0100 |
| S                       | E 19      | 0.045                                 | 0.045                                 | 295                       | n [min-1]   | 4508               | 3606   | 3005   | 2254   | 1803   | 1503   | 1127   |
|                         |           |                                       |                                       |                           | fz [in]     | 0.0025             | 0.0031 | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0100 |
|                         |           |                                       |                                       | 221 - 369                 | vf [in/min] | 68                 | 68     | 68     | 68     | 68     | 68     | 68     |
|                         | E 20      | 0.04                                  | 0.04                                  | 295                       | n [min-1]   | 4508               | 3606   | 3005   | 2254   | 1803   | 1503   | 1127   |
|                         |           |                                       |                                       |                           | fz [in]     | 0.0025             | 0.0031 | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0100 |
|                         |           |                                       |                                       | 221 - 369                 | vf [in/min] | 68                 | 68     | 68     | 68     | 68     | 68     | 68     |
|                         | E 21      | 0.035                                 | 0.035                                 | 145                       | n [min-1]   | 2216               | 1772   | 1477   | 1108   | 886    | 739    | 554    |
|                         |           |                                       |                                       |                           | fz [in]     | 0.0020             | 0.0025 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                         | E 22      | 0.05                                  | 0.05                                  | 295                       | n [min-1]   | 4508               | 3606   | 3005   | 2254   | 1803   | 1503   | 1127   |
|                         |           |                                       |                                       |                           | fz [in]     | 0.0025             | 0.0031 | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0100 |
| 221 - 369               |           |                                       |                                       | vf [in/min]               | 68          | 68                 | 68     | 68     | 68     | 68     | 68     |        |



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SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
vf [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

## SB638 / SBN638 - START VALUES

| COPY MILLING - FINISHING |           |                                       |                                       |                           |     |           |                    |        |        |        |        |        |        |
|--------------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-----|-----------|--------------------|--------|--------|--------|--------|--------|--------|
| ISO GROUP                | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |     |           | Z <sub>n</sub> = 6 |        |        |        |        |        |        |
|                          |           |                                       |                                       |                           |     |           | 1/4                | 5/16   | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                        | E 1 - 2   | 0.02                                  | 0.02                                  | 1045                      |     | n [min-1] | 15968              | 12774  | 10645  | 7984   | 6387   | 5323   | 3992   |
|                          |           |                                       |                                       |                           |     | fz [in]   | 0.0026             | 0.0033 | 0.0039 | 0.0052 | 0.0065 | 0.0078 | 0.0104 |
|                          |           |                                       |                                       | 784                       | -   | 1306      | vf [in/min]        | 249    | 249    | 249    | 249    | 249    | 249    |
|                          | E 3 - 4   | 0.02                                  | 0.02                                  | 900                       |     | n [min-1] | 13752              | 11002  | 9168   | 6876   | 5501   | 4584   | 3438   |
|                          |           |                                       |                                       |                           |     | fz [in]   | 0.0024             | 0.0030 | 0.0036 | 0.0048 | 0.0060 | 0.0072 | 0.0096 |
|                          |           |                                       |                                       | 675                       | -   | 1125      | vf [in/min]        | 198    | 198    | 198    | 198    | 198    | 198    |
|                          | E 5 - 6   | 0.02                                  | 0.02                                  | 775                       |     | n [min-1] | 11842              | 9474   | 7895   | 5921   | 4737   | 3947   | 2961   |
|                          |           |                                       |                                       |                           |     | fz [in]   | 0.0024             | 0.0030 | 0.0036 | 0.0048 | 0.0060 | 0.0072 | 0.0096 |
|                          |           |                                       |                                       | 581                       | -   | 969       | vf [in/min]        | 171    | 171    | 171    | 171    | 171    | 171    |
| M                        | E 8 - 9   | 0.02                                  | 0.02                                  | 395                       |     | n [min-1] | 6036               | 4828   | 4024   | 3018   | 2414   | 2012   | 1509   |
|                          |           |                                       |                                       |                           |     | fz [in]   | 0.0024             | 0.0030 | 0.0036 | 0.0048 | 0.0060 | 0.0072 | 0.0096 |
|                          | 296       | -                                     | 494                                   | vf [in/min]               | 87  | 87        | 87                 | 87     | 87     | 87     | 87     |        |        |
|                          | E 10 - 11 | 0.02                                  | 0.02                                  | 250                       |     | n [min-1] | 3820               | 3056   | 2547   | 1910   | 1528   | 1273   | 955    |
|                          |           |                                       |                                       |                           |     | fz [in]   | 0.0024             | 0.0030 | 0.0036 | 0.0048 | 0.0060 | 0.0072 | 0.0096 |
| 188                      | -         | 313                                   | vf [in/min]                           | 55                        | 55  | 55        | 55                 | 55     | 55     | 55     |        |        |        |
| K                        | E 12 - 13 | 0.02                                  | 0.02                                  | 990                       |     | n [min-1] | 15127              | 12102  | 10085  | 7564   | 6051   | 5042   | 3782   |
|                          |           |                                       |                                       |                           |     | fz [in]   | 0.0022             | 0.0028 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0088 |
|                          | 743       | -                                     | 1238                                  | vf [in/min]               | 200 | 200       | 200                | 200    | 200    | 200    | 200    |        |        |
|                          | E 14 - 15 | 0.02                                  | 0.02                                  | 815                       |     | n [min-1] | 12453              | 9963   | 8302   | 6227   | 4981   | 4151   | 3113   |
| fz [in]                  |           |                                       |                                       |                           |     | 0.0020    | 0.0025             | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |        |
| 611                      | -         | 1019                                  | vf [in/min]                           | 149                       | 149 | 149       | 149                | 149    | 149    | 149    | 149    |        |        |
| S                        | E 19      | 0.02                                  | 0.02                                  | 325                       |     | n [min-1] | 4966               | 3973   | 3311   | 2483   | 1986   | 1655   | 1242   |
|                          |           |                                       |                                       |                           |     | fz [in]   | 0.0020             | 0.0025 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                          |           |                                       |                                       | 244                       | -   | 406       | vf [in/min]        | 60     | 60     | 60     | 60     | 60     | 60     |
|                          | E 20      | 0.02                                  | 0.02                                  | 325                       |     | n [min-1] | 4966               | 3973   | 3311   | 2483   | 1986   | 1655   | 1242   |
|                          |           |                                       |                                       |                           |     | fz [in]   | 0.0020             | 0.0025 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                          |           |                                       |                                       | 244                       | -   | 406       | vf [in/min]        | 60     | 60     | 60     | 60     | 60     | 60     |
|                          | E 21      | 0.02                                  | 0.02                                  | 160                       |     | n [min-1] | 2445               | 1956   | 1630   | 1222   | 978    | 815    | 611    |
|                          |           |                                       |                                       |                           |     | fz [in]   | 0.0016             | 0.0020 | 0.0024 | 0.0032 | 0.0040 | 0.0048 | 0.0064 |
|                          |           |                                       |                                       | 120                       | -   | 200       | vf [in/min]        | 23     | 23     | 23     | 23     | 23     | 23     |
|                          | E 22      | 0.02                                  | 0.02                                  | 325                       |     | n [min-1] | 4966               | 3973   | 3311   | 2483   | 1986   | 1655   | 1242   |
| fz [in]                  |           |                                       |                                       |                           |     | 0.0020    | 0.0025             | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |        |
| 244                      | -         | 406                                   | vf [in/min]                           | 60                        | 60  | 60        | 60                 | 60     | 60     | 60     |        |        |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## SCS638 / SCS638R - CHIP SPLITTERS - START VALUES

| SIDE MILLING - SEMI ROUGHING |              |                                       |                                       |                           |     |     |             |                    |        |        |        |        |
|------------------------------|--------------|---------------------------------------|---------------------------------------|---------------------------|-----|-----|-------------|--------------------|--------|--------|--------|--------|
| ISO GROUP                    | SMG          | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |     |     |             | Z <sub>n</sub> = 6 |        |        |        |        |
|                              |              |                                       |                                       |                           |     |     |             | 3/8                | 1/2    | 5/8    | 3/4    | 1      |
| P                            | E<br>1 - 2   | 3.00                                  | 0.08                                  | 700                       |     |     | n [min-1]   | 7131               | 5348   | 4278   | 3565   | 2674   |
|                              |              |                                       |                                       |                           |     |     | fz [in]     | 0.0030             | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                              |              |                                       |                                       | 525 - 875                 |     |     | vf [in/min] | 128                | 128    | 128    | 128    | 128    |
|                              | E<br>3 - 4   | 3.00                                  | 0.08                                  | 645                       |     |     | n [min-1]   | 6570               | 4928   | 3942   | 3285   | 2464   |
|                              |              |                                       |                                       |                           |     |     | fz [in]     | 0.0030             | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                              |              |                                       |                                       | 484 - 806                 |     |     | vf [in/min] | 118                | 118    | 118    | 118    | 118    |
|                              | E<br>5 - 6   | 3.00                                  | 0.07                                  | 525                       |     |     | n [min-1]   | 5348               | 4011   | 3209   | 2674   | 2006   |
|                              |              |                                       |                                       |                           |     |     | fz [in]     | 0.0024             | 0.0033 | 0.0041 | 0.0049 | 0.0065 |
|                              |              |                                       |                                       | 394 - 656                 |     |     | vf [in/min] | 78                 | 78     | 78     | 78     | 78     |
| M                            | E<br>8 - 9   | 3.00                                  | 0.08                                  | 600                       |     |     | n [min-1]   | 6112               | 4584   | 3667   | 3056   | 2292   |
|                              |              |                                       |                                       |                           |     |     | fz [in]     | 0.0028             | 0.0038 | 0.0047 | 0.0056 | 0.0075 |
|                              | 450 - 750    |                                       |                                       | vf [in/min]               | 103 | 103 | 103         | 103                | 103    |        |        |        |
|                              | E<br>10 - 11 | 3.00                                  | 0.07                                  | 565                       |     |     | n [min-1]   | 5755               | 4317   | 3453   | 2878   | 2158   |
|                              |              |                                       |                                       |                           |     |     | fz [in]     | 0.0024             | 0.0033 | 0.0041 | 0.0049 | 0.0065 |
|                              | 424 - 706    |                                       |                                       | vf [in/min]               | 84  | 84  | 84          | 84                 | 84     |        |        |        |
| K                            | E<br>12 - 13 | 3.00                                  | 0.07                                  | 495                       |     |     | n [min-1]   | 5042               | 3782   | 3025   | 2521   | 1891   |
|                              |              |                                       |                                       |                           |     |     | fz [in]     | 0.0026             | 0.0035 | 0.0044 | 0.0053 | 0.0070 |
|                              | 371 - 619    |                                       |                                       | vf [in/min]               | 79  | 79  | 79          | 79                 | 79     |        |        |        |
|                              | E<br>14 - 15 | 3.00                                  | 0.07                                  | 430                       |     |     | n [min-1]   | 4380               | 3285   | 2628   | 2190   | 1643   |
| fz [in]                      |              |                                       |                                       |                           |     |     | 0.0019      | 0.0025             | 0.0031 | 0.0038 | 0.0050 |        |
| 323 - 538                    |              |                                       | vf [in/min]                           | 49                        | 49  | 49  | 49          | 49                 |        |        |        |        |
| S                            | E<br>19      | 3.00                                  | 0.05                                  | 150                       |     |     | n [min-1]   | 1528               | 1146   | 917    | 764    | 573    |
|                              |              |                                       |                                       |                           |     |     | fz [in]     | 0.0019             | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                              |              |                                       |                                       | 113 - 188                 |     |     | vf [in/min] | 17                 | 17     | 17     | 17     | 17     |
|                              | E<br>20      | 3.00                                  | 0.04                                  | 120                       |     |     | n [min-1]   | 1222               | 917    | 733    | 611    | 458    |
|                              |              |                                       |                                       |                           |     |     | fz [in]     | 0.0017             | 0.0023 | 0.0029 | 0.0035 | 0.0046 |
|                              |              |                                       |                                       | 90 - 150                  |     |     | vf [in/min] | 13                 | 13     | 13     | 13     | 13     |
|                              | E<br>21      | 3.00                                  | 0.04                                  | 100                       |     |     | n [min-1]   | 1019               | 764    | 611    | 509    | 382    |
|                              |              |                                       |                                       |                           |     |     | fz [in]     | 0.0017             | 0.0023 | 0.0029 | 0.0035 | 0.0046 |
|                              | 75 - 125     |                                       |                                       | vf [in/min]               | 11  | 11  | 11          | 11                 | 11     |        |        |        |
|                              | E<br>22      | 3.00                                  | 0.07                                  | 270                       |     |     | n [min-1]   | 2750               | 2063   | 1650   | 1375   | 1031   |
| fz [in]                      |              |                                       |                                       |                           |     |     | 0.0024      | 0.0033             | 0.0041 | 0.0049 | 0.0065 |        |
| 203 - 338                    |              |                                       | vf [in/min]                           | 40                        | 40  | 40  | 40          | 40                 |        |        |        |        |



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SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## S738 / S738R / S938 / S938R - START VALUES

| SIDE MILLING - ROUGHING |           |                                       |                                       |                           |     |     |             |        |        |        |        |        |        |
|-------------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-----|-----|-------------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |     |     | Zn=7        |        |        | Zn=9   |        |        |        |
|                         |           |                                       |                                       |                           |     |     | 1/4         | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |
| P                       | E 1 - 2   | 2.0                                   | 0.07                                  | 800                       |     |     | n [rev/min] | 12224  | 8149   | 6112   | 4890   | 4075   | 3056   |
|                         |           |                                       |                                       |                           |     |     | fz [in]     | 0.0025 | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0100 |
|                         |           |                                       |                                       | 600 - 1000                |     |     | vf [in/min] | 214    | 214    | 214    | 275    | 275    | 275    |
|                         | E 3 - 4   | 2.0                                   | 0.07                                  | 740                       |     |     | n [rev/min] | 11307  | 7538   | 5654   | 4523   | 3769   | 2827   |
|                         |           |                                       |                                       |                           |     |     | fz [in]     | 0.0025 | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0100 |
|                         |           |                                       |                                       | 555 - 925                 |     |     | vf [in/min] | 198    | 198    | 198    | 254    | 254    | 254    |
|                         | E 5 - 6   | 2.0                                   | 0.06                                  | 605                       |     |     | n [rev/min] | 9244   | 6163   | 4622   | 3698   | 3081   | 2311   |
|                         |           |                                       |                                       |                           |     |     | fz [in]     | 0.0020 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                         |           |                                       |                                       | 454 - 756                 |     |     | vf [in/min] | 129    | 129    | 129    | 166    | 166    | 166    |
| M                       | E 8 - 9   | 2.0                                   | 0.07                                  | 680                       |     |     | n [rev/min] | 10390  | 6927   | 5195   | 4156   | 3463   | 2598   |
|                         |           |                                       |                                       |                           |     |     | fz [in]     | 0.0020 | 0.0030 | 0.0040 | 0.0056 | 0.0068 | 0.0090 |
|                         | 510 - 850 |                                       |                                       | vf [in/min]               | 145 | 145 | 145         | 210    | 210    | 210    |        |        |        |
|                         | E 10 - 11 | 2.0                                   | 0.06                                  | 630                       |     |     | n [rev/min] | 9626   | 6418   | 4813   | 3851   | 3209   | 2407   |
| fz [in]                 |           |                                       |                                       |                           |     |     | 0.0018      | 0.0026 | 0.0035 | 0.0050 | 0.0060 | 0.0080 |        |
| 473 - 788               |           |                                       | vf [in/min]                           | 118                       | 118 | 118 | 173         | 173    | 173    |        |        |        |        |
| K                       | E 12 - 13 | 2.0                                   | 0.07                                  | 550                       |     |     | n [rev/min] | 8404   | 5603   | 4202   | 3362   | 2801   | 2101   |
|                         |           |                                       |                                       |                           |     |     | fz [in]     | 0.0020 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                         | 413 - 688 |                                       |                                       | vf [in/min]               | 118 | 118 | 118         | 151    | 151    | 151    |        |        |        |
|                         | E 14 - 15 | 2.0                                   | 0.06                                  | 490                       |     |     | n [rev/min] | 7487   | 4991   | 3744   | 2995   | 2496   | 1872   |
| fz [in]                 |           |                                       |                                       |                           |     |     | 0.0018      | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0070 |        |
| 368 - 613               |           |                                       | vf [in/min]                           | 92                        | 92  | 92  | 118         | 118    | 118    |        |        |        |        |
| S                       | E 19      | 2.0                                   | 0.04                                  | 170                       |     |     | n [rev/min] | 2598   | 1732   | 1299   | 1039   | 866    | 649    |
|                         |           |                                       |                                       |                           |     |     | fz [in]     | 0.0015 | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 |
|                         | 128 - 213 |                                       |                                       | vf [in/min]               | 27  | 27  | 27          | 35     | 35     | 35     |        |        |        |
|                         | E 20      | 2.0                                   | 0.04                                  | 135                       |     |     | n [rev/min] | 2063   | 1375   | 1031   | 825    | 688    | 516    |
|                         |           |                                       |                                       |                           |     |     | fz [in]     | 0.0014 | 0.0021 | 0.0028 | 0.0034 | 0.0041 | 0.0055 |
|                         | 101 - 169 |                                       |                                       | vf [in/min]               | 20  | 20  | 20          | 26     | 26     | 26     |        |        |        |
|                         | E 21      | 2.0                                   | 0.04                                  | 115                       |     |     | n [rev/min] | 1757   | 1171   | 879    | 703    | 586    | 439    |
|                         |           |                                       |                                       |                           |     |     | fz [in]     | 0.0014 | 0.0021 | 0.0028 | 0.0034 | 0.0041 | 0.0055 |
|                         | 86 - 144  |                                       |                                       | vf [in/min]               | 17  | 17  | 17          | 22     | 22     | 22     |        |        |        |
|                         | E 22      | 2.0                                   | 0.06                                  | 310                       |     |     | n [rev/min] | 4737   | 3158   | 2368   | 1895   | 1579   | 1184   |
| fz [in]                 |           |                                       |                                       |                           |     |     | 0.0015      | 0.0023 | 0.0030 | 0.0041 | 0.0049 | 0.0065 |        |
| 233 - 388               |           |                                       | vf [in/min]                           | 50                        | 50  | 50  | 69          | 69     | 69     |        |        |        |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## S738 / S738R / S938 / S938R - START VALUES

| SIDE MILLING - FINISHING |              |  |  |                              |             |        |        |        |        |        |        |
|--------------------------|--------------|--|--|------------------------------|-------------|--------|--------|--------|--------|--------|--------|
| ISO GROUP                | SMG          | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |             | Zn=7   |        |        | Zn=9   |        |        |
|                          |              |  |  |                              |             | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                        | E<br>1 - 2   | 2.00                                     | 0.02                                     | 920                          | n [min-1]   | 14058  | 9372   | 7029   | 5623   | 4686   | 3514   |
|                          |              |  |  |                              | fz [in]     | 0.0013 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                          |              |  |  | 690 - 1150                   | vf [in/min] | 123    | 123    | 123    | 158    | 158    | 158    |
|                          | E<br>3 - 4   | 2.00                                     | 0.02                                     | 851                          | n [min-1]   | 13003  | 8669   | 6502   | 5201   | 4334   | 3251   |
|                          |              |  |  |                              | fz [in]     | 0.0013 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                          |              |  |  | 638 - 1064                   | vf [in/min] | 114    | 114    | 114    | 146    | 146    | 146    |
|                          | E<br>5 - 6   | 2.00                                     | 0.02                                     | 696                          | n [min-1]   | 10635  | 7090   | 5317   | 4254   | 3545   | 2659   |
|                          |              |  |  |                              | fz [in]     | 0.0013 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                          |              |  |  | 522 - 870                    | vf [in/min] | 93     | 93     | 93     | 120    | 120    | 120    |
| M                        | E<br>8 - 9   | 2.00                                     | 0.02                                     | 782                          | n [min-1]   | 11949  | 7966   | 5974   | 4780   | 3983   | 2987   |
|                          |              |  |  |                              | fz [in]     | 0.0013 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                          | 587 - 978    | vf [in/min]                              | 105                                      | 105                          | 105         | 134    | 134    | 134    |        |        |        |
|                          | E<br>10 - 11 | 2.00                                     | 0.02                                     | 725                          | n [min-1]   | 11078  | 7385   | 5539   | 4431   | 3693   | 2770   |
|                          |              |  |  |                              | fz [in]     | 0.0013 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                          | 544 - 906    | vf [in/min]                              | 97                                       | 97                           | 97          | 125    | 125    | 125    |        |        |        |
| K                        | E<br>12 - 13 | 2.00                                     | 0.02                                     | 633                          | n [min-1]   | 9672   | 6448   | 4836   | 3869   | 3224   | 2418   |
|                          |              |  |  |                              | fz [in]     | 0.0013 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |
|                          | 475 - 791    | vf [in/min]                              | 85                                       | 85                           | 85          | 109    | 109    | 109    |        |        |        |
|                          | E<br>14 - 15 | 2.00                                     | 0.02                                     | 564                          | n [min-1]   | 8618   | 5745   | 4309   | 3447   | 2873   | 2154   |
|                          |              |  |  |                              | fz [in]     | 0.0010 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                          | 423 - 705    | vf [in/min]                              | 60                                       | 60                           | 60          | 78     | 78     | 78     |        |        |        |
| S                        | E<br>19      | 2.00                                     | 0.02                                     | 196                          | n [min-1]   | 2995   | 1997   | 1497   | 1198   | 998    | 749    |
|                          |              |  |  |                              | fz [in]     | 0.0010 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                          | 147 - 245    | vf [in/min]                              | 21                                       | 21                           | 21          | 27     | 27     | 27     |        |        |        |
|                          | E<br>20      | 2.00                                     | 0.02                                     | 155                          | n [min-1]   | 2368   | 1579   | 1184   | 947    | 789    | 592    |
|                          |              |  |  |                              | fz [in]     | 0.0010 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                          | 116 - 194    | vf [in/min]                              | 17                                       | 17                           | 17          | 21     | 21     | 21     |        |        |        |
|                          | E<br>21      | 2.00                                     | 0.02                                     | 132                          | n [min-1]   | 2017   | 1345   | 1008   | 807    | 672    | 504    |
|                          |              |  |  |                              | fz [in]     | 0.0010 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                          | 99 - 165     | vf [in/min]                              | 14                                       | 14                           | 14          | 18     | 18     | 18     |        |        |        |
|                          | E<br>22      | 2.00                                     | 0.02                                     | 357                          | n [min-1]   | 5455   | 3637   | 2727   | 2182   | 1818   | 1364   |
| fz [in]                  |              |  |  |                              | 0.0013      | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |        |
| 268 - 446                | vf [in/min]  | 48                                       | 48                                       | 48                           | 61          | 61     | 61     |        |        |        |        |



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SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.



## SCS738R / SCS938R - CHIP SPLITTERS - START VALUES

| SIDE MILLING - SEMI ROUGHING |             |                                       |                                       |                           |             |        |        |        |        |        |        |
|------------------------------|-------------|---------------------------------------|---------------------------------------|---------------------------|-------------|--------|--------|--------|--------|--------|--------|
| ISO GROUP                    | SMG         | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |             | Zn=7   |        |        | Zn=9   |        |        |
|                              |             |                                       |                                       |                           |             | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                            | E 1 - 2     | 3.00                                  | 0.05                                  | 800                       | n [min-1]   | 12224  | 8149   | 6112   | 4890   | 4075   | 3056   |
|                              |             |                                       |                                       |                           | fz [in]     | 0.0025 | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0100 |
|                              |             |                                       |                                       | 600 - 1000                | vf [in/min] | 214    | 214    | 214    | 275    | 275    | 275    |
|                              | E 3 - 4     | 3.00                                  | 0.05                                  | 740                       | n [min-1]   | 11307  | 7538   | 5654   | 4523   | 3769   | 2827   |
|                              |             |                                       |                                       |                           | fz [in]     | 0.0025 | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0100 |
|                              |             |                                       |                                       | 555 - 925                 | vf [in/min] | 198    | 198    | 198    | 254    | 254    | 254    |
|                              | E 5 - 6     | 3.00                                  | 0.04                                  | 605                       | n [min-1]   | 9244   | 6163   | 4622   | 3698   | 3081   | 2311   |
|                              |             |                                       |                                       |                           | fz [in]     | 0.0020 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                              |             |                                       |                                       | 454 - 756                 | vf [in/min] | 129    | 129    | 129    | 166    | 166    | 166    |
| M                            | E 8 - 9     | 3.00                                  | 0.05                                  | 680                       | n [min-1]   | 10390  | 6927   | 5195   | 4156   | 3463   | 2598   |
|                              |             |                                       |                                       |                           | fz [in]     | 0.0020 | 0.0030 | 0.0040 | 0.0056 | 0.0068 | 0.0090 |
|                              | 510 - 850   | vf [in/min]                           | 145                                   | 145                       | 145         | 210    | 210    | 210    |        |        |        |
|                              | E 10 - 11   | 3.00                                  | 0.04                                  | 630                       | n [min-1]   | 9626   | 6418   | 4813   | 3851   | 3209   | 2407   |
| fz [in]                      |             |                                       |                                       |                           | 0.0018      | 0.0026 | 0.0035 | 0.0050 | 0.0060 | 0.0080 |        |
| 473 - 788                    | vf [in/min] | 118                                   | 118                                   | 118                       | 173         | 173    | 173    |        |        |        |        |
| K                            | E 12 - 13   | 3.00                                  | 0.05                                  | 550                       | n [min-1]   | 8404   | 5603   | 4202   | 3362   | 2801   | 2101   |
|                              |             |                                       |                                       |                           | fz [in]     | 0.0020 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                              | 413 - 688   | vf [in/min]                           | 118                                   | 118                       | 118         | 151    | 151    | 151    |        |        |        |
|                              | E 14 - 15   | 3.00                                  | 0.04                                  | 490                       | n [min-1]   | 7487   | 4991   | 3744   | 2995   | 2496   | 1872   |
| fz [in]                      |             |                                       |                                       |                           | 0.0018      | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0070 |        |
| 368 - 613                    | vf [in/min] | 92                                    | 92                                    | 92                        | 118         | 118    | 118    |        |        |        |        |
| S                            | E 19        | 3.00                                  | 0.03                                  | 170                       | n [min-1]   | 2598   | 1732   | 1299   | 1039   | 866    | 649    |
|                              |             |                                       |                                       |                           | fz [in]     | 0.0015 | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 |
|                              | 128 - 213   | vf [in/min]                           | 27                                    | 27                        | 27          | 35     | 35     | 35     |        |        |        |
|                              | E 20        | 3.00                                  | 0.03                                  | 135                       | n [min-1]   | 2063   | 1375   | 1031   | 825    | 688    | 516    |
|                              |             |                                       |                                       |                           | fz [in]     | 0.0014 | 0.0021 | 0.0028 | 0.0034 | 0.0041 | 0.0055 |
|                              | 101 - 169   | vf [in/min]                           | 20                                    | 20                        | 20          | 26     | 26     | 26     |        |        |        |
|                              | E 21        | 3.00                                  | 0.03                                  | 115                       | n [min-1]   | 1757   | 1171   | 879    | 703    | 586    | 439    |
|                              |             |                                       |                                       |                           | fz [in]     | 0.0014 | 0.0021 | 0.0028 | 0.0034 | 0.0041 | 0.0055 |
|                              | 86 - 144    | vf [in/min]                           | 17                                    | 17                        | 17          | 22     | 22     | 22     |        |        |        |
|                              | E 22        | 3.00                                  | 0.04                                  | 310                       | n [min-1]   | 4737   | 3158   | 2368   | 1895   | 1579   | 1184   |
| fz [in]                      |             |                                       |                                       |                           | 0.0015      | 0.0023 | 0.0030 | 0.0041 | 0.0049 | 0.0065 |        |
| 233 - 388                    | vf [in/min] | 50                                    | 50                                    | 50                        | 69          | 69     | 69     |        |        |        |        |

**NOTE: Optimized roughing is an excellent strategy for achieving quality parts and extending tool life, but requires use of the right equipment and cutting parameters. If you are having problems implementing the approach or want to learn more about how to use the strategy to process a part, contact the Technical Support Team at 1-800-TEC-TEAM (1-800-832-8326).**

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## A245

SOLID CARBIDE

HELIX

45°

SQUARE END

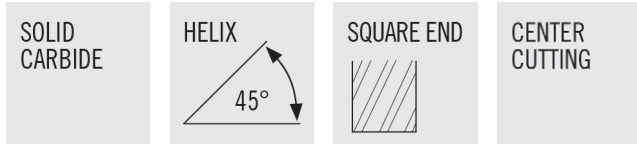
CENTER CUTTING



- Cylindrical land to eliminate chatter
- Form ground flute shape
- Eccentric primary relief
- Ideal for slotting in aluminum and non-ferrous materials
- Cutting Data - Page 105
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N61350</a> | A245-0.125-D2-S.0-Z2 | 1/8       | 1/8       | 1/4           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61442</a> | A245-0.125-D2-S.0-Z2 | 1/8       | 1/8       | 1/4           | 1-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61351</a> | A245-0.125-D3-S.0-Z2 | 1/8       | 1/8       | 3/8           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61443</a> | A245-0.125-D3-S.0-Z2 | 1/8       | 1/8       | 3/8           | 1-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61352</a> | A245-0.156-F2-S.0-Z2 | 5/32      | 3/16      | 5/16          | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61444</a> | A245-0.156-F2-S.0-Z2 | 5/32      | 3/16      | 5/16          | 2              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61353</a> | A245-0.156-F3-S.0-Z2 | 5/32      | 3/16      | 1/2           | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61445</a> | A245-0.156-F3-S.0-Z2 | 5/32      | 3/16      | 1/2           | 2              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61354</a> | A245-0.188-D2-S.0-Z2 | 3/16      | 3/16      | 5/16          | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61446</a> | A245-0.188-D2-S.0-Z2 | 3/16      | 3/16      | 5/16          | 2              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61355</a> | A245-0.188-D3-S.0-Z2 | 3/16      | 3/16      | 9/16          | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61447</a> | A245-0.188-D3-S.0-Z2 | 3/16      | 3/16      | 9/16          | 2              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61357</a> | A245-0.219-F3-S.0-Z2 | 7/32      | 1/4       | 3/4           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61449</a> | A245-0.219-F3-S.0-Z2 | 7/32      | 1/4       | 3/4           | 2-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61358</a> | A245-0.250-D2-S.0-Z2 | 1/4       | 1/4       | 3/8           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61450</a> | A245-0.250-D2-S.0-Z2 | 1/4       | 1/4       | 3/8           | 2-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61359</a> | A245-0.250-D3-S.0-Z2 | 1/4       | 1/4       | 3/4           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61451</a> | A245-0.250-D3-S.0-Z2 | 1/4       | 1/4       | 3/4           | 2-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61360</a> | A245-0.250-D5-S.0-Z2 | 1/4       | 1/4       | 1-1/4         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61452</a> | A245-0.250-D5-S.0-Z2 | 1/4       | 1/4       | 1-1/4         | 4              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61363</a> | A245-0.313-D1-S.0-Z2 | 5/16      | 5/16      | 7/16          | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61455</a> | A245-0.313-D1-S.0-Z2 | 5/16      | 5/16      | 7/16          | 2-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61364</a> | A245-0.313-D3-S.0-Z2 | 5/16      | 5/16      | 13/16         | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61456</a> | A245-0.313-D3-S.0-Z2 | 5/16      | 5/16      | 13/16         | 2-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61365</a> | A245-0.313-D4-S.0-Z2 | 5/16      | 5/16      | 1-1/4         | 3-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61457</a> | A245-0.313-D4-S.0-Z2 | 5/16      | 5/16      | 1-1/4         | 3-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61369</a> | A245-0.375-D1-S.0-Z2 | 3/8       | 3/8       | 1/2           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61461</a> | A245-0.375-D1-S.0-Z2 | 3/8       | 3/8       | 1/2           | 2-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61370</a> | A245-0.375-D3-S.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61462</a> | A245-0.375-D3-S.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61371</a> | A245-0.375-D4-S.0-Z2 | 3/8       | 3/8       | 1-1/2         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61463</a> | A245-0.375-D4-S.0-Z2 | 3/8       | 3/8       | 1-1/2         | 4              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61378</a> | A245-0.500-D1-S.0-Z2 | 1/2       | 1/2       | 5/8           | 3              | 2      | UNCOATED | CYLINDRICAL |

## A245 (CON'T)

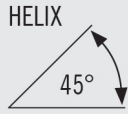


- Cylindrical land to eliminate chatter
- Form ground flute shape
- Eccentric primary relief
- Ideal for slotting in aluminum and non-ferrous materials
- Cutting Data - Page 105
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N61470</a> | A245-0.500-D1-S.0-Z2 | 1/2       | 1/2       | 5/8           | 3              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61379</a> | A245-0.500-D3-S.0-Z2 | 1/2       | 1/2       | 1-1/4         | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61471</a> | A245-0.500-D3-S.0-Z2 | 1/2       | 1/2       | 1-1/4         | 3              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61380</a> | A245-0.500-D4-S.0-Z2 | 1/2       | 1/2       | 2             | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61472</a> | A245-0.500-D4-S.0-Z2 | 1/2       | 1/2       | 2             | 4              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61381</a> | A245-0.500-D6-S.0-Z2 | 1/2       | 1/2       | 3-1/8         | 6              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61473</a> | A245-0.500-D6-S.0-Z2 | 1/2       | 1/2       | 3-1/8         | 6              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61382</a> | A245-0.625-D1-S.0-Z2 | 5/8       | 5/8       | 3/4           | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61474</a> | A245-0.625-D1-S.0-Z2 | 5/8       | 5/8       | 3/4           | 3              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61383</a> | A245-0.625-D3-S.0-Z2 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61475</a> | A245-0.625-D3-S.0-Z2 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61384</a> | A245-0.625-D4-S.0-Z2 | 5/8       | 5/8       | 2-1/2         | 5              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61476</a> | A245-0.625-D4-S.0-Z2 | 5/8       | 5/8       | 2-1/2         | 5              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61385</a> | A245-0.625-D6-S.0-Z2 | 5/8       | 5/8       | 3-3/4         | 6              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61477</a> | A245-0.625-D6-S.0-Z2 | 5/8       | 5/8       | 3-3/4         | 6              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61386</a> | A245-0.750-D1-S.0-Z2 | 3/4       | 3/4       | 1             | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61478</a> | A245-0.750-D1-S.0-Z2 | 3/4       | 3/4       | 1             | 3              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61387</a> | A245-0.750-D2-S.0-Z2 | 3/4       | 3/4       | 1-5/8         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61479</a> | A245-0.750-D2-S.0-Z2 | 3/4       | 3/4       | 1-5/8         | 4              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61388</a> | A245-0.750-D3-S.0-Z2 | 3/4       | 3/4       | 2-1/4         | 5              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61480</a> | A245-0.750-D3-S.0-Z2 | 3/4       | 3/4       | 2-1/4         | 5              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61389</a> | A245-0.750-D4-S.0-Z2 | 3/4       | 3/4       | 3-1/4         | 6              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61481</a> | A245-0.750-D4-S.0-Z2 | 3/4       | 3/4       | 3-1/4         | 6              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61390</a> | A245-0.750-D5-S.0-Z2 | 3/4       | 3/4       | 4             | 6-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61482</a> | A245-0.750-D5-S.0-Z2 | 3/4       | 3/4       | 4             | 6-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61391</a> | A245-1.000-D1-S.0-Z2 | 1         | 1         | 1-1/4         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61483</a> | A245-1.000-D1-S.0-Z2 | 1         | 1         | 1-1/4         | 4              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61392</a> | A245-1.000-D2-S.0-Z2 | 1         | 1         | 2             | 5              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61484</a> | A245-1.000-D2-S.0-Z2 | 1         | 1         | 2             | 5              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61394</a> | A245-1.000-D4-S.0-Z2 | 1         | 1         | 3-1/4         | 6              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61486</a> | A245-1.000-D4-S.0-Z2 | 1         | 1         | 3-1/4         | 6              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N61395</a> | A245-1.000-D5-S.0-Z2 | 1         | 1         | 4-1/8         | 7              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N61487</a> | A245-1.000-D5-S.0-Z2 | 1         | 1         | 4-1/8         | 7              | 2      | TICN     | CYLINDRICAL |

## A245R

SOLID CARBIDE



CENTER CUTTING



- Cylindrical land to eliminate chatter
- Form ground flute shape
- Eccentric primary relief
- Ideal for aluminum and non-ferrous materials
- Cutting Data - Page 105
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N90645</a> | A245R-0.375-D3-R010.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90646</a> | A245R-0.375-D3-R020.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90648</a> | A245R-0.375-D3-R030.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90650</a> | A245R-0.375-D3-R060.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90678</a> | A245R-0.500-D3-R010.0-Z2 | 1/2       | 1/2       | 1-1/4         | 3              | 2      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90679</a> | A245R-0.500-D3-R020.0-Z2 | 1/2       | 1/2       | 1-1/4         | 3              | 2      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90680</a> | A245R-0.500-D3-R030.0-Z2 | 1/2       | 1/2       | 1-1/4         | 3              | 2      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90682</a> | A245R-0.500-D3-R060.0-Z2 | 1/2       | 1/2       | 1-1/4         | 3              | 2      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90683</a> | A245R-0.500-D3-R090.0-Z2 | 1/2       | 1/2       | 1-1/4         | 3              | 2      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90684</a> | A245R-0.500-D3-R125.0-Z2 | 1/2       | 1/2       | 1-1/4         | 3              | 2      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90685</a> | A245R-0.500-D4-R010.0-Z2 | 1/2       | 1/2       | 2             | 4              | 2      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90686</a> | A245R-0.500-D4-R020.0-Z2 | 1/2       | 1/2       | 2             | 4              | 2      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90687</a> | A245R-0.500-D4-R030.0-Z2 | 1/2       | 1/2       | 2             | 4              | 2      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90689</a> | A245R-0.500-D4-R060.0-Z2 | 1/2       | 1/2       | 2             | 4              | 2      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90690</a> | A245R-0.500-D4-R090.0-Z2 | 1/2       | 1/2       | 2             | 4              | 2      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90691</a> | A245R-0.500-D4-R125.0-Z2 | 1/2       | 1/2       | 2             | 4              | 2      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90721</a> | A245R-0.750-D3-R010.0-Z2 | 3/4       | 3/4       | 2-1/4         | 5              | 2      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90722</a> | A245R-0.750-D3-R020.0-Z2 | 3/4       | 3/4       | 2-1/4         | 5              | 2      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90723</a> | A245R-0.750-D3-R030.0-Z2 | 3/4       | 3/4       | 2-1/4         | 5              | 2      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90725</a> | A245R-0.750-D3-R060.0-Z2 | 3/4       | 3/4       | 2-1/4         | 5              | 2      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90726</a> | A245R-0.750-D3-R090.0-Z2 | 3/4       | 3/4       | 2-1/4         | 5              | 2      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90727</a> | A245R-0.750-D3-R125.0-Z2 | 3/4       | 3/4       | 2-1/4         | 5              | 2      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90729</a> | A245R-0.750-D5-R010.0-Z2 | 3/4       | 3/4       | 4             | 6-1/2          | 2      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90730</a> | A245R-0.750-D5-R020.0-Z2 | 3/4       | 3/4       | 4             | 6-1/2          | 2      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90731</a> | A245R-0.750-D5-R030.0-Z2 | 3/4       | 3/4       | 4             | 6-1/2          | 2      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90733</a> | A245R-0.750-D5-R060.0-Z2 | 3/4       | 3/4       | 4             | 6-1/2          | 2      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90734</a> | A245R-0.750-D5-R090.0-Z2 | 3/4       | 3/4       | 4             | 6-1/2          | 2      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90735</a> | A245R-0.750-D5-R125.0-Z2 | 3/4       | 3/4       | 4             | 6-1/2          | 2      | TICN    | 0.125  | CYLINDRICAL |

## AB245

SOLID CARBIDE

HELIX

45°

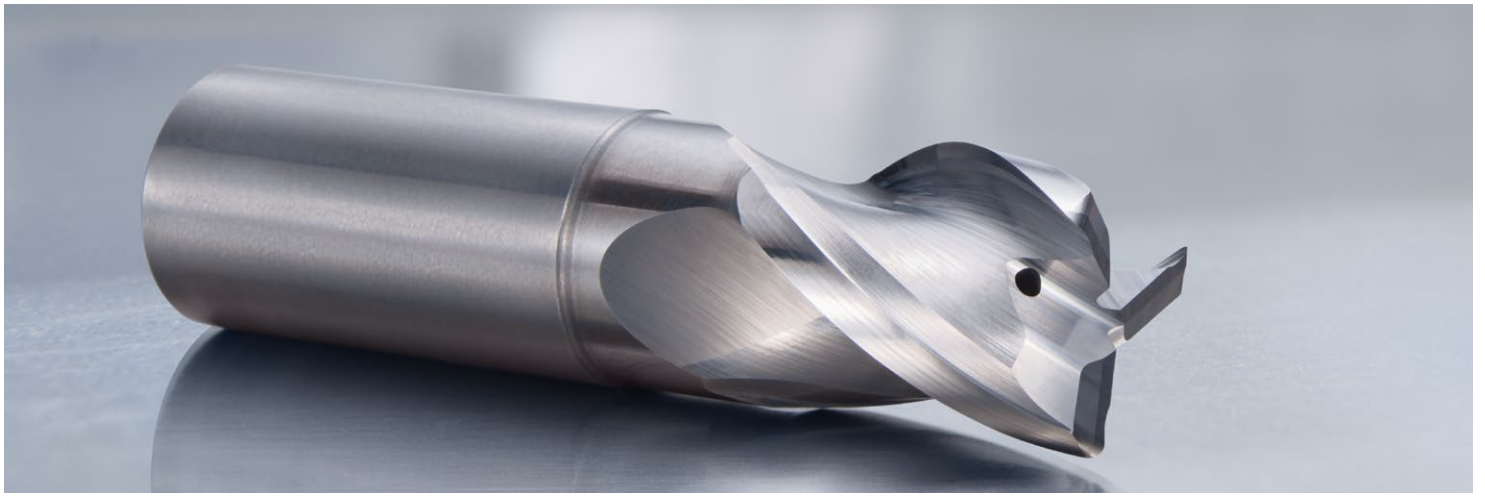
BALL END

CENTER CUTTING



- Cylindrical land to eliminate chatter
  - Form ground flute shape
  - Eccentric primary relief
  - Ideal for aluminum and non-ferrous materials
- Cutting Data - Page 105
  - Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N66070</a> | AB245-0.250-D2-B.0-Z2 | 1/4       | 1/4       | 3/8           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N66102</a> | AB245-0.250-D2-B.0-Z2 | 1/4       | 1/4       | 3/8           | 2-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N66071</a> | AB245-0.250-D3-B.0-Z2 | 1/4       | 1/4       | 3/4           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N66103</a> | AB245-0.250-D3-B.0-Z2 | 1/4       | 1/4       | 3/4           | 2-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N66073</a> | AB245-0.313-D3-B.0-Z2 | 5/16      | 5/16      | 13/16         | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N66105</a> | AB245-0.313-D3-B.0-Z2 | 5/16      | 5/16      | 13/16         | 2-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N66074</a> | AB245-0.375-D1-B.0-Z2 | 3/8       | 3/8       | 1/2           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N66106</a> | AB245-0.375-D1-B.0-Z2 | 3/8       | 3/8       | 1/2           | 2-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N66075</a> | AB245-0.375-D3-B.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N66107</a> | AB245-0.375-D3-B.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | TICN     | CYLINDRICAL |
| <a href="#">N66078</a> | AB245-0.500-D1-B.0-Z2 | 1/2       | 1/2       | 5/8           | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N66110</a> | AB245-0.500-D1-B.0-Z2 | 1/2       | 1/2       | 5/8           | 3              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N66079</a> | AB245-0.500-D3-B.0-Z2 | 1/2       | 1/2       | 1-1/4         | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N66111</a> | AB245-0.500-D3-B.0-Z2 | 1/2       | 1/2       | 1-1/4         | 3              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N66083</a> | AB245-0.750-D2-B.0-Z2 | 3/4       | 3/4       | 1-5/8         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N66115</a> | AB245-0.750-D2-B.0-Z2 | 3/4       | 3/4       | 1-5/8         | 4              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N66084</a> | AB245-1.000-D1-B.0-Z2 | 1         | 1         | 1-1/4         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N66116</a> | AB245-1.000-D1-B.0-Z2 | 1         | 1         | 1-1/4         | 4              | 2      | TICN     | CYLINDRICAL |
| <a href="#">N66085</a> | AB245-1.000-D2-B.0-Z2 | 1         | 1         | 2             | 5              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N66117</a> | AB245-1.000-D2-B.0-Z2 | 1         | 1         | 2             | 5              | 2      | TICN     | CYLINDRICAL |



## REACH PEAK METAL REMOVAL RATES IN HIGH-VELOCITY ALUMINUM MILLING

# AN230 & AN335

Achieve exceptional material removal rates for aerospace slotting and profiling applications in aluminum with the high-performance AN230 and AN335 solid carbide end mills from Niagara Cutter™. Designed to minimize deflection and vibrations with its advanced geometry, these end mills can keep up with any high-velocity spindle without sacrificing surface finish or tool life.

#### MATERIAL GROUPS

Non-ferrous 16-17

For modern machine tools equipped with spindles capable of 16,000 rpm or more, avoiding vibrations is critical to securing processes and preventing damage to the spindle. For the highest level of process security, the AN230 and AN335 end mills can spend days in cut with ease thanks to innovative engineering.

These end mills have been optimized with K-lands that enable reduced frictional forces and contact with the chip as well as smoother cutting thanks to the avoidance of material adhesion. Axial coolant holes in the 3-flute configuration further improve performance and chip control.

#### KEY BENEFITS

- Push your machine to its limits without sacrificing surface finish, tool life or process security
- Increase chip evacuation and reduce friction and heat with specially designed axial coolant holes
- Avoid deflection and chatter with advanced tool geometry
- Get customized tool designs according to your specific needs

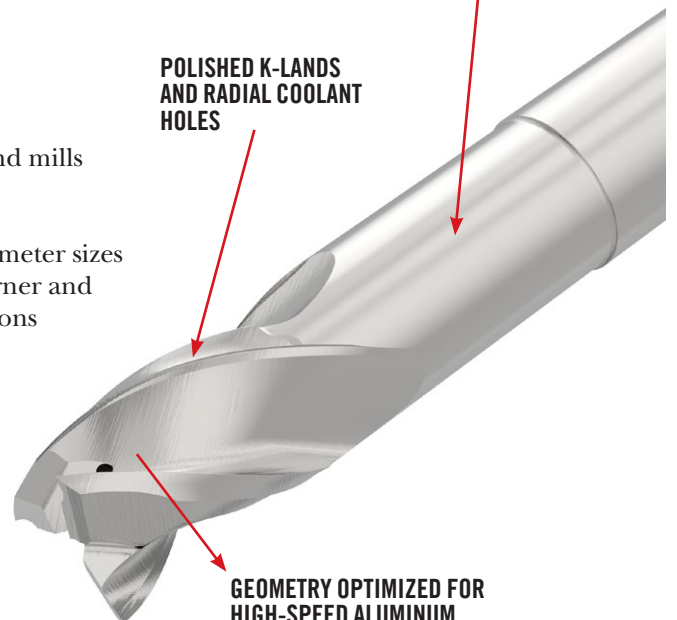
#### RANGE OVERVIEW

- 94 uncoated inch end mills (AN230/AN230R) (AN335/AN335R)
- 0.5", 0.75", 1.00" diameter sizes
- Standard square corner and aerospace radii options

#### COATING AND GEOMETRY MODIFICATIONS AVAILABLE

#### POLISHED K-LANDS AND RADIAL COOLANT HOLES

#### GEOMETRY OPTIMIZED FOR HIGH-SPEED ALUMINUM MACHINING



# 4 THINGS TO KNOW

## TO GET THE MOST OUT OF ALUMINUM MILLING WITH THE AN230 AND AN335

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### 1. WHY WAS THIS PRODUCT DEVELOPED?

The Niagara Cutter AN230 and AN335 are designed for high speed / high velocity aluminum milling applications. These two series of end mills meet the design requirements established by industry leading CNC machine tool builders to be run in milling machines utilizing 80kw and 120kw spindles. The flexibility of the AN230 and AN335 can also be used in mid-range to high performance milling machines found in many Aerospace machine shops.

### 2. WHAT CAN NIAGARA CUTTER OFFER?

A consistent and reliable high level of performance for each and every tool, standard or special. This is delivered from the engineered flute shape, to polishing of the K-land to provide a strong and homogenous cutting edge.

AN230 & AN335 offers:

- Square end and standard Aerospace corner radius sizes
- Unequal flute spacing to eliminate harmonics
- Polished Rake Face K-Land to reduce friction and chip to flute contact
- Stabilization land to eliminate harmonics
- Available in multiple reach lengths to accommodate shallow and deep pockets
- Shank lengths optimized for shrink fit toolholder clamping depths
- Internal Y coolant channels available as standards on the AN335 series

### 3. APPLICATION AREAS

High velocity slotting and profiling milling aluminum up to 1 x diameter depth of cut. High pressure flood coolant and thru the spindle coolant (AN335) is recommended to ensure proper chip evacuation. Balanced tool holder assemblies are highly recommended per the machine tool builder requirements.

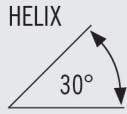
### 4. INDUSTRY REQUIREMENTS AND NEEDS

- 80 kw and up for AN230 geometry
- 120kw spindles for AN335 geometry
- High rpm applications require balanced toolholder assemblies
- High precision holders that ensure minimal run-out as well as good clamping and transmittable torque are highly recommended when high velocity milling, such as:
  - Heavy duty reinforced Shrinkfit holders
  - Power Milling chucks
  - High precision collet chucks
  - Weldon holders
- Anti-pullout protection such as Haimer Safe-Lock or weldon
- Programming “lead in” and “lead outs” to ensure smooth transitions into and exiting the workpiece



## AN230

SOLID  
CARBIDE



CENTER  
CUTTING



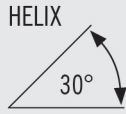
- Polished K-land to increase cutting edge strength
- Form ground flute shape
- Eccentric primary relief
- Ideal for high volume material removal in aluminum and non-ferrous materials
- Cutting Data - Page 106
- Tolerance Specs - Page 323

| PRODUCT NUMBER           | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | SHANK TYPE  |
|--------------------------|-----------------------|-----------|-----------|---------------|----------------|----------|-------|--------|-------------|
| <a href="#">03302585</a> | AN230-0.500-E2-S.0-Z2 | 1/2       | 1/2       | 3/4           | 3              | 0.470    | 1-1/4 | 2      | CYLINDRICAL |
| <a href="#">03302588</a> | AN230-0.500-E3-S.0-Z2 | 1/2       | 1/2       | 3/4           | 3-1/2          | 0.470    | 1-3/4 | 2      | CYLINDRICAL |
| <a href="#">03302591</a> | AN230-0.500-E4-S.0-Z2 | 1/2       | 1/2       | 3/4           | 4              | 0.470    | 2-1/4 | 2      | CYLINDRICAL |
| <a href="#">03302594</a> | AN230-0.500-E5-S.0-Z2 | 1/2       | 1/2       | 3/4           | 4-1/2          | 0.470    | 2-3/4 | 2      | CYLINDRICAL |
| <a href="#">03302597</a> | AN230-0.750-E2-S.0-Z2 | 3/4       | 3/4       | 1             | 4              | 0.720    | 2-1/8 | 2      | CYLINDRICAL |
| <a href="#">03302602</a> | AN230-0.750-E3-S.0-Z2 | 3/4       | 3/4       | 1             | 4-1/2          | 0.720    | 2-5/8 | 2      | CYLINDRICAL |
| <a href="#">03302607</a> | AN230-0.750-E4-S.0-Z2 | 3/4       | 3/4       | 1             | 5              | 0.720    | 3-1/8 | 2      | CYLINDRICAL |
| <a href="#">03302612</a> | AN230-0.750-E5-S.0-Z2 | 3/4       | 3/4       | 1             | 5-1/2          | 0.720    | 3-5/8 | 2      | CYLINDRICAL |
| <a href="#">03302617</a> | AN230-1.000-E2-S.0-Z2 | 1         | 1         | 1-1/4         | 4              | 0.960    | 2-1/8 | 2      | CYLINDRICAL |
| <a href="#">03302622</a> | AN230-1.000-E3-S.0-Z2 | 1         | 1         | 1-1/4         | 4-1/2          | 0.960    | 2-5/8 | 2      | CYLINDRICAL |
| <a href="#">03302627</a> | AN230-1.000-E4-S.0-Z2 | 1         | 1         | 1-1/4         | 5              | 0.960    | 3-1/8 | 2      | CYLINDRICAL |



## AN230R

SOLID  
CARBIDE



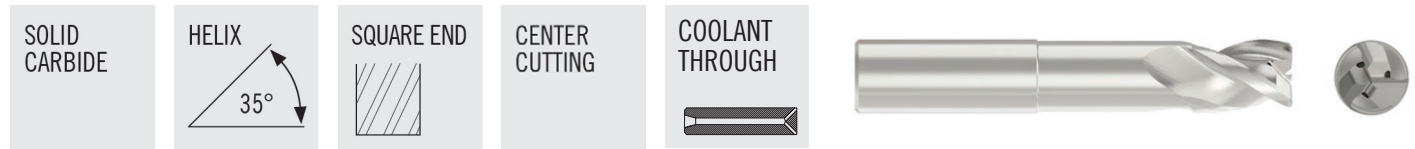
CENTER  
CUTTING



- Polished K-land to increase cutting edge strength
- Form ground flute shape
- Eccentric primary relief
- Ideal for high volume material removal in aluminum and non-ferrous materials
- With corner radius for strength
- Cutting Data - Page 106
- Tolerance Specs - Page 323

| PRODUCT NUMBER           | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | RADIUS | SHANK TYPE  |
|--------------------------|---------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|--------|-------------|
| <a href="#">03302586</a> | AN230R-0.500-E2-R030.0-Z2 | 1/2       | 1/2       | 3/4           | 3              | 0.470    | 1-1/4 | 2      | 0.030  | CYLINDRICAL |
| <a href="#">03302587</a> | AN230R-0.500-E2-R060.0-Z2 | 1/2       | 1/2       | 3/4           | 3              | 0.470    | 1-1/4 | 2      | 0.060  | CYLINDRICAL |
| <a href="#">03302589</a> | AN230R-0.500-E3-R030.0-Z2 | 1/2       | 1/2       | 3/4           | 3-1/2          | 0.470    | 1-3/4 | 2      | 0.030  | CYLINDRICAL |
| <a href="#">03302590</a> | AN230R-0.500-E3-R060.0-Z2 | 1/2       | 1/2       | 3/4           | 3-1/2          | 0.470    | 1-3/4 | 2      | 0.060  | CYLINDRICAL |
| <a href="#">03302592</a> | AN230R-0.500-E4-R030.0-Z2 | 1/2       | 1/2       | 3/4           | 4              | 0.470    | 2-1/4 | 2      | 0.030  | CYLINDRICAL |
| <a href="#">03302593</a> | AN230R-0.500-E4-R060.0-Z2 | 1/2       | 1/2       | 3/4           | 4              | 0.470    | 2-1/4 | 2      | 0.060  | CYLINDRICAL |
| <a href="#">03302595</a> | AN230R-0.500-E5-R030.0-Z2 | 1/2       | 1/2       | 3/4           | 4-1/2          | 0.470    | 2-3/4 | 2      | 0.030  | CYLINDRICAL |
| <a href="#">03302596</a> | AN230R-0.500-E5-R060.0-Z2 | 1/2       | 1/2       | 3/4           | 4-1/2          | 0.470    | 2-3/4 | 2      | 0.060  | CYLINDRICAL |
| <a href="#">03302598</a> | AN230R-0.750-E2-R030.0-Z2 | 3/4       | 3/4       | 1             | 4              | 0.720    | 2-1/8 | 2      | 0.030  | CYLINDRICAL |
| <a href="#">03302599</a> | AN230R-0.750-E2-R060.0-Z2 | 3/4       | 3/4       | 1             | 4              | 0.720    | 2-1/8 | 2      | 0.060  | CYLINDRICAL |
| <a href="#">03302600</a> | AN230R-0.750-E2-R090.0-Z2 | 3/4       | 3/4       | 1             | 4              | 0.720    | 2-1/8 | 2      | 0.090  | CYLINDRICAL |
| <a href="#">03302601</a> | AN230R-0.750-E2-R120.0-Z2 | 3/4       | 3/4       | 1             | 4              | 0.720    | 2-1/8 | 2      | 0.120  | CYLINDRICAL |
| <a href="#">03302603</a> | AN230R-0.750-E3-R030.0-Z2 | 3/4       | 3/4       | 1             | 4-1/2          | 0.720    | 2-5/8 | 2      | 0.030  | CYLINDRICAL |
| <a href="#">03302604</a> | AN230R-0.750-E3-R060.0-Z2 | 3/4       | 3/4       | 1             | 4-1/2          | 0.720    | 2-5/8 | 2      | 0.060  | CYLINDRICAL |
| <a href="#">03302605</a> | AN230R-0.750-E3-R090.0-Z2 | 3/4       | 3/4       | 1             | 4-1/2          | 0.720    | 2-5/8 | 2      | 0.090  | CYLINDRICAL |
| <a href="#">03302606</a> | AN230R-0.750-E3-R120.0-Z2 | 3/4       | 3/4       | 1             | 4-1/2          | 0.720    | 2-5/8 | 2      | 0.120  | CYLINDRICAL |
| <a href="#">03302608</a> | AN230R-0.750-E4-R030.0-Z2 | 3/4       | 3/4       | 1             | 5              | 0.720    | 3-1/8 | 2      | 0.030  | CYLINDRICAL |
| <a href="#">03302609</a> | AN230R-0.750-E4-R060.0-Z2 | 3/4       | 3/4       | 1             | 5              | 0.720    | 3-1/8 | 2      | 0.060  | CYLINDRICAL |
| <a href="#">03302610</a> | AN230R-0.750-E4-R090.0-Z2 | 3/4       | 3/4       | 1             | 5              | 0.720    | 3-1/8 | 2      | 0.090  | CYLINDRICAL |
| <a href="#">03302611</a> | AN230R-0.750-E4-R120.0-Z2 | 3/4       | 3/4       | 1             | 5              | 0.720    | 3-1/8 | 2      | 0.120  | CYLINDRICAL |
| <a href="#">03302613</a> | AN230R-0.750-E5-R030.0-Z2 | 3/4       | 3/4       | 1             | 5-1/2          | 0.720    | 3-5/8 | 2      | 0.030  | CYLINDRICAL |
| <a href="#">03302614</a> | AN230R-0.750-E5-R060.0-Z2 | 3/4       | 3/4       | 1             | 5-1/2          | 0.720    | 3-5/8 | 2      | 0.060  | CYLINDRICAL |
| <a href="#">03302615</a> | AN230R-0.750-E5-R090.0-Z2 | 3/4       | 3/4       | 1             | 5-1/2          | 0.720    | 3-5/8 | 2      | 0.090  | CYLINDRICAL |
| <a href="#">03302616</a> | AN230R-0.750-E5-R120.0-Z2 | 3/4       | 3/4       | 1             | 5-1/2          | 0.720    | 3-5/8 | 2      | 0.120  | CYLINDRICAL |
| <a href="#">03302618</a> | AN230R-1.000-E2-R030.0-Z2 | 1         | 1         | 1-1/4         | 4              | 0.960    | 2-1/8 | 2      | 0.030  | CYLINDRICAL |
| <a href="#">03302619</a> | AN230R-1.000-E2-R060.0-Z2 | 1         | 1         | 1-1/4         | 4              | 0.960    | 2-1/8 | 2      | 0.060  | CYLINDRICAL |
| <a href="#">03302620</a> | AN230R-1.000-E2-R090.0-Z2 | 1         | 1         | 1-1/4         | 4              | 0.960    | 2-1/8 | 2      | 0.090  | CYLINDRICAL |
| <a href="#">03302621</a> | AN230R-1.000-E2-R120.0-Z2 | 1         | 1         | 1-1/4         | 4              | 0.960    | 2-1/8 | 2      | 0.120  | CYLINDRICAL |
| <a href="#">03302623</a> | AN230R-1.000-E3-R030.0-Z2 | 1         | 1         | 1-1/4         | 4-1/2          | 0.960    | 2-5/8 | 2      | 0.030  | CYLINDRICAL |
| <a href="#">03302624</a> | AN230R-1.000-E3-R060.0-Z2 | 1         | 1         | 1-1/4         | 4-1/2          | 0.960    | 2-5/8 | 2      | 0.060  | CYLINDRICAL |
| <a href="#">03302625</a> | AN230R-1.000-E3-R090.0-Z2 | 1         | 1         | 1-1/4         | 4-1/2          | 0.960    | 2-5/8 | 2      | 0.090  | CYLINDRICAL |
| <a href="#">03302626</a> | AN230R-1.000-E3-R120.0-Z2 | 1         | 1         | 1-1/4         | 4-1/2          | 0.960    | 2-5/8 | 2      | 0.120  | CYLINDRICAL |
| <a href="#">03302628</a> | AN230R-1.000-E4-R030.0-Z2 | 1         | 1         | 1-1/4         | 5              | 0.960    | 3-1/8 | 2      | 0.030  | CYLINDRICAL |
| <a href="#">03302629</a> | AN230R-1.000-E4-R060.0-Z2 | 1         | 1         | 1-1/4         | 5              | 0.960    | 3-1/8 | 2      | 0.060  | CYLINDRICAL |
| <a href="#">03302630</a> | AN230R-1.000-E4-R090.0-Z2 | 1         | 1         | 1-1/4         | 5              | 0.960    | 3-1/8 | 2      | 0.090  | CYLINDRICAL |
| <a href="#">03302631</a> | AN230R-1.000-E4-R120.0-Z2 | 1         | 1         | 1-1/4         | 5              | 0.960    | 3-1/8 | 2      | 0.120  | CYLINDRICAL |

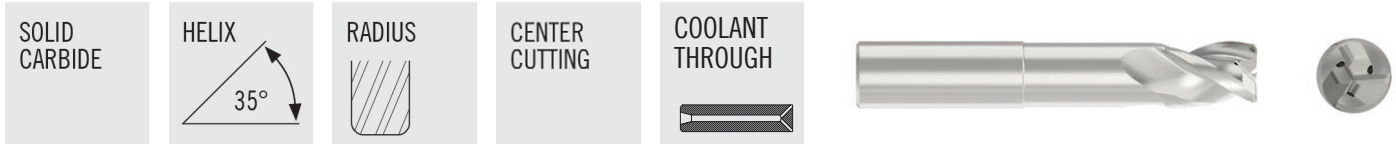
## AN335



- Polished K-land to increase cutting edge strength
- Form ground flute shape
- Eccentric primary relief
- Ideal for high volume material removal in aluminum and non-ferrous materials
- Y-Channel coolant through
- Cutting Data - Page 106
- Tolerance Specs - Page 323

| PRODUCT NUMBER           | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | SHANK TYPE  |
|--------------------------|------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|-------------|
| <a href="#">03302634</a> | AN335-0.500-E2-S.0-Z3A | 1/2       | 1/2       | 3/4           | 3              | 0.470    | 1-1/4 | 3      | CYLINDRICAL |
| <a href="#">03302637</a> | AN335-0.500-E3-S.0-Z3A | 1/2       | 1/2       | 3/4           | 3-1/2          | 0.470    | 1-3/4 | 3      | CYLINDRICAL |
| <a href="#">03302640</a> | AN335-0.500-E4-S.0-Z3A | 1/2       | 1/2       | 3/4           | 4              | 0.470    | 2-1/4 | 3      | CYLINDRICAL |
| <a href="#">03302643</a> | AN335-0.500-E5-S.0-Z3A | 1/2       | 1/2       | 3/4           | 4-1/2          | 0.470    | 2-3/4 | 3      | CYLINDRICAL |
| <a href="#">03302646</a> | AN335-0.750-E2-S.0-Z3A | 3/4       | 3/4       | 1             | 4              | 0.720    | 2-1/8 | 3      | CYLINDRICAL |
| <a href="#">03302651</a> | AN335-0.750-E3-S.0-Z3A | 3/4       | 3/4       | 1             | 4-1/2          | 0.720    | 2-5/8 | 3      | CYLINDRICAL |
| <a href="#">03302656</a> | AN335-0.750-E4-S.0-Z3A | 3/4       | 3/4       | 1             | 5              | 0.720    | 3-1/8 | 3      | CYLINDRICAL |
| <a href="#">03302662</a> | AN335-0.750-E5-S.0-Z3A | 3/4       | 3/4       | 1             | 5-1/2          | 0.720    | 3-5/8 | 3      | CYLINDRICAL |
| <a href="#">03302667</a> | AN335-1.000-E2-S.0-Z3A | 1         | 1         | 1-1/4         | 4              | 0.960    | 2-1/8 | 3      | CYLINDRICAL |
| <a href="#">03302672</a> | AN335-1.000-E3-S.0-Z3A | 1         | 1         | 1-1/4         | 4-1/2          | 0.960    | 2-5/8 | 3      | CYLINDRICAL |
| <a href="#">03302677</a> | AN335-1.000-E4-S.0-Z3A | 1         | 1         | 1-1/4         | 5              | 0.960    | 3-1/8 | 3      | CYLINDRICAL |

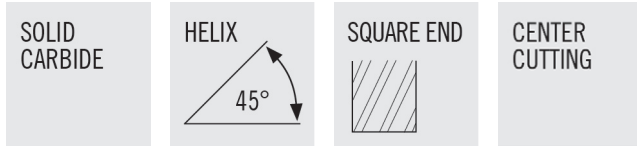
## AN335R



- Polished K-land to increase cutting edge strength
- Form ground flute shape
- Eccentric primary relief
- Ideal for high volume material removal in aluminum and non-ferrous materials
- With corner radius for strength
- Y-Channel coolant through
- Cutting Data - Page 106
- Tolerance Specs - Page 323

| PRODUCT NUMBER           | DESCRIPTION                | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | RADIUS | SHANK TYPE  |
|--------------------------|----------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|--------|-------------|
| <a href="#">03302635</a> | AN335R-0.500-E2-R030.0-Z3A | 1/2       | 1/2       | 3/4           | 3              | 0.470    | 1-1/4 | 3      | 0.030  | CYLINDRICAL |
| <a href="#">03302636</a> | AN335R-0.500-E2-R060.0-Z3A | 1/2       | 1/2       | 3/4           | 3              | 0.470    | 1-1/4 | 3      | 0.060  | CYLINDRICAL |
| <a href="#">03302638</a> | AN335R-0.500-E3-R030.0-Z3A | 1/2       | 1/2       | 3/4           | 3-1/2          | 0.470    | 1-3/4 | 3      | 0.030  | CYLINDRICAL |
| <a href="#">03302639</a> | AN335R-0.500-E3-R060.0-Z3A | 1/2       | 1/2       | 3/4           | 3-1/2          | 0.470    | 1-3/4 | 3      | 0.060  | CYLINDRICAL |
| <a href="#">03302641</a> | AN335R-0.500-E4-R030.0-Z3A | 1/2       | 1/2       | 3/4           | 4              | 0.470    | 2-1/4 | 3      | 0.030  | CYLINDRICAL |
| <a href="#">03302642</a> | AN335R-0.500-E4-R060.0-Z3A | 1/2       | 1/2       | 3/4           | 4              | 0.470    | 2-1/4 | 3      | 0.060  | CYLINDRICAL |
| <a href="#">03302644</a> | AN335R-0.500-E5-R030.0-Z3A | 1/2       | 1/2       | 3/4           | 4-1/2          | 0.470    | 2-3/4 | 3      | 0.030  | CYLINDRICAL |
| <a href="#">03302645</a> | AN335R-0.500-E5-R060.0-Z3A | 1/2       | 1/2       | 3/4           | 4-1/2          | 0.470    | 2-3/4 | 3      | 0.060  | CYLINDRICAL |
| <a href="#">03302647</a> | AN335R-0.750-E2-R030.0-Z3A | 3/4       | 3/4       | 1             | 4              | 0.720    | 2-1/8 | 3      | 0.030  | CYLINDRICAL |
| <a href="#">03302648</a> | AN335R-0.750-E2-R060.0-Z3A | 3/4       | 3/4       | 1             | 4              | 0.720    | 2-1/8 | 3      | 0.060  | CYLINDRICAL |
| <a href="#">03302649</a> | AN335R-0.750-E2-R090.0-Z3A | 3/4       | 3/4       | 1             | 4              | 0.720    | 2-1/8 | 3      | 0.090  | CYLINDRICAL |
| <a href="#">03302650</a> | AN335R-0.750-E2-R120.0-Z3A | 3/4       | 3/4       | 1             | 4              | 0.720    | 2-1/8 | 3      | 0.120  | CYLINDRICAL |
| <a href="#">03302652</a> | AN335R-0.750-E3-R030.0-Z3A | 3/4       | 3/4       | 1             | 4-1/2          | 0.720    | 2-5/8 | 3      | 0.030  | CYLINDRICAL |
| <a href="#">03302653</a> | AN335R-0.750-E3-R060.0-Z3A | 3/4       | 3/4       | 1             | 4-1/2          | 0.720    | 2-5/8 | 3      | 0.060  | CYLINDRICAL |
| <a href="#">03302654</a> | AN335R-0.750-E3-R090.0-Z3A | 3/4       | 3/4       | 1             | 4-1/2          | 0.720    | 2-5/8 | 3      | 0.090  | CYLINDRICAL |
| <a href="#">03302655</a> | AN335R-0.750-E3-R120.0-Z3A | 3/4       | 3/4       | 1             | 4-1/2          | 0.720    | 2-5/8 | 3      | 0.120  | CYLINDRICAL |
| <a href="#">03302657</a> | AN335R-0.750-E4-R030.0-Z3A | 3/4       | 3/4       | 1             | 5              | 0.720    | 3-1/8 | 3      | 0.030  | CYLINDRICAL |
| <a href="#">03302658</a> | AN335R-0.750-E4-R060.0-Z3A | 3/4       | 3/4       | 1             | 5              | 0.720    | 3-1/8 | 3      | 0.060  | CYLINDRICAL |
| <a href="#">03302659</a> | AN335R-0.750-E4-R090.0-Z3A | 3/4       | 3/4       | 1             | 5              | 0.720    | 3-1/8 | 3      | 0.090  | CYLINDRICAL |
| <a href="#">03302660</a> | AN335R-0.750-E4-R120.0-Z3A | 3/4       | 3/4       | 1             | 5              | 0.720    | 3-1/8 | 3      | 0.120  | CYLINDRICAL |
| <a href="#">03302663</a> | AN335R-0.750-E5-R030.0-Z3A | 3/4       | 3/4       | 1             | 5-1/2          | 0.720    | 3-5/8 | 3      | 0.030  | CYLINDRICAL |
| <a href="#">03302664</a> | AN335R-0.750-E5-R060.0-Z3A | 3/4       | 3/4       | 1             | 5-1/2          | 0.720    | 3-5/8 | 3      | 0.060  | CYLINDRICAL |
| <a href="#">03302665</a> | AN335R-0.750-E5-R090.0-Z3A | 3/4       | 3/4       | 1             | 5-1/2          | 0.720    | 3-5/8 | 3      | 0.090  | CYLINDRICAL |
| <a href="#">03302666</a> | AN335R-0.750-E5-R120.0-Z3A | 3/4       | 3/4       | 1             | 5-1/2          | 0.720    | 3-5/8 | 3      | 0.120  | CYLINDRICAL |
| <a href="#">03302668</a> | AN335R-1.000-E2-R030.0-Z3A | 1         | 1         | 1-1/4         | 4              | 0.960    | 2-1/8 | 3      | 0.030  | CYLINDRICAL |
| <a href="#">03302669</a> | AN335R-1.000-E2-R060.0-Z3A | 1         | 1         | 1-1/4         | 4              | 0.960    | 2-1/8 | 3      | 0.060  | CYLINDRICAL |
| <a href="#">03302670</a> | AN335R-1.000-E2-R090.0-Z3A | 1         | 1         | 1-1/4         | 4              | 0.960    | 2-1/8 | 3      | 0.090  | CYLINDRICAL |
| <a href="#">03302671</a> | AN335R-1.000-E2-R120.0-Z3A | 1         | 1         | 1-1/4         | 4              | 0.960    | 2-1/8 | 3      | 0.120  | CYLINDRICAL |
| <a href="#">03302673</a> | AN335R-1.000-E3-R030.0-Z3A | 1         | 1         | 1-1/4         | 4-1/2          | 0.960    | 2-5/8 | 3      | 0.030  | CYLINDRICAL |
| <a href="#">03302674</a> | AN335R-1.000-E3-R060.0-Z3A | 1         | 1         | 1-1/4         | 4-1/2          | 0.960    | 2-5/8 | 3      | 0.060  | CYLINDRICAL |
| <a href="#">03302675</a> | AN335R-1.000-E3-R090.0-Z3A | 1         | 1         | 1-1/4         | 4-1/2          | 0.960    | 2-5/8 | 3      | 0.090  | CYLINDRICAL |
| <a href="#">03302676</a> | AN335R-1.000-E3-R120.0-Z3A | 1         | 1         | 1-1/4         | 4-1/2          | 0.960    | 2-5/8 | 3      | 0.120  | CYLINDRICAL |
| <a href="#">03302678</a> | AN335R-1.000-E4-R030.0-Z3A | 1         | 1         | 1-1/4         | 5              | 0.960    | 3-1/8 | 3      | 0.030  | CYLINDRICAL |
| <a href="#">03302679</a> | AN335R-1.000-E4-R060.0-Z3A | 1         | 1         | 1-1/4         | 5              | 0.960    | 3-1/8 | 3      | 0.060  | CYLINDRICAL |
| <a href="#">03302680</a> | AN335R-1.000-E4-R090.0-Z3A | 1         | 1         | 1-1/4         | 5              | 0.960    | 3-1/8 | 3      | 0.090  | CYLINDRICAL |
| <a href="#">03302681</a> | AN335R-1.000-E4-R120.0-Z3A | 1         | 1         | 1-1/4         | 5              | 0.960    | 3-1/8 | 3      | 0.120  | CYLINDRICAL |

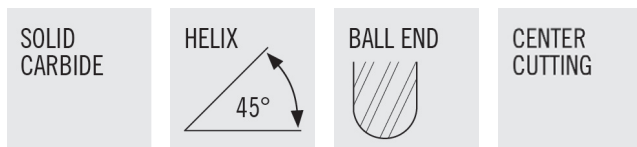
## AN245



- Cylindrical land to eliminate chatter
- Form ground flute shape
- Eccentric primary relief
- Designed for aluminum and non-ferrous materials
- Cutting Data - Page 105
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | SHANK TYPE  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|-------------|
| <a href="#">N57993</a> | AN245-0.375-E5-S.0-Z2  | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-1/8 | 2      | TICN    | CYLINDRICAL |
| <a href="#">N57996</a> | AN245-0.500-E7-S.0-Z2  | 1/2       | 1/2       | 5/8           | 4              | 0.480    | 2-1/8 | 2      | TICN    | CYLINDRICAL |
| <a href="#">N57998</a> | AN245-0.500-E8-S.0-Z2  | 1/2       | 1/2       | 5/8           | 8              | 0.480    | 6     | 2      | TICN    | CYLINDRICAL |
| <a href="#">N57999</a> | AN245-0.500-E10-S.0-Z2 | 1/2       | 1/2       | 3/4           | 6              | 0.480    | 4     | 2      | TICN    | CYLINDRICAL |
| <a href="#">N57997</a> | AN245-0.500-E9-S.0-Z2  | 1/2       | 1/2       | 3/4           | 6              | 0.480    | 3-3/8 | 2      | TICN    | CYLINDRICAL |
| <a href="#">N58001</a> | AN245-0.625-E7-S.0-Z2  | 5/8       | 5/8       | 3/4           | 5              | 0.600    | 2-3/8 | 2      | TICN    | CYLINDRICAL |
| <a href="#">N58006</a> | AN245-0.750-E9-S.0-Z2  | 3/4       | 3/4       | 1             | 5              | 0.720    | 2-1/2 | 2      | TICN    | CYLINDRICAL |
| <a href="#">N58009</a> | AN245-0.750-E11-S.0-Z2 | 3/4       | 3/4       | 1             | 6              | 0.720    | 4     | 2      | TICN    | CYLINDRICAL |
| <a href="#">N58010</a> | AN245-0.750-E12-S.0-Z2 | 3/4       | 3/4       | 1             | 8              | 0.720    | 6     | 2      | TICN    | CYLINDRICAL |

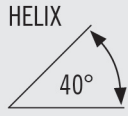
## ANB245



| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|----------|-------------|
| <a href="#">N58028</a> | ANB245-0.375-E2-B.0-Z2 | 3/8       | 3/8       | 3/4           | 4              | 0.360    | 2-1/8 | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N58033</a> | ANB245-0.375-E2-B.0-Z2 | 3/8       | 3/8       | 3/4           | 4              | 0.360    | 2-1/8 | 2      | TICN     | CYLINDRICAL |
| <a href="#">N58029</a> | ANB245-0.500-E2-B.0-Z2 | 1/2       | 1/2       | 1             | 6              | 0.480    | 4-1/8 | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N58034</a> | ANB245-0.500-E2-B.0-Z2 | 1/2       | 1/2       | 1             | 6              | 0.480    | 4-1/8 | 2      | TICN     | CYLINDRICAL |
| <a href="#">N58030</a> | ANB245-0.625-E2-B.0-Z2 | 5/8       | 5/8       | 1-1/4         | 6              | 0.600    | 4     | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N58035</a> | ANB245-0.625-E2-B.0-Z2 | 5/8       | 5/8       | 1-1/4         | 6              | 0.600    | 4     | 2      | TICN     | CYLINDRICAL |

## AN340

SOLID CARBIDE



CENTER CUTTING



- Cylindrical land to eliminate chatter
- Form ground flute shape
- Eccentric primary relief
- Ideal for high volume material removal in aluminum and non-ferrous materials
- With corner radius for strength
- Wiper flat to improve floor finish on the workpiece
- Cutting Data - Page 106
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH  | FLUTES | COATING  | RADIUS | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|----------|--------|--------|----------|--------|-------------|
| <a href="#">N57881</a> | AN340-0.188-E1-R010.0-Z3 | 3/16      | 3/16      | 1/4           | 2              | 0.178    | 9/16   | 3      | UNCOATED | 0.010  | CYLINDRICAL |
| <a href="#">N57910</a> | AN340-0.188-E1-R010.0-Z3 | 3/16      | 3/16      | 1/4           | 2              | 0.178    | 9/16   | 3      | TICN     | 0.010  | CYLINDRICAL |
| <a href="#">N57882</a> | AN340-0.188-E2-R010.0-Z3 | 3/16      | 3/16      | 1/4           | 3              | 0.178    | 1-9/16 | 3      | UNCOATED | 0.010  | CYLINDRICAL |
| <a href="#">N57911</a> | AN340-0.188-E2-R010.0-Z3 | 3/16      | 3/16      | 1/4           | 3              | 0.178    | 1-9/16 | 3      | TICN     | 0.010  | CYLINDRICAL |
| <a href="#">N57884</a> | AN340-0.250-E1-R010.0-Z3 | 1/4       | 1/4       | 5/16          | 2-1/2          | 0.240    | 3/4    | 3      | UNCOATED | 0.010  | CYLINDRICAL |
| <a href="#">N57913</a> | AN340-0.250-E1-R010.0-Z3 | 1/4       | 1/4       | 5/16          | 2-1/2          | 0.240    | 3/4    | 3      | TICN     | 0.010  | CYLINDRICAL |
| <a href="#">N57885</a> | AN340-0.250-E2-R010.0-Z3 | 1/4       | 1/4       | 5/16          | 3-1/4          | 0.240    | 1-3/4  | 3      | UNCOATED | 0.010  | CYLINDRICAL |
| <a href="#">N57914</a> | AN340-0.250-E2-R010.0-Z3 | 1/4       | 1/4       | 5/16          | 3-1/4          | 0.240    | 1-3/4  | 3      | TICN     | 0.010  | CYLINDRICAL |
| <a href="#">N57888</a> | AN340-0.375-E1-R015.0-Z3 | 3/8       | 3/8       | 1/2           | 2-1/2          | 0.360    | 7/8    | 3      | UNCOATED | 0.015  | CYLINDRICAL |
| <a href="#">N57917</a> | AN340-0.375-E1-R015.0-Z3 | 3/8       | 3/8       | 1/2           | 2-1/2          | 0.360    | 7/8    | 3      | TICN     | 0.015  | CYLINDRICAL |
| <a href="#">N57889</a> | AN340-0.375-E2-R015.0-Z3 | 3/8       | 3/8       | 1/2           | 3              | 0.360    | 1-3/8  | 3      | UNCOATED | 0.015  | CYLINDRICAL |
| <a href="#">N57918</a> | AN340-0.375-E2-R015.0-Z3 | 3/8       | 3/8       | 1/2           | 3              | 0.360    | 1-3/8  | 3      | TICN     | 0.015  | CYLINDRICAL |
| <a href="#">N57890</a> | AN340-0.375-E3-R015.0-Z3 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-3/8  | 3      | UNCOATED | 0.015  | CYLINDRICAL |
| <a href="#">N57919</a> | AN340-0.375-E3-R015.0-Z3 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-3/8  | 3      | TICN     | 0.015  | CYLINDRICAL |
| <a href="#">N57893</a> | AN340-0.500-E1-R020.0-Z3 | 1/2       | 1/2       | 5/8           | 3              | 0.480    | 1-1/8  | 3      | UNCOATED | 0.020  | CYLINDRICAL |
| <a href="#">N57922</a> | AN340-0.500-E1-R020.0-Z3 | 1/2       | 1/2       | 5/8           | 3              | 0.480    | 1-1/8  | 3      | TICN     | 0.020  | CYLINDRICAL |
| <a href="#">N57894</a> | AN340-0.500-E2-R020.0-Z3 | 1/2       | 1/2       | 5/8           | 4              | 0.480    | 2-1/8  | 3      | UNCOATED | 0.020  | CYLINDRICAL |
| <a href="#">N57923</a> | AN340-0.500-E2-R020.0-Z3 | 1/2       | 1/2       | 5/8           | 4              | 0.480    | 2-1/8  | 3      | TICN     | 0.020  | CYLINDRICAL |
| <a href="#">N57895</a> | AN340-0.500-E3-R020.0-Z3 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3-1/8  | 3      | UNCOATED | 0.020  | CYLINDRICAL |
| <a href="#">N57924</a> | AN340-0.500-E3-R020.0-Z3 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3-1/8  | 3      | TICN     | 0.020  | CYLINDRICAL |
| <a href="#">N57897</a> | AN340-0.625-E1-R025.0-Z3 | 5/8       | 5/8       | 3/4           | 3-1/2          | 0.600    | 1-1/2  | 3      | UNCOATED | 0.025  | CYLINDRICAL |
| <a href="#">N57926</a> | AN340-0.625-E1-R025.0-Z3 | 5/8       | 5/8       | 3/4           | 3-1/2          | 0.600    | 1-1/2  | 3      | TICN     | 0.025  | CYLINDRICAL |
| <a href="#">N57901</a> | AN340-0.750-E1-R030.0-Z3 | 3/4       | 3/4       | 1             | 4              | 0.720    | 1-7/8  | 3      | UNCOATED | 0.030  | CYLINDRICAL |
| <a href="#">N57930</a> | AN340-0.750-E1-R030.0-Z3 | 3/4       | 3/4       | 1             | 4              | 0.720    | 1-7/8  | 3      | TICN     | 0.030  | CYLINDRICAL |
| <a href="#">N57902</a> | AN340-0.750-E2-R030.0-Z3 | 3/4       | 3/4       | 1             | 5              | 0.720    | 2-7/8  | 3      | UNCOATED | 0.030  | CYLINDRICAL |
| <a href="#">N57931</a> | AN340-0.750-E2-R030.0-Z3 | 3/4       | 3/4       | 1             | 5              | 0.720    | 2-7/8  | 3      | TICN     | 0.030  | CYLINDRICAL |
| <a href="#">N57903</a> | AN340-0.750-E3-R030.0-Z3 | 3/4       | 3/4       | 1             | 6              | 0.720    | 3-7/8  | 3      | UNCOATED | 0.030  | CYLINDRICAL |
| <a href="#">N57932</a> | AN340-0.750-E3-R030.0-Z3 | 3/4       | 3/4       | 1             | 6              | 0.720    | 3-7/8  | 3      | TICN     | 0.030  | CYLINDRICAL |
| <a href="#">N57906</a> | AN340-1.000-E1-R040.0-Z3 | 1         | 1         | 1-1/4         | 4              | 0.960    | 1-5/8  | 3      | UNCOATED | 0.040  | CYLINDRICAL |
| <a href="#">N57935</a> | AN340-1.000-E1-R040.0-Z3 | 1         | 1         | 1-1/4         | 4              | 0.960    | 1-5/8  | 3      | TICN     | 0.040  | CYLINDRICAL |

## A345

SOLID CARBIDE

HELIX

45°

SQUARE END

CENTER CUTTING

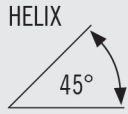


- Cylindrical land to eliminate chatter
  - Form ground flute shape
  - Eccentric primary relief
  - Ideal for peripheral milling in aluminum and non-ferrous materials
  - Wiper flat to improve floor finish on the workpiece
  - Open end tooth gashing design to permit increased chip evacuation
- Cutting Data - Page 106
  - Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N61534</a> | A345-0.125-D2-S.0-Z3 | 1/8       | 1/8       | 1/4           | 1-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61626</a> | A345-0.125-D2-S.0-Z3 | 1/8       | 1/8       | 1/4           | 1-1/2          | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61535</a> | A345-0.125-D3-S.0-Z3 | 1/8       | 1/8       | 3/8           | 1-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61627</a> | A345-0.125-D3-S.0-Z3 | 1/8       | 1/8       | 3/8           | 1-1/2          | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61536</a> | A345-0.156-F2-S.0-Z3 | 5/32      | 3/16      | 5/16          | 2              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61628</a> | A345-0.156-F2-S.0-Z3 | 5/32      | 3/16      | 5/16          | 2              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61537</a> | A345-0.156-F3-S.0-Z3 | 5/32      | 3/16      | 1/2           | 2              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61629</a> | A345-0.156-F3-S.0-Z3 | 5/32      | 3/16      | 1/2           | 2              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61538</a> | A345-0.188-D2-S.0-Z3 | 3/16      | 3/16      | 5/16          | 2              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61630</a> | A345-0.188-D2-S.0-Z3 | 3/16      | 3/16      | 5/16          | 2              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61539</a> | A345-0.188-D3-S.0-Z3 | 3/16      | 3/16      | 9/16          | 2              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61631</a> | A345-0.188-D3-S.0-Z3 | 3/16      | 3/16      | 9/16          | 2              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61541</a> | A345-0.219-F3-S.0-Z3 | 7/32      | 1/4       | 3/4           | 2-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61633</a> | A345-0.219-F3-S.0-Z3 | 7/32      | 1/4       | 3/4           | 2-1/2          | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61542</a> | A345-0.250-D2-S.0-Z3 | 1/4       | 1/4       | 3/8           | 2-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61634</a> | A345-0.250-D2-S.0-Z3 | 1/4       | 1/4       | 3/8           | 2-1/2          | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61543</a> | A345-0.250-D3-S.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61635</a> | A345-0.250-D3-S.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61544</a> | A345-0.250-D5-S.0-Z3 | 1/4       | 1/4       | 1-1/4         | 4              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61636</a> | A345-0.250-D5-S.0-Z3 | 1/4       | 1/4       | 1-1/4         | 4              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61547</a> | A345-0.313-D1-S.0-Z3 | 5/16      | 5/16      | 7/16          | 2-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61639</a> | A345-0.313-D1-S.0-Z3 | 5/16      | 5/16      | 7/16          | 2-1/2          | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61548</a> | A345-0.313-D3-S.0-Z3 | 5/16      | 5/16      | 13/16         | 2-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61640</a> | A345-0.313-D3-S.0-Z3 | 5/16      | 5/16      | 13/16         | 2-1/2          | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61549</a> | A345-0.313-D4-S.0-Z3 | 5/16      | 5/16      | 1-1/4         | 3-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61641</a> | A345-0.313-D4-S.0-Z3 | 5/16      | 5/16      | 1-1/4         | 3-1/2          | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61550</a> | A345-0.313-D7-S.0-Z3 | 5/16      | 5/16      | 2-1/4         | 4              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61642</a> | A345-0.313-D7-S.0-Z3 | 5/16      | 5/16      | 2-1/4         | 4              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61553</a> | A345-0.375-D1-S.0-Z3 | 3/8       | 3/8       | 1/2           | 2-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61645</a> | A345-0.375-D1-S.0-Z3 | 3/8       | 3/8       | 1/2           | 2-1/2          | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61554</a> | A345-0.375-D3-S.0-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61646</a> | A345-0.375-D3-S.0-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61555</a> | A345-0.375-D4-S.0-Z3 | 3/8       | 3/8       | 1-1/2         | 4              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61647</a> | A345-0.375-D4-S.0-Z3 | 3/8       | 3/8       | 1-1/2         | 4              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61559</a> | A345-0.438-D2-S.0-Z3 | 7/16      | 7/16      | 1             | 2-3/4          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61651</a> | A345-0.438-D2-S.0-Z3 | 7/16      | 7/16      | 1             | 2-3/4          | 3      | TICN     | CYLINDRICAL |

## A345 (CON'T)

SOLID  
CARBIDE



CENTER  
CUTTING

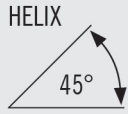


- Cylindrical land to eliminate chatter
- Form ground flute shape
- Eccentric primary relief
- Ideal for peripheral milling in aluminum and non-ferrous materials
- Wiper flat to improve floor finish on the workpiece
- Open end tooth gashing design to permit increased chip evacuation
- Cutting Data - Page 106
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N61562</a> | A345-0.500-D1-S.0-Z3 | 1/2       | 1/2       | 5/8           | 3              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61654</a> | A345-0.500-D1-S.0-Z3 | 1/2       | 1/2       | 5/8           | 3              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61563</a> | A345-0.500-D3-S.0-Z3 | 1/2       | 1/2       | 1-1/4         | 3              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61655</a> | A345-0.500-D3-S.0-Z3 | 1/2       | 1/2       | 1-1/4         | 3              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61564</a> | A345-0.500-D4-S.0-Z3 | 1/2       | 1/2       | 2             | 4              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61656</a> | A345-0.500-D4-S.0-Z3 | 1/2       | 1/2       | 2             | 4              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61565</a> | A345-0.500-D6-S.0-Z3 | 1/2       | 1/2       | 3-1/8         | 6              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61657</a> | A345-0.500-D6-S.0-Z3 | 1/2       | 1/2       | 3-1/8         | 6              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61566</a> | A345-0.625-D1-S.0-Z3 | 5/8       | 5/8       | 3/4           | 3              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61658</a> | A345-0.625-D1-S.0-Z3 | 5/8       | 5/8       | 3/4           | 3              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61567</a> | A345-0.625-D3-S.0-Z3 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61659</a> | A345-0.625-D3-S.0-Z3 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61568</a> | A345-0.625-D4-S.0-Z3 | 5/8       | 5/8       | 2-1/2         | 5              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61660</a> | A345-0.625-D4-S.0-Z3 | 5/8       | 5/8       | 2-1/2         | 5              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61569</a> | A345-0.625-D6-S.0-Z3 | 5/8       | 5/8       | 3-3/4         | 6              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61661</a> | A345-0.625-D6-S.0-Z3 | 5/8       | 5/8       | 3-3/4         | 6              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61570</a> | A345-0.750-D1-S.0-Z3 | 3/4       | 3/4       | 1             | 3              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61662</a> | A345-0.750-D1-S.0-Z3 | 3/4       | 3/4       | 1             | 3              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61571</a> | A345-0.750-D2-S.0-Z3 | 3/4       | 3/4       | 1-5/8         | 4              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61663</a> | A345-0.750-D2-S.0-Z3 | 3/4       | 3/4       | 1-5/8         | 4              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61572</a> | A345-0.750-D3-S.0-Z3 | 3/4       | 3/4       | 2-1/4         | 5              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61664</a> | A345-0.750-D3-S.0-Z3 | 3/4       | 3/4       | 2-1/4         | 5              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61573</a> | A345-0.750-D4-S.0-Z3 | 3/4       | 3/4       | 3-1/4         | 6              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61665</a> | A345-0.750-D4-S.0-Z3 | 3/4       | 3/4       | 3-1/4         | 6              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61574</a> | A345-0.750-D5-S.0-Z3 | 3/4       | 3/4       | 4             | 6-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61666</a> | A345-0.750-D5-S.0-Z3 | 3/4       | 3/4       | 4             | 6-1/2          | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61575</a> | A345-1.000-D1-S.0-Z3 | 1         | 1         | 1-1/4         | 4              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61667</a> | A345-1.000-D1-S.0-Z3 | 1         | 1         | 1-1/4         | 4              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61576</a> | A345-1.000-D2-S.0-Z3 | 1         | 1         | 2             | 5              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61668</a> | A345-1.000-D2-S.0-Z3 | 1         | 1         | 2             | 5              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61577</a> | A345-1.000-D3-S.0-Z3 | 1         | 1         | 2-5/8         | 6              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61669</a> | A345-1.000-D3-S.0-Z3 | 1         | 1         | 2-5/8         | 6              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61578</a> | A345-1.000-D4-S.0-Z3 | 1         | 1         | 3-1/4         | 6              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61670</a> | A345-1.000-D4-S.0-Z3 | 1         | 1         | 3-1/4         | 6              | 3      | TICN     | CYLINDRICAL |
| <a href="#">N61579</a> | A345-1.000-D5-S.0-Z3 | 1         | 1         | 4-1/8         | 7              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N61671</a> | A345-1.000-D5-S.0-Z3 | 1         | 1         | 4-1/8         | 7              | 3      | TICN     | CYLINDRICAL |

## A345M

SOLID  
CARBIDE



CENTER  
CUTTING



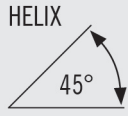
- Cylindrical land to eliminate chatter
- Form ground flute shape
- Eccentric primary relief
- Ideal for aluminum and non-ferrous materials
- Wiper flat to improve floor finish on the workpiece
- Open end tooth gashing design to permit increased chip evacuation
- Cutting Data - Page 108
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION         | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|---------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N47812</a> | A345M-030-D4-S.0-Z3 | 3mm       | 3mm       | 12mm          | 38mm           | 3      | TICN    | CYLINDRICAL |
| <a href="#">N47816</a> | A345M-040-D3-S.0-Z3 | 4mm       | 4mm       | 12mm          | 50mm           | 3      | TICN    | CYLINDRICAL |
| <a href="#">N47818</a> | A345M-050-D3-S.0-Z3 | 5mm       | 5mm       | 14mm          | 50mm           | 3      | TICN    | CYLINDRICAL |
| <a href="#">N47822</a> | A345M-060-D3-S.0-Z3 | 6mm       | 6mm       | 16mm          | 58mm           | 3      | TICN    | CYLINDRICAL |
| <a href="#">N47826</a> | A345M-080-D2-S.0-Z3 | 8mm       | 8mm       | 20mm          | 64mm           | 3      | TICN    | CYLINDRICAL |
| <a href="#">N47830</a> | A345M-100-D2-S.0-Z3 | 10mm      | 10mm      | 22mm          | 73mm           | 3      | TICN    | CYLINDRICAL |
| <a href="#">N47834</a> | A345M-120-D3-S.0-Z3 | 12mm      | 12mm      | 32mm          | 84mm           | 3      | TICN    | CYLINDRICAL |
| <a href="#">N47838</a> | A345M-140-D2-S.0-Z3 | 14mm      | 14mm      | 32mm          | 83mm           | 3      | TICN    | CYLINDRICAL |
| <a href="#">N47842</a> | A345M-160-D2-S.0-Z3 | 16mm      | 16mm      | 36mm          | 93mm           | 3      | TICN    | CYLINDRICAL |
| <a href="#">N47850</a> | A345M-200-D3-S.0-Z3 | 20mm      | 20mm      | 50mm          | 104mm          | 3      | TICN    | CYLINDRICAL |
| <a href="#">N47854</a> | A345M-250-D3-S.0-Z3 | 25mm      | 25mm      | 60mm          | 140mm          | 3      | TICN    | CYLINDRICAL |



## A345R

SOLID  
CARBIDE



CENTER  
CUTTING

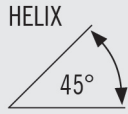


- Cylindrical land to eliminate chatter
- Form ground flute shape
- Eccentric primary relief
- Ideal for aluminum and non-ferrous materials
- Wiper flat to improve floor finish on the workpiece
- Open end tooth gashing design to permit increased chip evacuation
- Cutting Data - Page 106
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N90753</a> | A345R-0.125-D3-R010.0-Z3 | 1/8       | 1/8       | 3/8           | 1-1/2          | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90755</a> | A345R-0.125-D3-R020.0-Z3 | 1/8       | 1/8       | 3/8           | 1-1/2          | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90756</a> | A345R-0.125-D3-R030.0-Z3 | 1/8       | 1/8       | 3/8           | 1-1/2          | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90757</a> | A345R-0.156-F3-R010.0-Z3 | 5/32      | 3/16      | 1/2           | 2              | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90759</a> | A345R-0.156-F3-R020.0-Z3 | 5/32      | 3/16      | 1/2           | 2              | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90760</a> | A345R-0.156-F3-R030.0-Z3 | 5/32      | 3/16      | 1/2           | 2              | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90761</a> | A345R-0.188-D3-R010.0-Z3 | 3/16      | 3/16      | 9/16          | 2              | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90763</a> | A345R-0.188-D3-R020.0-Z3 | 3/16      | 3/16      | 9/16          | 2              | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90764</a> | A345R-0.188-D3-R030.0-Z3 | 3/16      | 3/16      | 9/16          | 2              | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90765</a> | A345R-0.219-F3-R010.0-Z3 | 7/32      | 1/4       | 3/4           | 2-1/2          | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90767</a> | A345R-0.219-F3-R020.0-Z3 | 7/32      | 1/4       | 3/4           | 2-1/2          | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90768</a> | A345R-0.219-F3-R030.0-Z3 | 7/32      | 1/4       | 3/4           | 2-1/2          | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90769</a> | A345R-0.250-D3-R010.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90775</a> | A345R-0.250-D3-R020.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90776</a> | A345R-0.250-D3-R030.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90777</a> | A345R-0.250-D3-R045.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90778</a> | A345R-0.250-D3-R060.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90785</a> | A345R-0.313-D3-R010.0-Z3 | 5/16      | 5/16      | 13/16         | 2-1/2          | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90787</a> | A345R-0.313-D3-R020.0-Z3 | 5/16      | 5/16      | 13/16         | 2-1/2          | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90788</a> | A345R-0.313-D3-R030.0-Z3 | 5/16      | 5/16      | 13/16         | 2-1/2          | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90789</a> | A345R-0.313-D3-R045.0-Z3 | 5/16      | 5/16      | 13/16         | 2-1/2          | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90790</a> | A345R-0.313-D3-R060.0-Z3 | 5/16      | 5/16      | 13/16         | 2-1/2          | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90803</a> | A345R-0.375-D3-R010.0-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90805</a> | A345R-0.375-D3-R020.0-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90806</a> | A345R-0.375-D3-R030.0-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90807</a> | A345R-0.375-D3-R045.0-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90808</a> | A345R-0.375-D3-R060.0-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90815</a> | A345R-0.438-D2-R010.0-Z3 | 7/16      | 7/16      | 1             | 2-3/4          | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90817</a> | A345R-0.438-D2-R020.0-Z3 | 7/16      | 7/16      | 1             | 2-3/4          | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90818</a> | A345R-0.438-D2-R030.0-Z3 | 7/16      | 7/16      | 1             | 2-3/4          | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90819</a> | A345R-0.438-D2-R045.0-Z3 | 7/16      | 7/16      | 1             | 2-3/4          | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90820</a> | A345R-0.438-D2-R060.0-Z3 | 7/16      | 7/16      | 1             | 2-3/4          | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90821</a> | A345R-0.438-D2-R090.0-Z3 | 7/16      | 7/16      | 1             | 2-3/4          | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90822</a> | A345R-0.438-D2-R125.0-Z3 | 7/16      | 7/16      | 1             | 2-3/4          | 3      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90831</a> | A345R-0.500-D1-R010.0-Z3 | 1/2       | 1/2       | 5/8           | 3              | 3      | TICN    | 0.010  | CYLINDRICAL |

## A345R (CON'T)

SOLID CARBIDE



CENTER CUTTING



- Cylindrical land to eliminate chatter
- Form ground flute shape
- Eccentric primary relief
- Ideal for aluminum and non-ferrous materials
- Wiper flat to improve floor finish on the workpiece
- Open end tooth gashing design to permit increased chip evacuation
- Cutting Data - Page 106
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N90833</a> | A345R-0.500-D1-R020.0-Z3 | 1/2       | 1/2       | 5/8           | 3              | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90834</a> | A345R-0.500-D1-R030.0-Z3 | 1/2       | 1/2       | 5/8           | 3              | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90835</a> | A345R-0.500-D1-R045.0-Z3 | 1/2       | 1/2       | 5/8           | 3              | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90836</a> | A345R-0.500-D1-R060.0-Z3 | 1/2       | 1/2       | 5/8           | 3              | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90837</a> | A345R-0.500-D1-R090.0-Z3 | 1/2       | 1/2       | 5/8           | 3              | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90838</a> | A345R-0.500-D1-R125.0-Z3 | 1/2       | 1/2       | 5/8           | 3              | 3      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90839</a> | A345R-0.500-D3-R010.0-Z3 | 1/2       | 1/2       | 1-1/4         | 3              | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90841</a> | A345R-0.500-D3-R020.0-Z3 | 1/2       | 1/2       | 1-1/4         | 3              | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90842</a> | A345R-0.500-D3-R030.0-Z3 | 1/2       | 1/2       | 1-1/4         | 3              | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90843</a> | A345R-0.500-D3-R045.0-Z3 | 1/2       | 1/2       | 1-1/4         | 3              | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90844</a> | A345R-0.500-D3-R060.0-Z3 | 1/2       | 1/2       | 1-1/4         | 3              | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90847</a> | A345R-0.500-D3-R090.0-Z3 | 1/2       | 1/2       | 1-1/4         | 3              | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90848</a> | A345R-0.500-D3-R125.0-Z3 | 1/2       | 1/2       | 1-1/4         | 3              | 3      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90849</a> | A345R-0.500-D4-R010.0-Z3 | 1/2       | 1/2       | 2             | 4              | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90851</a> | A345R-0.500-D4-R020.0-Z3 | 1/2       | 1/2       | 2             | 4              | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90852</a> | A345R-0.500-D4-R030.0-Z3 | 1/2       | 1/2       | 2             | 4              | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90853</a> | A345R-0.500-D4-R045.0-Z3 | 1/2       | 1/2       | 2             | 4              | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90854</a> | A345R-0.500-D4-R060.0-Z3 | 1/2       | 1/2       | 2             | 4              | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90855</a> | A345R-0.500-D4-R090.0-Z3 | 1/2       | 1/2       | 2             | 4              | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90856</a> | A345R-0.500-D4-R125.0-Z3 | 1/2       | 1/2       | 2             | 4              | 3      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90865</a> | A345R-0.625-D3-R010.0-Z3 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90867</a> | A345R-0.625-D3-R020.0-Z3 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90868</a> | A345R-0.625-D3-R030.0-Z3 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90869</a> | A345R-0.625-D3-R045.0-Z3 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90870</a> | A345R-0.625-D3-R060.0-Z3 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90871</a> | A345R-0.625-D3-R090.0-Z3 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90872</a> | A345R-0.625-D3-R125.0-Z3 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 3      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90881</a> | A345R-0.750-D1-R010.0-Z3 | 3/4       | 3/4       | 1             | 3              | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90883</a> | A345R-0.750-D1-R020.0-Z3 | 3/4       | 3/4       | 1             | 3              | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90884</a> | A345R-0.750-D1-R030.0-Z3 | 3/4       | 3/4       | 1             | 3              | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90885</a> | A345R-0.750-D1-R045.0-Z3 | 3/4       | 3/4       | 1             | 3              | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90886</a> | A345R-0.750-D1-R060.0-Z3 | 3/4       | 3/4       | 1             | 3              | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90887</a> | A345R-0.750-D1-R090.0-Z3 | 3/4       | 3/4       | 1             | 3              | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90888</a> | A345R-0.750-D1-R125.0-Z3 | 3/4       | 3/4       | 1             | 3              | 3      | TICN    | 0.125  | CYLINDRICAL |

## A345R (CON'T)

SOLID CARBIDE

HELIX

RADIUS

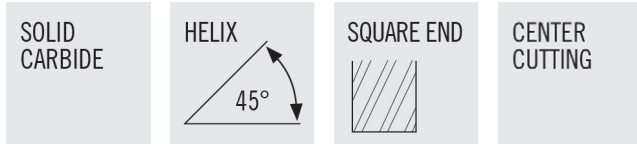
CENTER CUTTING



- Cylindrical land to eliminate chatter
  - Form ground flute shape
  - Eccentric primary relief
  - Ideal for aluminum and non-ferrous materials
  - Wiper flat to improve floor finish on the workpiece
  - Open end tooth gashing design to permit increased chip evacuation
- Cutting Data - Page 106
  - Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N90889</a> | A345R-0.750-D1-R190.0-Z3 | 3/4       | 3/4       | 1             | 3              | 3      | TICN    | 0.190  | CYLINDRICAL |
| <a href="#">N90890</a> | A345R-0.750-D3-R010.0-Z3 | 3/4       | 3/4       | 2-1/4         | 5              | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90892</a> | A345R-0.750-D3-R020.0-Z3 | 3/4       | 3/4       | 2-1/4         | 5              | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90893</a> | A345R-0.750-D3-R030.0-Z3 | 3/4       | 3/4       | 2-1/4         | 5              | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90894</a> | A345R-0.750-D3-R045.0-Z3 | 3/4       | 3/4       | 2-1/4         | 5              | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90895</a> | A345R-0.750-D3-R060.0-Z3 | 3/4       | 3/4       | 2-1/4         | 5              | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90896</a> | A345R-0.750-D3-R090.0-Z3 | 3/4       | 3/4       | 2-1/4         | 5              | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90897</a> | A345R-0.750-D3-R125.0-Z3 | 3/4       | 3/4       | 2-1/4         | 5              | 3      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90899</a> | A345R-0.750-D3-R190.0-Z3 | 3/4       | 3/4       | 2-1/4         | 5              | 3      | TICN    | 0.190  | CYLINDRICAL |
| <a href="#">N90900</a> | A345R-0.750-D5-R010.0-Z3 | 3/4       | 3/4       | 4             | 6-1/2          | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90902</a> | A345R-0.750-D5-R020.0-Z3 | 3/4       | 3/4       | 4             | 6-1/2          | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90903</a> | A345R-0.750-D5-R030.0-Z3 | 3/4       | 3/4       | 4             | 6-1/2          | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90904</a> | A345R-0.750-D5-R045.0-Z3 | 3/4       | 3/4       | 4             | 6-1/2          | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90905</a> | A345R-0.750-D5-R060.0-Z3 | 3/4       | 3/4       | 4             | 6-1/2          | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90906</a> | A345R-0.750-D5-R090.0-Z3 | 3/4       | 3/4       | 4             | 6-1/2          | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90907</a> | A345R-0.750-D5-R125.0-Z3 | 3/4       | 3/4       | 4             | 6-1/2          | 3      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90534</a> | A345R-0.750-D5-R190.0-Z3 | 3/4       | 3/4       | 4             | 6-1/2          | 3      | TICN    | 0.190  | CYLINDRICAL |
| <a href="#">N90909</a> | A345R-1.000-D3-R010.0-Z3 | 1         | 1         | 2-5/8         | 6              | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90911</a> | A345R-1.000-D3-R020.0-Z3 | 1         | 1         | 2-5/8         | 6              | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90912</a> | A345R-1.000-D3-R030.0-Z3 | 1         | 1         | 2-5/8         | 6              | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90913</a> | A345R-1.000-D3-R045.0-Z3 | 1         | 1         | 2-5/8         | 6              | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90914</a> | A345R-1.000-D3-R060.0-Z3 | 1         | 1         | 2-5/8         | 6              | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90915</a> | A345R-1.000-D3-R090.0-Z3 | 1         | 1         | 2-5/8         | 6              | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90916</a> | A345R-1.000-D3-R125.0-Z3 | 1         | 1         | 2-5/8         | 6              | 3      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90917</a> | A345R-1.000-D3-R190.0-Z3 | 1         | 1         | 2-5/8         | 6              | 3      | TICN    | 0.190  | CYLINDRICAL |

## AN345



- Cylindrical land to eliminate chatter
- Form ground flute shape
- Eccentric primary relief
- Ideal for slotting, pocketing and long reach peripheral milling in aluminum
- Wiper flat to improve floor finish on the workpiece
- Open end tooth gashing design to permit increased chip evacuation

- Cutting Data - Page 107
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|----------|-------|--------|----------|-------------|
| <a href="#">N18597</a> | AN345-0.250-E2-S.0-Z3 | 1/4       | 1/4       | 3/8           | 4              | 0.240    | 2-1/8 | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N57938</a> | AN345-0.250-E3-S.0-Z3 | 1/4       | 1/4       | 1/2           | 3              | 0.240    | 1     | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N57939</a> | AN345-0.250-E4-S.0-Z3 | 1/4       | 1/4       | 1/2           | 4              | 0.240    | 1-1/2 | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N18598</a> | AN345-0.313-E1-S.0-Z3 | 5/16      | 5/16      | 7/16          | 4              | 0.300    | 2-1/8 | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N18599</a> | AN345-0.375-E1-S.0-Z3 | 3/8       | 3/8       | 3/8           | 2-1/2          | 0.360    | 1-1/8 | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N18600</a> | AN345-0.375-E2-S.0-Z3 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-1/8 | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N18601</a> | AN345-0.375-E3-S.0-Z3 | 3/8       | 3/8       | 1/2           | 6              | 0.360    | 4-1/8 | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N57940</a> | AN345-0.375-E4-S.0-Z3 | 3/8       | 3/8       | 3/4           | 4              | 0.360    | 2     | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N57941</a> | AN345-0.375-E5-S.0-Z3 | 3/8       | 3/8       | 3/4           | 5              | 0.360    | 3     | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N18603</a> | AN345-0.500-E2-S.0-Z3 | 1/2       | 1/2       | 5/8           | 4              | 0.480    | 2-1/8 | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N57942</a> | AN345-0.500-E4-S.0-Z3 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3     | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N18604</a> | AN345-0.500-E3-S.0-Z3 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N18606</a> | AN345-0.625-E2-S.0-Z3 | 5/8       | 5/8       | 3/4           | 6              | 0.600    | 4     | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N18609</a> | AN345-0.750-E3-S.0-Z3 | 3/4       | 3/4       | 1             | 6              | 0.720    | 3-1/2 | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N18610</a> | AN345-0.750-E4-S.0-Z3 | 3/4       | 3/4       | 1             | 7              | 0.720    | 4-1/8 | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N18612</a> | AN345-1.000-E2-S.0-Z3 | 1         | 1         | 1-1/4         | 6              | 0.960    | 3-1/2 | 3      | UNCOATED | CYLINDRICAL |

## AN345R

SOLID CARBIDE

HELIX  
45°

RADIUS

CENTER CUTTING

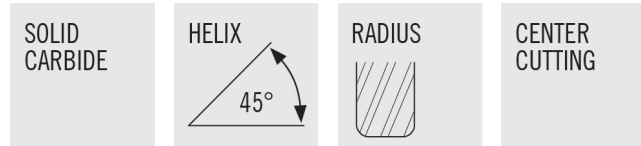


- Cylindrical land to eliminate chatter
- Form ground flute shape
- Eccentric primary relief
- Ideal for slotting, pocketing and long reach peripheral milling in aluminum
- Wiper flat to improve floor finish on the work piece
- Open end tooth gashing design to permit increased chip evacuation

- Cutting Data - Page 107
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|--------|-------------|
| <a href="#">N90288</a> | AN345R-0.250-E2-R010.0-Z3 | 1/4       | 1/4       | 3/8           | 4              | 0.240    | 2-1/8 | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90255</a> | AN345R-0.250-E2-R020.0-Z3 | 1/4       | 1/4       | 3/8           | 4              | 0.240    | 2-1/8 | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90289</a> | AN345R-0.250-E2-R030.0-Z3 | 1/4       | 1/4       | 3/8           | 4              | 0.240    | 2-1/8 | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90290</a> | AN345R-0.250-E2-R045.0-Z3 | 1/4       | 1/4       | 3/8           | 4              | 0.240    | 2-1/8 | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90291</a> | AN345R-0.250-E2-R060.0-Z3 | 1/4       | 1/4       | 3/8           | 4              | 0.240    | 2-1/8 | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90489</a> | AN345R-0.250-E3-R010.0-Z3 | 1/4       | 1/4       | 1/2           | 3              | 0.240    | 1     | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90279</a> | AN345R-0.250-E3-R020.0-Z3 | 1/4       | 1/4       | 1/2           | 3              | 0.240    | 1     | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90490</a> | AN345R-0.250-E3-R030.0-Z3 | 1/4       | 1/4       | 1/2           | 3              | 0.240    | 1     | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90491</a> | AN345R-0.250-E3-R045.0-Z3 | 1/4       | 1/4       | 1/2           | 3              | 0.240    | 1     | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90492</a> | AN345R-0.250-E3-R060.0-Z3 | 1/4       | 1/4       | 1/2           | 3              | 0.240    | 1     | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90497</a> | AN345R-0.250-E4-R010.0-Z3 | 1/4       | 1/4       | 1/2           | 4              | 0.240    | 1-1/2 | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90281</a> | AN345R-0.250-E4-R020.0-Z3 | 1/4       | 1/4       | 1/2           | 4              | 0.240    | 1-1/2 | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90498</a> | AN345R-0.250-E4-R030.0-Z3 | 1/4       | 1/4       | 1/2           | 4              | 0.240    | 1-1/2 | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90499</a> | AN345R-0.250-E4-R045.0-Z3 | 1/4       | 1/4       | 1/2           | 4              | 0.240    | 1-1/2 | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90500</a> | AN345R-0.250-E4-R060.0-Z3 | 1/4       | 1/4       | 1/2           | 4              | 0.240    | 1-1/2 | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90262</a> | AN345R-0.313-E1-R020.0-Z3 | 5/16      | 5/16      | 7/16          | 4              | 0.300    | 2-1/8 | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90292</a> | AN345R-0.313-E1-R010.0-Z3 | 5/16      | 5/16      | 7/16          | 4              | 0.300    | 2-1/8 | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90293</a> | AN345R-0.313-E1-R030.0-Z3 | 5/16      | 5/16      | 7/16          | 4              | 0.300    | 2-1/8 | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90294</a> | AN345R-0.313-E1-R045.0-Z3 | 5/16      | 5/16      | 7/16          | 4              | 0.300    | 2-1/8 | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90295</a> | AN345R-0.313-E1-R060.0-Z3 | 5/16      | 5/16      | 7/16          | 4              | 0.300    | 2-1/8 | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90296</a> | AN345R-0.375-E1-R010.0-Z3 | 3/8       | 3/8       | 3/8           | 2-1/2          | 0.360    | 1-1/8 | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90263</a> | AN345R-0.375-E1-R020.0-Z3 | 3/8       | 3/8       | 3/8           | 2-1/2          | 0.360    | 1-1/8 | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90297</a> | AN345R-0.375-E1-R030.0-Z3 | 3/8       | 3/8       | 3/8           | 2-1/2          | 0.360    | 1-1/8 | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90298</a> | AN345R-0.375-E1-R045.0-Z3 | 3/8       | 3/8       | 3/8           | 2-1/2          | 0.360    | 1-1/8 | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90299</a> | AN345R-0.375-E1-R060.0-Z3 | 3/8       | 3/8       | 3/8           | 2-1/2          | 0.360    | 1-1/8 | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90301</a> | AN345R-0.375-E2-R010.0-Z3 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-1/8 | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90265</a> | AN345R-0.375-E2-R020.0-Z3 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-1/8 | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90302</a> | AN345R-0.375-E2-R030.0-Z3 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-1/8 | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90303</a> | AN345R-0.375-E2-R045.0-Z3 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-1/8 | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90306</a> | AN345R-0.375-E2-R060.0-Z3 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-1/8 | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90307</a> | AN345R-0.375-E3-R010.0-Z3 | 3/8       | 3/8       | 1/2           | 6              | 0.360    | 4-1/8 | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90266</a> | AN345R-0.375-E3-R020.0-Z3 | 3/8       | 3/8       | 1/2           | 6              | 0.360    | 4-1/8 | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90308</a> | AN345R-0.375-E3-R030.0-Z3 | 3/8       | 3/8       | 1/2           | 6              | 0.360    | 4-1/8 | 3      | TICN    | 0.030  | CYLINDRICAL |

AN345R (CONT'D)





- Cylindrical land to eliminate chatter
- Form ground flute shape
- Eccentric primary relief
- Ideal for slotting, pocketing and long reach peripheral milling in aluminum
- Wiper flat to improve floor finish on the work piece
- Open end tooth gashing design to permit increased chip evacuation

- Cutting Data - Page 107
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|--------|-------------|
| <a href="#">N90309</a> | AN345R-0.375-E3-R045.0-Z3 | 3/8       | 3/8       | 1/2           | 6              | 0.360    | 4-1/8 | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90310</a> | AN345R-0.375-E3-R060.0-Z3 | 3/8       | 3/8       | 1/2           | 6              | 0.360    | 4-1/8 | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90501</a> | AN345R-0.375-E4-R010.0-Z3 | 3/8       | 3/8       | 3/4           | 4              | 0.360    | 2     | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90282</a> | AN345R-0.375-E4-R020.0-Z3 | 3/8       | 3/8       | 3/4           | 4              | 0.360    | 2     | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90506</a> | AN345R-0.375-E4-R030.0-Z3 | 3/8       | 3/8       | 3/4           | 4              | 0.360    | 2     | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90510</a> | AN345R-0.375-E4-R045.0-Z3 | 3/8       | 3/8       | 3/4           | 4              | 0.360    | 2     | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90514</a> | AN345R-0.375-E4-R060.0-Z3 | 3/8       | 3/8       | 3/4           | 4              | 0.360    | 2     | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90515</a> | AN345R-0.375-E5-R010.0-Z3 | 3/8       | 3/8       | 3/4           | 5              | 0.360    | 3     | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90283</a> | AN345R-0.375-E5-R020.0-Z3 | 3/8       | 3/8       | 3/4           | 5              | 0.360    | 3     | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90516</a> | AN345R-0.375-E5-R030.0-Z3 | 3/8       | 3/8       | 3/4           | 5              | 0.360    | 3     | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90517</a> | AN345R-0.375-E5-R045.0-Z3 | 3/8       | 3/8       | 3/4           | 5              | 0.360    | 3     | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90518</a> | AN345R-0.375-E5-R060.0-Z3 | 3/8       | 3/8       | 3/4           | 5              | 0.360    | 3     | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90341</a> | AN345R-0.500-E2-R010.0-Z3 | 1/2       | 1/2       | 5/8           | 4              | 0.480    | 2-1/8 | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90268</a> | AN345R-0.500-E2-R020.0-Z3 | 1/2       | 1/2       | 5/8           | 4              | 0.480    | 2-1/8 | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90342</a> | AN345R-0.500-E2-R030.0-Z3 | 1/2       | 1/2       | 5/8           | 4              | 0.480    | 2-1/8 | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90343</a> | AN345R-0.500-E2-R045.0-Z3 | 1/2       | 1/2       | 5/8           | 4              | 0.480    | 2-1/8 | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90344</a> | AN345R-0.500-E2-R060.0-Z3 | 1/2       | 1/2       | 5/8           | 4              | 0.480    | 2-1/8 | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90346</a> | AN345R-0.500-E2-R090.0-Z3 | 1/2       | 1/2       | 5/8           | 4              | 0.480    | 2-1/8 | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90347</a> | AN345R-0.500-E2-R125.0-Z3 | 1/2       | 1/2       | 5/8           | 4              | 0.480    | 2-1/8 | 3      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90519</a> | AN345R-0.500-E3-R010.0-Z3 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3     | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90286</a> | AN345R-0.500-E3-R020.0-Z3 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3     | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90520</a> | AN345R-0.500-E3-R030.0-Z3 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3     | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90521</a> | AN345R-0.500-E3-R045.0-Z3 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3     | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90522</a> | AN345R-0.500-E3-R060.0-Z3 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3     | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90523</a> | AN345R-0.500-E3-R090.0-Z3 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3     | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90524</a> | AN345R-0.500-E3-R125.0-Z3 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3     | 3      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90348</a> | AN345R-0.500-E4-R010.0-Z3 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90269</a> | AN345R-0.500-E4-R020.0-Z3 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90350</a> | AN345R-0.500-E4-R030.0-Z3 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90351</a> | AN345R-0.500-E4-R045.0-Z3 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90352</a> | AN345R-0.500-E4-R060.0-Z3 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90353</a> | AN345R-0.500-E4-R090.0-Z3 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90354</a> | AN345R-0.500-E4-R125.0-Z3 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 3      | TICN    | 0.125  | CYLINDRICAL |

## AN345R (CONT'D)

|               |  |   |                |
|---------------|--|---|----------------|
| SOLID CARBIDE |  <p>HELIX<br/>45°</p> |  <p>RADIUS</p> | CENTER CUTTING |
|---------------|--|---|----------------|

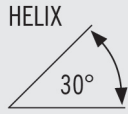


- Cylindrical land to eliminate chatter
- Form ground flute shape
- Eccentric primary relief
- Ideal for slotting, pocketing and long reach peripheral milling in aluminum
- Wiper flat to improve floor finish on the work piece
- Open end tooth gashing design to permit increased chip evacuation
- Cutting Data - Page 107
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|--------|-------------|
| <a href="#">N90361</a> | AN345R-0.625-E2-R010.0-Z3 | 5/8       | 5/8       | 3/4           | 6              | 0.600    | 4     | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90271</a> | AN345R-0.625-E2-R020.0-Z3 | 5/8       | 5/8       | 3/4           | 6              | 0.600    | 4     | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90362</a> | AN345R-0.625-E2-R030.0-Z3 | 5/8       | 5/8       | 3/4           | 6              | 0.600    | 4     | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90363</a> | AN345R-0.625-E2-R045.0-Z3 | 5/8       | 5/8       | 3/4           | 6              | 0.600    | 4     | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90364</a> | AN345R-0.625-E2-R060.0-Z3 | 5/8       | 5/8       | 3/4           | 6              | 0.600    | 4     | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90365</a> | AN345R-0.625-E2-R090.0-Z3 | 5/8       | 5/8       | 3/4           | 6              | 0.600    | 4     | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90366</a> | AN345R-0.625-E2-R125.0-Z3 | 5/8       | 5/8       | 3/4           | 6              | 0.600    | 4     | 3      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90380</a> | AN345R-0.750-E3-R010.0-Z3 | 3/4       | 3/4       | 1             | 6              | 0.720    | 3-1/2 | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90274</a> | AN345R-0.750-E3-R020.0-Z3 | 3/4       | 3/4       | 1             | 6              | 0.720    | 3-1/2 | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90382</a> | AN345R-0.750-E3-R030.0-Z3 | 3/4       | 3/4       | 1             | 6              | 0.720    | 3-1/2 | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90383</a> | AN345R-0.750-E3-R045.0-Z3 | 3/4       | 3/4       | 1             | 6              | 0.720    | 3-1/2 | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90384</a> | AN345R-0.750-E3-R060.0-Z3 | 3/4       | 3/4       | 1             | 6              | 0.720    | 3-1/2 | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90385</a> | AN345R-0.750-E3-R090.0-Z3 | 3/4       | 3/4       | 1             | 6              | 0.720    | 3-1/2 | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90386</a> | AN345R-0.750-E3-R125.0-Z3 | 3/4       | 3/4       | 1             | 6              | 0.720    | 3-1/2 | 3      | TICN    | 0.125  | CYLINDRICAL |
| <a href="#">N90399</a> | AN345R-1.000-E2-R010.0-Z3 | 1         | 1         | 1-1/4         | 6              | 0.960    | 3-1/2 | 3      | TICN    | 0.010  | CYLINDRICAL |
| <a href="#">N90277</a> | AN345R-1.000-E2-R020.0-Z3 | 1         | 1         | 1-1/4         | 6              | 0.960    | 3-1/2 | 3      | TICN    | 0.020  | CYLINDRICAL |
| <a href="#">N90401</a> | AN345R-1.000-E2-R030.0-Z3 | 1         | 1         | 1-1/4         | 6              | 0.960    | 3-1/2 | 3      | TICN    | 0.030  | CYLINDRICAL |
| <a href="#">N90402</a> | AN345R-1.000-E2-R045.0-Z3 | 1         | 1         | 1-1/4         | 6              | 0.960    | 3-1/2 | 3      | TICN    | 0.045  | CYLINDRICAL |
| <a href="#">N90403</a> | AN345R-1.000-E2-R060.0-Z3 | 1         | 1         | 1-1/4         | 6              | 0.960    | 3-1/2 | 3      | TICN    | 0.060  | CYLINDRICAL |
| <a href="#">N90404</a> | AN345R-1.000-E2-R090.0-Z3 | 1         | 1         | 1-1/4         | 6              | 0.960    | 3-1/2 | 3      | TICN    | 0.090  | CYLINDRICAL |
| <a href="#">N90441</a> | AN345R-1.000-E2-R125.0-Z3 | 1         | 1         | 1-1/4         | 6              | 0.960    | 3-1/2 | 3      | TICN    | 0.125  | CYLINDRICAL |

## AR330

SOLID  
CARBIDE



CENTER  
CUTTING

COARSE  
PITCH




- Form ground flute shape
- Ideal for aluminum and non-ferrous materials
- Reduced radial pressure
- Cutting Data - Page 107
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|-------------|
| <a href="#">N76195</a> | AR330-0.250-D3-C020.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | UNCOATED | 0.020   | CYLINDRICAL |
| <a href="#">N76227</a> | AR330-0.250-D3-C020.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | TICN     | 0.020   | CYLINDRICAL |
| <a href="#">N76198</a> | AR330-0.375-D1-C020.0-Z3 | 3/8       | 3/8       | 1/2           | 2              | 3      | UNCOATED | 0.020   | CYLINDRICAL |
| <a href="#">N76230</a> | AR330-0.375-D1-C020.0-Z3 | 3/8       | 3/8       | 1/2           | 2              | 3      | TICN     | 0.020   | CYLINDRICAL |
| <a href="#">N76199</a> | AR330-0.375-D3-C020.0-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | UNCOATED | 0.020   | CYLINDRICAL |
| <a href="#">N76231</a> | AR330-0.375-D3-C020.0-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | TICN     | 0.020   | CYLINDRICAL |
| <a href="#">N76203</a> | AR330-0.500-D3-C025.0-Z3 | 1/2       | 1/2       | 1-1/4         | 3              | 3      | UNCOATED | 0.025   | CYLINDRICAL |
| <a href="#">N76235</a> | AR330-0.500-D3-C025.0-Z3 | 1/2       | 1/2       | 1-1/4         | 3              | 3      | TICN     | 0.025   | CYLINDRICAL |
| <a href="#">N76205</a> | AR330-0.625-D3-C025.0-Z3 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 3      | UNCOATED | 0.025   | CYLINDRICAL |
| <a href="#">N76237</a> | AR330-0.625-D3-C025.0-Z3 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 3      | TICN     | 0.025   | CYLINDRICAL |
| <a href="#">N76206</a> | AR330-0.750-D1-C025.0-Z3 | 3/4       | 3/4       | 1             | 3              | 3      | UNCOATED | 0.025   | CYLINDRICAL |
| <a href="#">N76238</a> | AR330-0.750-D1-C025.0-Z3 | 3/4       | 3/4       | 1             | 3              | 3      | TICN     | 0.025   | CYLINDRICAL |
| <a href="#">N76207</a> | AR330-0.750-D2-C025.0-Z3 | 3/4       | 3/4       | 1-5/8         | 4              | 3      | UNCOATED | 0.025   | CYLINDRICAL |
| <a href="#">N76239</a> | AR330-0.750-D2-C025.0-Z3 | 3/4       | 3/4       | 1-5/8         | 4              | 3      | TICN     | 0.025   | CYLINDRICAL |
| <a href="#">N76209</a> | AR330-1.000-D2-C025.0-Z3 | 1         | 1         | 2             | 5              | 3      | UNCOATED | 0.025   | CYLINDRICAL |
| <a href="#">N76241</a> | AR330-1.000-D2-C025.0-Z3 | 1         | 1         | 2             | 5              | 3      | TICN     | 0.025   | CYLINDRICAL |



**AN230 E2 LENGTH - START VALUES**

| SLOT MILLING |                                |                           |                           |                     |  |  |             |        |        |        |
|--------------|--------------------------------|---------------------------|---------------------------|---------------------|--|--|-------------|--------|--------|--------|
| ISO GROUP    | SMG                            | $a_p \times D_c$<br>(max) | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |  |  |             |        |        |        |
|              |                                |                           |                           |                     |  |  | 1/2         | 3/4    | 1      |        |
| N            | E<br>16<br>Alum (Si<9%)        | 1.00<br>x<br>Dc           | 1.00<br>x<br>Dc           | 3300                |  |  | n (min-1)   | 25212  | 16808  | 12606  |
|              |                                |                           |                           |                     |  |  | fz (in)     | 0.0041 | 0.0061 | 0.0081 |
|              |                                |                           |                           | 1650 - 4950         |  |  | vf (in/min) | 205    | 205    | 205    |
|              | E<br>17<br>Alum<br>(9%<Si<16%) | 0.80<br>x<br>Dc           | 1.00<br>x<br>Dc           | 2700                |  |  | n (min-1)   | 20628  | 13752  | 10314  |
|              |                                |                           |                           |                     |  |  | fz (in)     | 0.0032 | 0.0047 | 0.0063 |
|              |                                |                           |                           | 1350 - 4050         |  |  | vf (in/min) | 130    | 130    | 130    |

**AN230 E2 LENGTH - START VALUES**

| SIDE MILLING - ROUGHING |                                |                           |                           |                     |  |  |             |        |        |        |
|-------------------------|--------------------------------|---------------------------|---------------------------|---------------------|--|--|-------------|--------|--------|--------|
| ISO GROUP               | SMG                            | $a_p \times D_c$<br>(max) | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |  |  |             |        |        |        |
|                         |                                |                           |                           |                     |  |  | 1/2         | 3/4    | 1      |        |
| N                       | E<br>16<br>Alum (Si<9%)        | 1.30<br>x<br>Dc           | 0.25<br>x<br>Dc           | 4000                |  |  | n (min-1)   | 30560  | 20373  | 15280  |
|                         |                                |                           |                           |                     |  |  | fz (in)     | 0.0059 | 0.0088 | 0.0118 |
|                         |                                |                           |                           | 2000 - 6000         |  |  | vf (in/min) | 360    | 360    | 360    |
|                         | E<br>17<br>Alum<br>(9%<Si<16%) | 1.30<br>x<br>Dc           | 0.25<br>x<br>Dc           | 3300                |  |  | n (min-1)   | 25212  | 16808  | 12606  |
|                         |                                |                           |                           |                     |  |  | fz (in)     | 0.0044 | 0.0065 | 0.0087 |
|                         |                                |                           |                           | 1650 - 4950         |  |  | vf (in/min) | 220    | 220    | 220    |

**AN230 E2 LENGTH - START VALUES**

| SIDE MILLING - FINISHING |                                |                           |                           |                     |  |  |             |        |        |        |
|--------------------------|--------------------------------|---------------------------|---------------------------|---------------------|--|--|-------------|--------|--------|--------|
| ISO GROUP                | SMG                            | $a_p \times D_c$<br>(max) | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |  |  |             |        |        |        |
|                          |                                |                           |                           |                     |  |  | 1/2         | 3/4    | 1      |        |
| N                        | E<br>16<br>Alum (Si<9%)        | 1.00<br>x<br>Dc           | 0.02<br>x<br>Dc           | 5000                |  |  | n (min-1)   | 38200  | 25467  | 19100  |
|                          |                                |                           |                           |                     |  |  | fz (in)     | 0.0025 | 0.0037 | 0.0050 |
|                          |                                |                           |                           | 2500 - 7500         |  |  | vf (in/min) | 190    | 190    | 190    |
|                          | E<br>17<br>Alum<br>(9%<Si<16%) | 1.00<br>x<br>Dc           | 0.02<br>x<br>Dc           | 4100                |  |  | n (min-1)   | 31324  | 20883  | 15662  |
|                          |                                |                           |                           |                     |  |  | fz (in)     | 0.0025 | 0.0037 | 0.0050 |
|                          |                                |                           |                           | 2050 - 6150         |  |  | vf (in/min) | 155    | 155    | 155    |

SMG = Seco Material Group

n (min-1) = RPM

fz (in) = Feed/tooth

vf (in/min) = Feed rate

$v_c$  (sf/min) = Surface feet/min

$a_p \times D_c$  = % of diameter

$a_e \times D_c$  = % of diameter

All cutting data are start values

All cutting data is in inch values

SMG = Seco Material Group

n [min-1] = RPM

$v_c$  (sf/min) = Surface feet/min

fz [in] = Feed/tooth

$a_p/D_c$  = % of diameter

vf [in/min] = Feed rate

$a_e/D_c$  = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist

All cutting data are start values. All cutting data is in inch values.

Please reference the Workpiece Material Classification chart located on page 15.

### AN335 E2 LENGTH - START VALUES

| SLOT MILLING |                                |                           |                           |                     |        |        |             |        |        |           |
|--------------|--------------------------------|---------------------------|---------------------------|---------------------|--------|--------|-------------|--------|--------|-----------|
| ISO GROUP    | SMG                            | $a_p \times D_c$<br>(max) | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |        |        |             |        |        |           |
|              |                                |                           |                           |                     |        |        | 1/2         | 3/4    | 1      |           |
| N            | E<br>16<br>Alum (Si<9%)        | 0.50<br>x<br>Dc           | 1.00<br>x<br>Dc           | 3300                |        |        | n (min-1)   | 25212  | 16808  | 12606     |
|              |                                |                           |                           |                     |        |        | fz (in)     | 0.0032 | 0.0049 | 0.0065    |
|              |                                |                           |                           | 1650 - 4950         |        |        | vf (in/min) | 245    | 245    | 245       |
|              | E<br>17<br>Alum<br>(9%<Si<16%) | 0.40<br>x<br>Dc           | 1.00<br>x<br>Dc           |                     |        |        | 2700        |        |        | n (min-1) |
|              |                                |                           |                           | fz (in)             | 0.0024 | 0.0036 |             |        |        | 0.0049    |
|              |                                |                           |                           | 1350 - 4050         |        |        | vf (in/min) | 150    | 150    | 150       |

### AN335 E2 LENGTH - START VALUES

| SIDE MILLING - ROUGHING |                                |                           |                           |                     |        |        |             |        |        |           |
|-------------------------|--------------------------------|---------------------------|---------------------------|---------------------|--------|--------|-------------|--------|--------|-----------|
| ISO GROUP               | SMG                            | $a_p \times D_c$<br>(max) | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |        |        |             |        |        |           |
|                         |                                |                           |                           |                     |        |        | 1/2         | 3/4    | 1      |           |
| N                       | E<br>16<br>Alum (Si<9%)        | 1.30<br>x<br>Dc           | 0.25<br>x<br>Dc           | 4000                |        |        | n (min-1)   | 30560  | 20373  | 15280     |
|                         |                                |                           |                           |                     |        |        | fz (in)     | 0.0044 | 0.0065 | 0.0087    |
|                         |                                |                           |                           | 2000 - 6000         |        |        | vf (in/min) | 400    | 400    | 400       |
|                         | E<br>17<br>Alum<br>(9%<Si<16%) | 1.20<br>x<br>Dc           | 0.25<br>x<br>Dc           |                     |        |        | 3300        |        |        | n (min-1) |
|                         |                                |                           |                           | fz (in)             | 0.0033 | 0.0050 |             |        |        | 0.0066    |
|                         |                                |                           |                           | 1650 - 4950         |        |        | vf (in/min) | 250    | 250    | 250       |

### AN335 E2 LENGTH - START VALUES

| SIDE MILLING - FINISHING |                                |                           |                           |                     |        |        |             |        |        |         |
|--------------------------|--------------------------------|---------------------------|---------------------------|---------------------|--------|--------|-------------|--------|--------|---------|
| ISO GROUP                | SMG                            | $a_p \times D_c$<br>(max) | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |        |        |             |        |        |         |
|                          |                                |                           |                           |                     |        |        | 1/2         | 3/4    | 1      |         |
| N                        | E<br>16<br>Alum (Si<9%)        | 1.00<br>x<br>Dc           | 0.02<br>x<br>Dc           | 5000                |        |        | n (min-1)   | 38200  | 25467  | 19100   |
|                          |                                |                           |                           |                     |        |        | fz (in)     | 0.0025 | 0.0037 | 0.0050  |
|                          |                                |                           |                           | 2500 - 7500         |        |        | vf (in/min) | 190    | 190    | 190     |
|                          | E<br>17<br>Alum<br>(9%<Si<16%) | 1.00<br>x<br>Dc           | 0.02<br>x<br>Dc           |                     |        |        | 4100        |        |        | (min-1) |
|                          |                                |                           |                           | fz (in)             | 0.0025 | 0.0037 |             |        |        | 0.0050  |
|                          |                                |                           |                           | 2050 - 6150         |        |        | vf (in/min) | 155    | 155    | 155     |

SMG = Seco Material Group

n (min-1) = RPM

fz (in) = Feed/tooth

vf (in/min) = Feed rate

$v_c$  (sf/min) = Surface feet/min

$a_p \times D_c$  = % of diameter

$a_e \times D_c$  = % of diameter

All cutting data are start values

All cutting data is in inch values



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SMG = Seco Material Group

n [min-1] = RPM

$v_c$  (sf/min) = Surface feet/min

fz [in] = Feed/tooth

$a_p/D_c$  = % of diameter

vf [in/min] = Feed rate

$a_e/D_c$  = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist

All cutting data are start values. All cutting data is in inch values.

Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - ELITE A SERIES HIGH PERFORMANCE

## A245 / A245R / AB245 - START VALUES

|           |      | SLOTTING               |                        |                  |                |        |        |        |        |        |        |        |
|-----------|------|------------------------|------------------------|------------------|----------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG  | $a_p \times D_c$ (max) | $a_e \times D_c$ (max) | $v_c$ (sf / min) | $Z_n = 2$      |        |        |        |        |        |        |        |
|           |      |                        |                        |                  | n (rev/min)    | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| N         | E 16 | 1.0                    | 1.00                   | 1000             | n (rev/min)    | 30560  | 15280  | 10187  | 7640   | 6112   | 5093   | 3820   |
|           |      |                        |                        |                  | $f_z$ (in)     | 0.0012 | 0.0024 | 0.0036 | 0.0048 | 0.0060 | 0.0072 | 0.0096 |
|           |      |                        |                        | 700 - 1300       | $v_f$ (in/min) | 73.3   | 73.3   | 73.3   | 73.3   | 73.3   | 73.3   | 73.3   |
|           | E 17 | 1.0                    | 1.00                   | 800              | n (rev/min)    | 24448  | 12224  | 8149   | 6112   | 4890   | 4075   | 3056   |
|           |      |                        |                        |                  | $f_z$ (in)     | 0.0010 | 0.0019 | 0.0029 | 0.0038 | 0.0048 | 0.0058 | 0.0077 |
|           |      |                        |                        | 500 - 1100       | $v_f$ (in/min) | 47     | 47     | 47     | 47     | 47     | 47     | 47     |

|   |      | SIDE MILLING - ROUGHING |      |            |                |        |        |        |        |        |        |        |
|---|------|-------------------------|------|------------|----------------|--------|--------|--------|--------|--------|--------|--------|
| N | E 16 | 2.0                     | 0.50 | 1000       | n (rev/min)    | 30560  | 15280  | 10187  | 7640   | 6112   | 5093   | 3820   |
|   |      |                         |      |            | $f_z$ (in)     | 0.0015 | 0.0030 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 |
|   |      |                         |      | 700 - 1300 | $v_f$ (in/min) | 91.7   | 91.7   | 91.7   | 91.7   | 91.7   | 91.7   | 91.7   |
|   | E 17 | 1.5                     | 0.50 | 800        | n (rev/min)    | 24448  | 12224  | 8149   | 6112   | 4890   | 4075   | 3056   |
|   |      |                         |      |            | $f_z$ (in)     | 0.0012 | 0.0024 | 0.0036 | 0.0048 | 0.0060 | 0.0072 | 0.0096 |
|   |      |                         |      | 500 - 1100 | $v_f$ (in/min) | 59     | 59     | 59     | 59     | 59     | 59     | 59     |

## AN245 / ANB245 - START VALUES

|           |      | SLOTTING               |                        |                  |                |        |        |        |        |        |        |        |
|-----------|------|------------------------|------------------------|------------------|----------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG  | $a_p \times D_c$ (max) | $a_e \times D_c$ (max) | $v_c$ (sf / min) | $Z_n = 2$      |        |        |        |        |        |        |        |
|           |      |                        |                        |                  | n (rev/min)    | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| N         | E 16 | 1.00                   | 1.00                   | 800              | n (rev/min)    | 24448  | 12224  | 8149   | 6112   | 4890   | 4075   | 3056   |
|           |      |                        |                        |                  | $f_z$ (in)     | 0.0010 | 0.0019 | 0.0029 | 0.0039 | 0.0048 | 0.0058 | 0.0077 |
|           |      |                        |                        | 500 - 1100       | $v_f$ (in/min) | 47.1   | 47.1   | 47.1   | 47.1   | 47.1   | 47.1   | 47.1   |
|           | E 17 | 1.00                   | 1.00                   | 640              | n (rev/min)    | 19558  | 9779   | 6519   | 4890   | 3912   | 3260   | 2445   |
|           |      |                        |                        |                  | $f_z$ (in)     | 0.0008 | 0.0015 | 0.0023 | 0.0031 | 0.0038 | 0.0046 | 0.0061 |
|           |      |                        |                        | 340 - 940        | $v_f$ (in/min) | 30     | 30     | 30     | 30     | 30     | 30     | 30     |

|   |      | SIDE MILLING - ROUGHING |      |            |                |        |        |        |        |        |        |        |
|---|------|-------------------------|------|------------|----------------|--------|--------|--------|--------|--------|--------|--------|
| N | E 16 | 2.00                    | 0.50 | 800        | n (rev/min)    | 24448  | 12224  | 8149   | 6112   | 4890   | 4075   | 3056   |
|   |      |                         |      |            | $f_z$ (in)     | 0.0012 | 0.0024 | 0.0036 | 0.0048 | 0.0060 | 0.0072 | 0.0096 |
|   |      |                         |      | 500 - 1100 | $v_f$ (in/min) | 58.7   | 58.7   | 58.7   | 58.7   | 58.7   | 58.7   | 58.7   |
|   | E 17 | 1.50                    | 0.50 | 640        | n (rev/min)    | 19558  | 9779   | 6519   | 4890   | 3912   | 3260   | 2445   |
|   |      |                         |      |            | $f_z$ (in)     | 0.0010 | 0.0019 | 0.0029 | 0.0039 | 0.0048 | 0.0058 | 0.0077 |
|   |      |                         |      | 340 - 940  | $v_f$ (in/min) | 38     | 38     | 38     | 38     | 38     | 38     | 38     |

SMG = Seco Material Group  
 n [min-1] = RPM  
 $v_c$  (sf/min) = Surface feet/min

$f_z$  [in] = Feed/tooth  
 $a_p/D_c$  = % of diameter  
 $v_f$  [in/min] = Feed rate  
 $a_e/D_c$  = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## AN340 - START VALUES

|           |      | SLOTTING                  |                           |                           |                         |        |        |        |        |        |        |        |
|-----------|------|---------------------------|---------------------------|---------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG  | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) | Z <sub>n</sub> = 3      |        |        |        |        |        |        |        |
|           |      |                           |                           |                           | 1/8                     | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |
| N         | E 16 | 1.0                       | 1.00                      | 1200                      | n (rev/min)             | 36672  | 18336  | 12224  | 9168   | 7334   | 6112   | 4584   |
|           |      |                           |                           |                           | f <sub>z</sub> (in)     | 0.0019 | 0.0038 | 0.0056 | 0.0075 | 0.0094 | 0.0113 | 0.0150 |
|           |      |                           |                           | 900 - 1500                | v <sub>f</sub> (in/min) | 206.3  | 206.3  | 206.3  | 206.3  | 206.3  | 206.3  | 206.3  |
|           | E 17 | 1.0                       | 1.00                      | 1000                      | n (rev/min)             | 30560  | 15280  | 10187  | 7640   | 6112   | 5093   | 3820   |
|           |      |                           |                           |                           | f <sub>z</sub> (in)     | 0.0019 | 0.0038 | 0.0056 | 0.0075 | 0.0094 | 0.0113 | 0.0150 |
|           |      |                           |                           | 700 - 1300                | v <sub>f</sub> (in/min) | 172    | 172    | 172    | 172    | 172    | 172    | 172    |

|   |      | SIDE MILLING - ROUGHING |      |            |                         |        |        |        |        |        |        |        |
|---|------|-------------------------|------|------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|
| N | E 16 | 1.0                     | 0.25 | 1200       | n (rev/min)             | 36672  | 18336  | 12224  | 9168   | 7334   | 6112   | 4584   |
|   |      |                         |      |            | f <sub>z</sub> (in)     | 0.0028 | 0.0056 | 0.0084 | 0.0113 | 0.0141 | 0.0169 | 0.0225 |
|   |      |                         |      | 900 - 1500 | v <sub>f</sub> (in/min) | 309.4  | 309.4  | 309.4  | 309.4  | 309.4  | 309.4  | 309.4  |
|   | E 17 | 1.0                     | 0.25 | 1000       | n (rev/min)             | 30560  | 15280  | 10187  | 7640   | 6112   | 5093   | 3820   |
|   |      |                         |      |            | f <sub>z</sub> (in)     | 0.0028 | 0.0056 | 0.0084 | 0.0113 | 0.0141 | 0.0169 | 0.0225 |
|   |      |                         |      | 700 - 1300 | v <sub>f</sub> (in/min) | 258    | 258    | 258    | 258    | 258    | 258    | 258    |

## A345 / A345R - START VALUES

|           |              | SLOTTING                  |                           |                           |                         |        |        |        |        |        |        |        |
|-----------|--------------|---------------------------|---------------------------|---------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG          | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) | Z <sub>n</sub> = 3      |        |        |        |        |        |        |        |
|           |              |                           |                           |                           | 1/8                     | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |
| N         | E / M / A 16 | 0.5                       | 1.00                      | 1000                      | n (rev/min)             | 30560  | 15280  | 10187  | 7640   | 6112   | 5093   | 3820   |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0012 | 0.0024 | 0.0036 | 0.0048 | 0.0060 | 0.0072 | 0.0096 |
|           |              |                           |                           | 700 - 1300                | v <sub>f</sub> (in/min) | 110.0  | 110.0  | 110.0  | 110.0  | 110.0  | 110.0  | 110.0  |
|           | E / M / A 17 | 0.5                       | 1.00                      | 800                       | n (rev/min)             | 24448  | 12224  | 8149   | 6112   | 4890   | 4075   | 3056   |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0010 | 0.0019 | 0.0029 | 0.0038 | 0.0048 | 0.0058 | 0.0077 |
|           |              |                           |                           | 500 - 1100                | v <sub>f</sub> (in/min) | 70     | 70     | 70     | 70     | 70     | 70     | 70     |

|   |              | SIDE MILLING - ROUGHING |      |            |                         |        |        |        |        |        |        |        |
|---|--------------|-------------------------|------|------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|
| N | E / M / A 16 | 2.0                     | 0.40 | 1000       | n (rev/min)             | 30560  | 15280  | 10187  | 7640   | 6112   | 5093   | 3820   |
|   |              |                         |      |            | f <sub>z</sub> (in)     | 0.0015 | 0.0030 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 |
|   |              |                         |      | 700 - 1300 | v <sub>f</sub> (in/min) | 137.5  | 137.5  | 137.5  | 137.5  | 137.5  | 137.5  | 137.5  |
|   | E / M / A 17 | 1.5                     | 0.40 | 800        | n (rev/min)             | 24448  | 12224  | 8149   | 6112   | 4890   | 4075   | 3056   |
|   |              |                         |      |            | f <sub>z</sub> (in)     | 0.0012 | 0.0024 | 0.0036 | 0.0048 | 0.0060 | 0.0072 | 0.0096 |
|   |              |                         |      | 500 - 1100 | v <sub>f</sub> (in/min) | 88     | 88     | 88     | 88     | 88     | 88     | 88     |



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## AN345 / AN345R - START VALUES

| SLOTING   |      |                                       |                                       |                           |   |                     |                         |        |        |        |        |        |        |
|-----------|------|---------------------------------------|---------------------------------------|---------------------------|---|---------------------|-------------------------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG  | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |   | Z <sub>n</sub> = 3  |                         |        |        |        |        |        |        |
|           |      |                                       |                                       |                           |   | 1/8                 | 1/4                     | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |
| N         | E 16 | 0.5                                   | 1.00                                  | 800                       |   | n (rev/min)         | 24448                   | 12224  | 8149   | 6112   | 4890   | 4075   | 3056   |
|           |      |                                       |                                       |                           |   | f <sub>z</sub> (in) | 0.0010                  | 0.0019 | 0.0029 | 0.0039 | 0.0048 | 0.0058 | 0.0077 |
|           |      |                                       |                                       | 500                       | - | 1100                | v <sub>f</sub> (in/min) | 70.6   | 70.6   | 70.6   | 70.6   | 70.6   | 70.6   |
|           | E 17 | 0.5                                   | 1.00                                  | 640                       |   | n (rev/min)         | 19558                   | 9779   | 6519   | 4890   | 3912   | 3260   | 2445   |
|           |      |                                       |                                       |                           |   | f <sub>z</sub> (in) | 0.0008                  | 0.0015 | 0.0023 | 0.0031 | 0.0038 | 0.0046 | 0.0061 |
|           |      |                                       |                                       | 340                       | - | 940                 | v <sub>f</sub> (in/min) | 45     | 45     | 45     | 45     | 45     | 45     |

| SIDE MILLING - ROUGHING |      |     |      |     |   |                     |                         |        |        |        |        |        |        |
|-------------------------|------|-----|------|-----|---|---------------------|-------------------------|--------|--------|--------|--------|--------|--------|
| N                       | E 16 | 2.0 | 0.40 | 800 |   | n (rev/min)         | 24448                   | 12224  | 8149   | 6112   | 4890   | 4075   | 3056   |
|                         |      |     |      |     |   | f <sub>z</sub> (in) | 0.0012                  | 0.0024 | 0.0036 | 0.0048 | 0.0060 | 0.0072 | 0.0096 |
|                         |      |     |      | 500 | - | 1100                | v <sub>f</sub> (in/min) | 88.0   | 88.0   | 88.0   | 88.0   | 88.0   | 88.0   |
|                         | E 17 | 1.5 | 0.40 | 640 |   | n (rev/min)         | 19558                   | 9779   | 6519   | 4890   | 3912   | 3260   | 2445   |
|                         |      |     |      |     |   | f <sub>z</sub> (in) | 0.0010                  | 0.0019 | 0.0029 | 0.0039 | 0.0048 | 0.0058 | 0.0077 |
|                         |      |     |      | 340 | - | 940                 | v <sub>f</sub> (in/min) | 57     | 57     | 57     | 57     | 57     | 57     |

## AR330 - START VALUES

| SLOTING   |      |                                       |                                       |                           |   |                     |                         |        |        |        |        |        |        |
|-----------|------|---------------------------------------|---------------------------------------|---------------------------|---|---------------------|-------------------------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG  | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |   | Z <sub>n</sub> = 3  |                         |        |        |        |        |        |        |
|           |      |                                       |                                       |                           |   | 1/8                 | 1/4                     | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |
| N         | E 16 | 1.00                                  | 1.00                                  | 800                       |   | n (rev/min)         | 24448                   | 12224  | 8149   | 6112   | 4890   | 4075   | 3056   |
|           |      |                                       |                                       |                           |   | f <sub>z</sub> (in) | 0.0008                  | 0.0015 | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 |
|           |      |                                       |                                       | 500                       | - | 1100                | v <sub>f</sub> (in/min) | 55.0   | 55.0   | 55.0   | 55.0   | 55.0   | 55.0   |
|           | E 17 | 1.00                                  | 1.00                                  | 800                       |   | n (rev/min)         | 24448                   | 12224  | 8149   | 6112   | 4890   | 4075   | 3056   |
|           |      |                                       |                                       |                           |   | f <sub>z</sub> (in) | 0.0008                  | 0.0015 | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 |
|           |      |                                       |                                       | 500                       | - | 1100                | v <sub>f</sub> (in/min) | 55     | 55     | 55     | 55     | 55     | 55     |

| SIDE MILLING - ROUGHING |      |      |      |      |   |                     |                         |        |        |        |        |        |        |
|-------------------------|------|------|------|------|---|---------------------|-------------------------|--------|--------|--------|--------|--------|--------|
| N                       | E 16 | 1.00 | 0.25 | 1100 |   | n (rev/min)         | 33616                   | 16808  | 11205  | 8404   | 6723   | 5603   | 4202   |
|                         |      |      |      |      |   | f <sub>z</sub> (in) | 0.0011                  | 0.0021 | 0.0032 | 0.0042 | 0.0053 | 0.0063 | 0.0084 |
|                         |      |      |      | 800  | - | 1400                | v <sub>f</sub> (in/min) | 105.9  | 105.9  | 105.9  | 105.9  | 105.9  | 105.9  |
|                         | E 17 | 1.00 | 0.25 | 1100 |   | n (rev/min)         | 33616                   | 16808  | 11205  | 8404   | 6723   | 5603   | 4202   |
|                         |      |      |      |      |   | f <sub>z</sub> (in) | 0.0011                  | 0.0021 | 0.0032 | 0.0042 | 0.0053 | 0.0063 | 0.0084 |
|                         |      |      |      | 800  | - | 1400                | v <sub>f</sub> (in/min) | 106    | 106    | 106    | 106    | 106    | 106    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## A345M - START VALUES

|           |      | SLOTTING                              |                                       |                           |                    |        |        |        |        |        |        |        |        |        |        |        |
|-----------|------|---------------------------------------|---------------------------------------|---------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG  | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) | Z <sub>n</sub> = 3 |        |        |        |        |        |        |        |        |        |        |        |
|           |      |                                       |                                       |                           | 3                  | 4      | 5      | 6      | 8      | 10     | 12     | 14     | 16     | 20     | 25     |        |
| N         | E 16 | 0.5                                   | 1.00                                  | 1000                      | n (min-1)          | 32343  | 24257  | 19406  | 16171  | 12129  | 9703   | 8086   | 6931   | 6064   | 4851   | 3881   |
|           |      |                                       |                                       |                           | fz (in)            | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0053 | 0.0060 | 0.0076 | 0.0094 |
|           |      |                                       |                                       | 700 - 1300                | vf (in/min)        | 110.0  | 110.0  | 110.0  | 110.0  | 110.0  | 110.0  | 110.0  | 110.0  | 110.0  | 110.0  | 110.0  |
|           | E 17 | 0.5                                   | 1.00                                  | 800                       | n (min-1)          | 25874  | 19406  | 15524  | 12937  | 9703   | 7762   | 6469   | 5544   | 4851   | 3881   | 3105   |
|           |      |                                       |                                       |                           | fz (in)            | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 | 0.0030 | 0.0036 | 0.0042 | 0.0049 | 0.0061 | 0.0076 |
|           |      |                                       |                                       | 500 - 1100                | vf (in/min)        | 71     | 71     | 71     | 71     | 71     | 71     | 71     | 71     | 71     | 71     | 71     |

|   |      | SIDE MILLING - ROUGHING |      |            |             |        |        |        |        |        |        |        |        |        |        |        |
|---|------|-------------------------|------|------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| N | E 16 | 2.0                     | 0.40 | 1000       | n (min-1)   | 32343  | 24257  | 19406  | 16171  | 12129  | 9703   | 8086   | 6931   | 6064   | 4851   | 3881   |
|   |      |                         |      |            | fz (in)     | 0.0014 | 0.0019 | 0.0024 | 0.0028 | 0.0038 | 0.0047 | 0.0057 | 0.0066 | 0.0076 | 0.0094 | 0.0118 |
|   |      |                         |      | 700 - 1300 | vf (in/min) | 137.5  | 137.5  | 137.5  | 137.5  | 137.5  | 137.5  | 137.5  | 137.5  | 137.5  | 137.5  | 137.5  |
|   | E 17 | 1.5                     | 0.40 | 800        | n (min-1)   | 25874  | 19406  | 15524  | 12937  | 9703   | 7762   | 6469   | 5544   | 4851   | 3881   | 3105   |
|   |      |                         |      |            | fz (in)     | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0053 | 0.0060 | 0.0076 | 0.0094 |
|   |      |                         |      | 500 - 1100 | vf (in/min) | 88     | 88     | 88     | 88     | 88     | 88     | 88     | 88     | 88     | 88     | 88     |

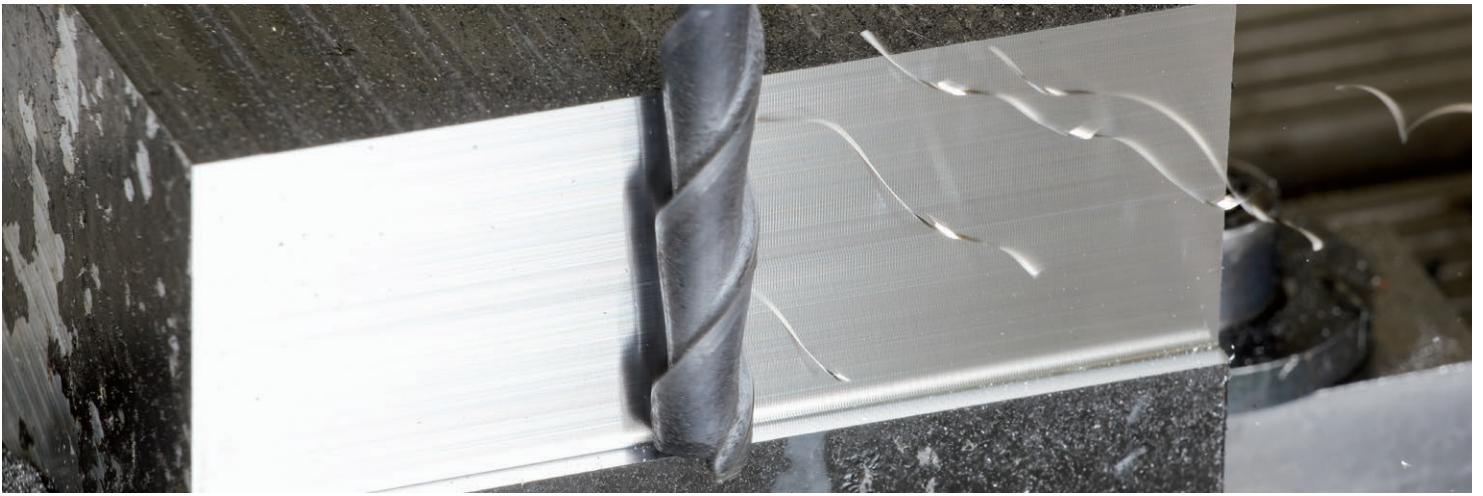


**DOWNLOAD THE "SOLID MILLING" APP FREE** ON GOOGLE PLAY & THE APP STORE.  
**GET CUTTING DATA RECOMMENDATIONS/CALCULATIONS, TIPS & TRICKS, TECHNICAL VIDEOS, AND MORE!**

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.



# ONE PASS, HIGH PRECISION FINISHING NS240R LONG FLUTE FINISHER

The Niagara NS240R long flute finisher is a geometry for optimized performance in general machining. The NS240R allows one pass machining in square shoulder milling applications, thus reducing cycle time. These end mills are designed especially to produce high tolerance straight walls in deep pockets and to provide excellent surface quality.

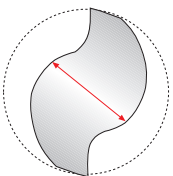
The Niagara long flute finishers are offered with a 5xD depth of cut as standard, ranging in diameters from 1/4" to 1 1/4" with various radii available.

The NS240R is effective in most materials but excels in stainless steel and titanium. A typical application for this end mill is in the manufacture of aerospace structural parts made from titanium and aluminum.

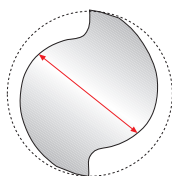
## PRODUCT OVERVIEW

- NS240R stabilized edge design gives improved surface quality
- Increased core diameter for more stability
- Defined back taper along cutting length to compensate for tool deflection
- Polished AlTiN coating gives increased tool life

## INCREASED CORE DIAMETER



Typical two flute core diameter



NS240R core diameter

The enlarged core diameter provides better cutter stability and less tool deflection during machining.

## YOUR BENEFITS

- Optimized finishing
- Vibration free machining
- High surface quality
- Correct workpiece dimensions in a single pass
- High process stability
- Aerospace corner radii available on some diameters

## MATERIAL GROUPS

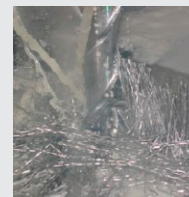
|                      |
|----------------------|
| Steel 1-6            |
| Stainless Steel 8-11 |
| Cast Iron 12-15      |
| Non-ferrous 16-18    |
| Superalloys 19-22    |

## COMMON APPLICATION AREAS

- Aerospace: wing parts, body and floor panels, engine casings, brackets

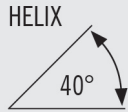
## NS240R APPLICATION EXAMPLE

|              |          |                          |
|--------------|----------|--------------------------|
| Material     | Titanium |                          |
| Spindle      | BT50     |                          |
| Cutter       | NS240R   |                          |
| Diameter     | 1 1/4"   |                          |
| Cutting data | $v_c$    | 165 sf/min               |
|              | $n$      | 497 rev/min              |
|              | $f_z$    | .012"                    |
|              | $v_f$    | 12 ipm                   |
|              | $a_e$    | .012"                    |
|              | $a_p$    | 5.5"                     |
|              | $h_m$    | .0011"                   |
|              | $Q$      | .50 in <sup>3</sup> /min |
|              | $R_a$    | 0.51 $\mu$ m             |



## NS240R

SOLID  
CARBIDE



RADIUS



CENTER  
CUTTING



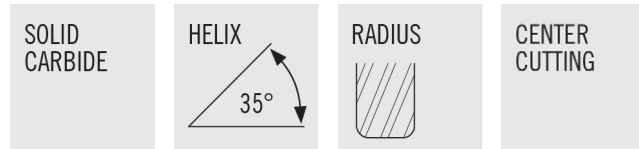
- Rigid design to minimize tool deflection
- Designed for peripheral finish milling of aerospace parts requiring long axial engagement in materials such as titanium, stainless steels, and superalloys.
- Cutting Data - Page 123
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N00291</a> | NS240R-0.250-D1-R010.0-Z2 | 1/4       | 1/4       | 1-1/4         | 3              | 2      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N00292</a> | NS240R-0.313-D1-R010.0-Z2 | 5/16      | 5/16      | 1-1/2         | 3-1/2          | 2      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N00293</a> | NS240R-0.375-D1-R010.0-Z2 | 3/8       | 3/8       | 1-7/8         | 4              | 2      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N00294</a> | NS240R-0.500-D1-R010.0-Z2 | 1/2       | 1/2       | 2-1/2         | 5              | 2      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N00295</a> | NS240R-0.625-D1-R015.0-Z2 | 5/8       | 5/8       | 3-1/8         | 6              | 2      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N00296</a> | NS240R-0.750-D1-R015.0-Z2 | 3/4       | 3/4       | 3-3/4         | 7              | 2      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N00297</a> | NS240R-0.750-D1-R120.0-Z2 | 3/4       | 3/4       | 3-3/4         | 7              | 2      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N00298</a> | NS240R-0.750-D1-R250.0-Z2 | 3/4       | 3/4       | 3-3/4         | 7              | 2      | ALTIN   | 0.250  | CYLINDRICAL |
| <a href="#">N00299</a> | NS240R-1.000-D1-R015.0-Z2 | 1         | 1         | 5             | 8              | 2      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N00300</a> | NS240R-1.000-D1-R120.0-Z2 | 1         | 1         | 5             | 8              | 2      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N00301</a> | NS240R-1.000-D1-R250.0-Z2 | 1         | 1         | 5             | 8              | 2      | ALTIN   | 0.250  | CYLINDRICAL |
| <a href="#">N00302</a> | NS240R-1.250-D1-R015.0-Z2 | 1-1/4     | 1-1/4     | 6-1/4         | 9-1/2          | 2      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N00303</a> | NS240R-1.250-D1-R120.0-Z2 | 1-1/4     | 1-1/4     | 6-1/4         | 9-1/2          | 2      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N00304</a> | NS240R-1.250-D1-R250.0-Z2 | 1-1/4     | 1-1/4     | 6-1/4         | 9-1/2          | 2      | ALTIN   | 0.250  | CYLINDRICAL |

**DUE TO THE LONG AXIAL ENGAGEMENT THE LENGTH OF CHIP CAN BE DIFFICULT TO EVACUATE. GOOD COOLANT VOLUME, VELOCITY, AND DIRECTION IS REQUIRED TO FLUSH THE LONG CHIPS AWAY FROM THE CUTTING ZONE TO AVOID RE-CUTTING OF CHIPS.**



## S335

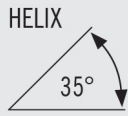


- Ideal for slotting in steel, stainless steel, titanium, and high temperature alloys
- Large area for chip evacuation
- Cutting Data - Page 124-125
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION             | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|-------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N61802</a> | S335-0.125-D2-R010.0-Z3 | 1/8       | 1/8       | 1/4           | 1-1/2          | 3      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N61803</a> | S335-0.125-D4-R010.0-Z3 | 1/8       | 1/8       | 1/2           | 1-1/2          | 3      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N61804</a> | S335-0.156-F2-R010.0-Z3 | 5/32      | 3/16      | 5/16          | 2              | 3      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N61805</a> | S335-0.156-F4-R010.0-Z3 | 5/32      | 3/16      | 9/16          | 2              | 3      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N61806</a> | S335-0.188-D2-R010.0-Z3 | 3/16      | 3/16      | 5/16          | 2              | 3      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N61807</a> | S335-0.188-D3-R010.0-Z3 | 3/16      | 3/16      | 9/16          | 2              | 3      | ALTIN   | 0.010  | CYLINDRICAL |
| <a href="#">N61808</a> | S335-0.219-F2-R020.0-Z3 | 7/32      | 1/4       | 3/8           | 2              | 3      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N61809</a> | S335-0.219-F3-R020.0-Z3 | 7/32      | 1/4       | 3/4           | 2-1/2          | 3      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N61810</a> | S335-0.250-D2-R020.0-Z3 | 1/4       | 1/4       | 3/8           | 2              | 3      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N61811</a> | S335-0.250-D3-R020.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N61812</a> | S335-0.281-F2-R020.0-Z3 | 9/32      | 5/16      | 7/16          | 2              | 3      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N61813</a> | S335-0.281-F3-R020.0-Z3 | 9/32      | 5/16      | 13/16         | 2-1/2          | 3      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N61814</a> | S335-0.313-D1-R020.0-Z3 | 5/16      | 5/16      | 7/16          | 2              | 3      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N61815</a> | S335-0.313-D3-R020.0-Z3 | 5/16      | 5/16      | 13/16         | 2-1/2          | 3      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N61818</a> | S335-0.375-D1-R020.3-Z3 | 3/8       | 3/8       | 1/2           | 2              | 3      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N61819</a> | S335-0.375-D3-R020.3-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N61820</a> | S335-0.438-D1-R020.3-Z3 | 7/16      | 7/16      | 9/16          | 2-1/2          | 3      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N61821</a> | S335-0.438-D2-R020.3-Z3 | 7/16      | 7/16      | 1             | 2-3/4          | 3      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N61822</a> | S335-0.500-D1-R030.3-Z3 | 1/2       | 1/2       | 5/8           | 2-1/2          | 3      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N61823</a> | S335-0.500-D3-R030.3-Z3 | 1/2       | 1/2       | 1-1/4         | 3              | 3      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N61824</a> | S335-0.625-D1-R030.3-Z3 | 5/8       | 5/8       | 3/4           | 3              | 3      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N61825</a> | S335-0.625-D3-R030.3-Z3 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 3      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N61826</a> | S335-0.750-D1-R030.3-Z3 | 3/4       | 3/4       | 1             | 3              | 3      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N61827</a> | S335-0.750-D2-R030.3-Z3 | 3/4       | 3/4       | 1-5/8         | 4              | 3      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N61828</a> | S335-1.000-D1-R030.3-Z3 | 1         | 1         | 1-1/4         | 4              | 3      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N61829</a> | S335-1.000-D2-R030.3-Z3 | 1         | 1         | 2             | 5              | 3      | ALTIN   | 0.030  | WELDON      |

## SB335

SOLID  
CARBIDE



CENTER  
CUTTING

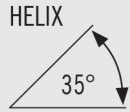


- Ideal for slotting in steel, stainless steel, titanium and high temperature alloys
- Large area for chip evacuation
- Cutting Data - Page 126-127
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N66218</a> | SB335-0.125-D2-B.0-Z3 | 1/8       | 1/8       | 1/4           | 1-1/2          | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66219</a> | SB335-0.125-D4-B.0-Z3 | 1/8       | 1/8       | 1/2           | 1-1/2          | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66220</a> | SB335-0.156-F2-B.0-Z3 | 5/32      | 3/16      | 5/16          | 2              | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66221</a> | SB335-0.156-F4-B.0-Z3 | 5/32      | 3/16      | 9/16          | 2              | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66222</a> | SB335-0.188-D2-B.0-Z3 | 3/16      | 3/16      | 5/16          | 2              | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66223</a> | SB335-0.188-D3-B.0-Z3 | 3/16      | 3/16      | 9/16          | 2              | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66224</a> | SB335-0.219-F2-B.0-Z3 | 7/32      | 1/4       | 3/8           | 2              | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66225</a> | SB335-0.219-F3-B.0-Z3 | 7/32      | 1/4       | 3/4           | 2-1/2          | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66226</a> | SB335-0.250-D2-B.0-Z3 | 1/4       | 1/4       | 3/8           | 2              | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66227</a> | SB335-0.250-D3-B.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66228</a> | SB335-0.281-F2-B.0-Z3 | 9/32      | 5/16      | 7/16          | 2              | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66229</a> | SB335-0.281-F3-B.0-Z3 | 9/32      | 5/16      | 13/16         | 2-1/2          | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66230</a> | SB335-0.313-D1-B.0-Z3 | 5/16      | 5/16      | 7/16          | 2              | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66231</a> | SB335-0.313-D3-B.0-Z3 | 5/16      | 5/16      | 13/16         | 2-1/2          | 3      | ALTIN   | CYLINDRICAL |
| <a href="#">N66232</a> | SB335-0.344-F1-B.3-Z3 | 11/32     | 3/8       | 1/2           | 2              | 3      | ALTIN   | WELDON      |
| <a href="#">N66233</a> | SB335-0.344-F3-B.3-Z3 | 11/32     | 3/8       | 1             | 2-1/2          | 3      | ALTIN   | WELDON      |
| <a href="#">N66234</a> | SB335-0.375-D1-B.3-Z3 | 3/8       | 3/8       | 1/2           | 2              | 3      | ALTIN   | WELDON      |
| <a href="#">N66235</a> | SB335-0.375-D3-B.3-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | ALTIN   | WELDON      |
| <a href="#">N66236</a> | SB335-0.438-D1-B.3-Z3 | 7/16      | 7/16      | 9/16          | 2-1/2          | 3      | ALTIN   | WELDON      |
| <a href="#">N66237</a> | SB335-0.438-D2-B.3-Z3 | 7/16      | 7/16      | 1             | 2-3/4          | 3      | ALTIN   | WELDON      |
| <a href="#">N66238</a> | SB335-0.500-D1-B.3-Z3 | 1/2       | 1/2       | 5/8           | 2-1/2          | 3      | ALTIN   | WELDON      |
| <a href="#">N66239</a> | SB335-0.500-D3-B.3-Z3 | 1/2       | 1/2       | 1-1/4         | 3              | 3      | ALTIN   | WELDON      |
| <a href="#">N66241</a> | SB335-0.625-D3-B.3-Z3 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 3      | ALTIN   | WELDON      |
| <a href="#">N66243</a> | SB335-0.750-D2-B.3-Z3 | 3/4       | 3/4       | 1-5/8         | 4              | 3      | ALTIN   | WELDON      |
| <a href="#">N66245</a> | SB335-1.000-D2-B.3-Z3 | 1         | 1         | 2             | 5              | 3      | ALTIN   | WELDON      |

## SN335

SOLID  
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RADIUS



CENTER  
CUTTING

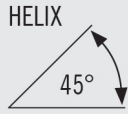


- Ideal for slotting, pocketing and long reach peripheral milling in steel, stainless steel, titanium, and exotic alloys
- Cutting Data - Page 128-129
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|--------|-------------|
| <a href="#">N18648</a> | SN335-0.250-E2-R020.0-Z3 | 1/4       | 1/4       | 3/8           | 4              | 0.240    | 2-1/8 | 3      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N18650</a> | SN335-0.375-E1-R020.3-Z3 | 3/8       | 3/8       | 1/2           | 4              | 0.360    | 2-1/8 | 3      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N18651</a> | SN335-0.375-E2-R020.3-Z3 | 3/8       | 3/8       | 1/2           | 6              | 0.360    | 3-3/8 | 3      | ALTIN   | 0.020  | WELDON      |
| <a href="#">N18654</a> | SN335-0.500-E1-R030.3-Z3 | 1/2       | 1/2       | 5/8           | 4              | 0.480    | 2-1/8 | 3      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N18655</a> | SN335-0.500-E2-R030.3-Z3 | 1/2       | 1/2       | 5/8           | 5              | 0.480    | 3-1/8 | 3      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N18656</a> | SN335-0.500-E3-R030.3-Z3 | 1/2       | 1/2       | 5/8           | 6              | 0.480    | 4-1/8 | 3      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N18657</a> | SN335-0.625-E1-R030.3-Z3 | 5/8       | 5/8       | 3/4           | 4              | 0.600    | 2-1/8 | 3      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N18659</a> | SN335-0.625-E3-R030.3-Z3 | 5/8       | 5/8       | 3/4           | 6              | 0.600    | 4     | 3      | ALTIN   | 0.030  | WELDON      |
| <a href="#">N18661</a> | SN335-0.750-E2-R030.3-Z3 | 3/4       | 3/4       | 1             | 5              | 0.720    | 3     | 3      | ALTIN   | 0.030  | WELDON      |

## S545

SOLID CARBIDE



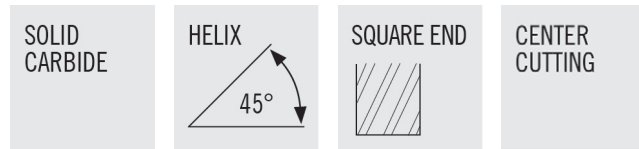
CENTER CUTTING



- Eccentric primary relief
- Ideal for peripheral finish milling in steel, stainless steel, titanium and high temperature alloys
- Cutting Data - Page 130
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N61830</a> | S545-0.125-D2-S.0-Z5 | 1/8       | 1/8       | 1/4           | 1-1/2          | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61983</a> | S545-0.125-D2-S.0-Z5 | 1/8       | 1/8       | 1/4           | 1-1/2          | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61831</a> | S545-0.125-D4-S.0-Z5 | 1/8       | 1/8       | 1/2           | 1-1/2          | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61984</a> | S545-0.125-D4-S.0-Z5 | 1/8       | 1/8       | 1/2           | 1-1/2          | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61832</a> | S545-0.156-F2-S.0-Z5 | 5/32      | 3/16      | 5/16          | 2              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61985</a> | S545-0.156-F2-S.0-Z5 | 5/32      | 3/16      | 5/16          | 2              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61833</a> | S545-0.156-F4-S.0-Z5 | 5/32      | 3/16      | 9/16          | 2              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61986</a> | S545-0.156-F4-S.0-Z5 | 5/32      | 3/16      | 9/16          | 2              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61834</a> | S545-0.188-D2-S.0-Z5 | 3/16      | 3/16      | 5/16          | 2              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61987</a> | S545-0.188-D2-S.0-Z5 | 3/16      | 3/16      | 5/16          | 2              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61835</a> | S545-0.188-D3-S.0-Z5 | 3/16      | 3/16      | 9/16          | 2              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61988</a> | S545-0.188-D3-S.0-Z5 | 3/16      | 3/16      | 9/16          | 2              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61836</a> | S545-0.219-F2-S.0-Z5 | 7/32      | 1/4       | 3/8           | 2              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61989</a> | S545-0.219-F2-S.0-Z5 | 7/32      | 1/4       | 3/8           | 2              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61837</a> | S545-0.219-F3-S.0-Z5 | 7/32      | 1/4       | 3/4           | 2-1/2          | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61990</a> | S545-0.219-F3-S.0-Z5 | 7/32      | 1/4       | 3/4           | 2-1/2          | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61838</a> | S545-0.250-D2-S.0-Z5 | 1/4       | 1/4       | 3/8           | 2              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61991</a> | S545-0.250-D2-S.0-Z5 | 1/4       | 1/4       | 3/8           | 2              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61839</a> | S545-0.250-D3-S.0-Z5 | 1/4       | 1/4       | 3/4           | 2-1/2          | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61992</a> | S545-0.250-D3-S.0-Z5 | 1/4       | 1/4       | 3/4           | 2-1/2          | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61840</a> | S545-0.250-D5-S.0-Z5 | 1/4       | 1/4       | 1-1/4         | 4              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61993</a> | S545-0.250-D5-S.0-Z5 | 1/4       | 1/4       | 1-1/4         | 4              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61842</a> | S545-0.281-F3-S.0-Z5 | 9/32      | 5/16      | 13/16         | 2-1/2          | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61995</a> | S545-0.281-F3-S.0-Z5 | 9/32      | 5/16      | 13/16         | 2-1/2          | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61843</a> | S545-0.313-D1-S.0-Z5 | 5/16      | 5/16      | 7/16          | 2              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61996</a> | S545-0.313-D1-S.0-Z5 | 5/16      | 5/16      | 7/16          | 2              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61844</a> | S545-0.313-D3-S.0-Z5 | 5/16      | 5/16      | 13/16         | 2-1/2          | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61997</a> | S545-0.313-D3-S.0-Z5 | 5/16      | 5/16      | 13/16         | 2-1/2          | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61845</a> | S545-0.313-D4-S.0-Z5 | 5/16      | 5/16      | 1-1/4         | 4              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61998</a> | S545-0.313-D4-S.0-Z5 | 5/16      | 5/16      | 1-1/4         | 4              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61846</a> | S545-0.313-D7-S.0-Z5 | 5/16      | 5/16      | 2-1/8         | 4              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N61999</a> | S545-0.313-D7-S.0-Z5 | 5/16      | 5/16      | 2-1/8         | 4              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61849</a> | S545-0.375-D1-S.0-Z5 | 3/8       | 3/8       | 1/2           | 2              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62002</a> | S545-0.375-D1-S.0-Z5 | 3/8       | 3/8       | 1/2           | 2              | 5      | ALTIN    | CYLINDRICAL |

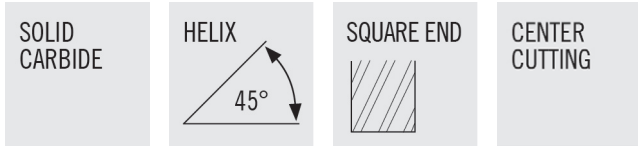
## S545 (CON'T)



- Eccentric primary relief
- Ideal for peripheral finish milling in steel, stainless steel, titanium and high temperature alloys
- Cutting Data - Page 130
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N61850</a> | S545-0.375-D3-S.0-Z5 | 3/8       | 3/8       | 1             | 2-1/2          | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62003</a> | S545-0.375-D3-S.0-Z5 | 3/8       | 3/8       | 1             | 2-1/2          | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61851</a> | S545-0.375-D4-S.0-Z5 | 3/8       | 3/8       | 1-1/2         | 4              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62004</a> | S545-0.375-D4-S.0-Z5 | 3/8       | 3/8       | 1-1/2         | 4              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61852</a> | S545-0.375-D7-S.0-Z5 | 3/8       | 3/8       | 2-1/2         | 6              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62005</a> | S545-0.375-D7-S.0-Z5 | 3/8       | 3/8       | 2-1/2         | 6              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61855</a> | S545-0.438-D1-S.0-Z5 | 7/16      | 7/16      | 9/16          | 2-1/2          | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62008</a> | S545-0.438-D1-S.0-Z5 | 7/16      | 7/16      | 9/16          | 2-1/2          | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61856</a> | S545-0.438-D2-S.0-Z5 | 7/16      | 7/16      | 1             | 2-3/4          | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62009</a> | S545-0.438-D2-S.0-Z5 | 7/16      | 7/16      | 1             | 2-3/4          | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61857</a> | S545-0.438-D5-S.0-Z5 | 7/16      | 7/16      | 2             | 4              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62010</a> | S545-0.438-D5-S.0-Z5 | 7/16      | 7/16      | 2             | 4              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61860</a> | S545-0.500-D1-S.0-Z5 | 1/2       | 1/2       | 5/8           | 2-1/2          | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62013</a> | S545-0.500-D1-S.0-Z5 | 1/2       | 1/2       | 5/8           | 2-1/2          | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61861</a> | S545-0.500-D3-S.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62014</a> | S545-0.500-D3-S.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61862</a> | S545-0.500-D4-S.0-Z5 | 1/2       | 1/2       | 2             | 4              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62015</a> | S545-0.500-D4-S.0-Z5 | 1/2       | 1/2       | 2             | 4              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61863</a> | S545-0.500-D6-S.0-Z5 | 1/2       | 1/2       | 3-1/8         | 6              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62016</a> | S545-0.500-D6-S.0-Z5 | 1/2       | 1/2       | 3-1/8         | 6              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N55330</a> | S545-0.563-D3-S.0-Z5 | 9/16      | 9/16      | 1-1/2         | 3-1/2          | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N55333</a> | S545-0.563-D3-S.0-Z5 | 9/16      | 9/16      | 1-1/2         | 3-1/2          | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61864</a> | S545-0.625-D1-S.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62017</a> | S545-0.625-D1-S.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61865</a> | S545-0.625-D3-S.0-Z5 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62018</a> | S545-0.625-D3-S.0-Z5 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61866</a> | S545-0.625-D4-S.0-Z5 | 5/8       | 5/8       | 2-1/2         | 5              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62019</a> | S545-0.625-D4-S.0-Z5 | 5/8       | 5/8       | 2-1/2         | 5              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61867</a> | S545-0.625-D6-S.0-Z5 | 5/8       | 5/8       | 4             | 6              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62020</a> | S545-0.625-D6-S.0-Z5 | 5/8       | 5/8       | 4             | 6              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61868</a> | S545-0.750-D1-S.0-Z5 | 3/4       | 3/4       | 1             | 3              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62021</a> | S545-0.750-D1-S.0-Z5 | 3/4       | 3/4       | 1             | 3              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61869</a> | S545-0.750-D2-S.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62022</a> | S545-0.750-D2-S.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALTIN    | CYLINDRICAL |

**S545 (CONT'D)**



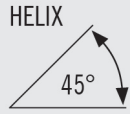
- Eccentric primary relief
- Ideal for peripheral finish milling in steel, stainless steel, titanium and high temperature alloys

- Cutting Data S545 - Page 130
- Tolerance Specs S545 - Page 323
- Cutting Data S545M - Page 133
- Tolerance Specs S545M - Page 323

| PRODUCT NUMBER              | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|-----------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <b>INCH - S545 (CONT'D)</b> |                      |           |           |               |                |        |          |             |
| <a href="#">N61870</a>      | S545-0.750-D3-S.0-Z5 | 3/4       | 3/4       | 2-1/4         | 5              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62023</a>      | S545-0.750-D3-S.0-Z5 | 3/4       | 3/4       | 2-1/4         | 5              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61871</a>      | S545-0.750-D4-S.0-Z5 | 3/4       | 3/4       | 3-1/4         | 6              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62024</a>      | S545-0.750-D4-S.0-Z5 | 3/4       | 3/4       | 3-1/4         | 6              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61872</a>      | S545-0.750-D5-S.0-Z5 | 3/4       | 3/4       | 4             | 6              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62025</a>      | S545-0.750-D5-S.0-Z5 | 3/4       | 3/4       | 4             | 6              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61873</a>      | S545-1.000-D1-S.0-Z5 | 1         | 1         | 1-1/4         | 4              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62026</a>      | S545-1.000-D1-S.0-Z5 | 1         | 1         | 1-1/4         | 4              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61874</a>      | S545-1.000-D2-S.0-Z5 | 1         | 1         | 2             | 4              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62027</a>      | S545-1.000-D2-S.0-Z5 | 1         | 1         | 2             | 4              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61875</a>      | S545-1.000-D3-S.0-Z5 | 1         | 1         | 2-5/8         | 6              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62028</a>      | S545-1.000-D3-S.0-Z5 | 1         | 1         | 2-5/8         | 6              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61876</a>      | S545-1.000-D4-S.0-Z5 | 1         | 1         | 3-1/4         | 6              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62029</a>      | S545-1.000-D4-S.0-Z5 | 1         | 1         | 3-1/4         | 6              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61877</a>      | S545-1.000-D5-S.0-Z5 | 1         | 1         | 4-1/8         | 7              | 5      | UNCOATED | CYLINDRICAL |
| <a href="#">N62030</a>      | S545-1.000-D5-S.0-Z5 | 1         | 1         | 4-1/8         | 7              | 5      | ALTIN    | CYLINDRICAL |
| <a href="#">N61878</a>      | S545-1.250-D2-S.0-Z7 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 7      | UNCOATED | CYLINDRICAL |
| <a href="#">N62031</a>      | S545-1.250-D2-S.0-Z7 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 7      | ALTIN    | CYLINDRICAL |
| <a href="#">N61879</a>      | S545-1.250-D3-S.0-Z7 | 1-1/4     | 1-1/4     | 3-1/4         | 6              | 7      | UNCOATED | CYLINDRICAL |
| <a href="#">N62032</a>      | S545-1.250-D3-S.0-Z7 | 1-1/4     | 1-1/4     | 3-1/4         | 6              | 7      | ALTIN    | CYLINDRICAL |
| <a href="#">N61880</a>      | S545-1.250-D4-S.0-Z7 | 1-1/4     | 1-1/4     | 5             | 7-1/2          | 7      | UNCOATED | CYLINDRICAL |
| <a href="#">N62033</a>      | S545-1.250-D4-S.0-Z7 | 1-1/4     | 1-1/4     | 5             | 7-1/2          | 7      | ALTIN    | CYLINDRICAL |

## S545R

SOLID  
CARBIDE



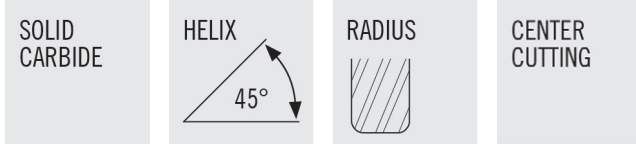
CENTER  
CUTTING



- Eccentric primary relief
- Ideal for peripheral finish milling in steel, stainless steel, titanium and high temperature alloys
- Cutting Data - Page 130
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N90927</a> | S545R-0.125-D2-R015.0-Z5 | 1/8       | 1/8       | 1/4           | 1-1/2          | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N90928</a> | S545R-0.125-D2-R020.0-Z5 | 1/8       | 1/8       | 1/4           | 1-1/2          | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N90929</a> | S545R-0.125-D4-R015.0-Z5 | 1/8       | 1/8       | 1/2           | 1-1/2          | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N90930</a> | S545R-0.125-D4-R020.0-Z5 | 1/8       | 1/8       | 1/2           | 1-1/2          | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N90931</a> | S545R-0.188-D2-R015.0-Z5 | 3/16      | 3/16      | 5/16          | 2              | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N90932</a> | S545R-0.188-D2-R020.0-Z5 | 3/16      | 3/16      | 5/16          | 2              | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N90908</a> | S545R-0.188-D3-R015.0-Z5 | 3/16      | 3/16      | 9/16          | 2              | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N90933</a> | S545R-0.188-D3-R020.0-Z5 | 3/16      | 3/16      | 9/16          | 2              | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N90935</a> | S545R-0.250-D2-R015.0-Z5 | 1/4       | 1/4       | 3/8           | 2              | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N90936</a> | S545R-0.250-D2-R020.0-Z5 | 1/4       | 1/4       | 3/8           | 2              | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N90937</a> | S545R-0.250-D2-R030.0-Z5 | 1/4       | 1/4       | 3/8           | 2              | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N90938</a> | S545R-0.250-D2-R045.0-Z5 | 1/4       | 1/4       | 3/8           | 2              | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N90926</a> | S545R-0.250-D3-R015.0-Z5 | 1/4       | 1/4       | 3/4           | 2-1/2          | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N90940</a> | S545R-0.250-D3-R020.0-Z5 | 1/4       | 1/4       | 3/4           | 2-1/2          | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N90934</a> | S545R-0.250-D3-R030.0-Z5 | 1/4       | 1/4       | 3/4           | 2-1/2          | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N90941</a> | S545R-0.250-D3-R045.0-Z5 | 1/4       | 1/4       | 3/4           | 2-1/2          | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N90943</a> | S545R-0.313-D1-R015.0-Z5 | 5/16      | 5/16      | 7/16          | 2              | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N90945</a> | S545R-0.313-D1-R030.0-Z5 | 5/16      | 5/16      | 7/16          | 2              | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N90944</a> | S545R-0.313-D1-R020.0-Z5 | 5/16      | 5/16      | 7/16          | 2              | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N90946</a> | S545R-0.313-D1-R045.0-Z5 | 5/16      | 5/16      | 7/16          | 2              | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N90947</a> | S545R-0.313-D3-R015.0-Z5 | 5/16      | 5/16      | 13/16         | 2-1/2          | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N90948</a> | S545R-0.313-D3-R020.0-Z5 | 5/16      | 5/16      | 13/16         | 2-1/2          | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N90939</a> | S545R-0.313-D3-R030.0-Z5 | 5/16      | 5/16      | 13/16         | 2-1/2          | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N90949</a> | S545R-0.313-D3-R045.0-Z5 | 5/16      | 5/16      | 13/16         | 2-1/2          | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N90950</a> | S545R-0.375-D1-R015.0-Z5 | 3/8       | 3/8       | 1/2           | 2              | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N90952</a> | S545R-0.375-D1-R020.0-Z5 | 3/8       | 3/8       | 1/2           | 2              | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N90953</a> | S545R-0.375-D1-R030.0-Z5 | 3/8       | 3/8       | 1/2           | 2              | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N90954</a> | S545R-0.375-D1-R045.0-Z5 | 3/8       | 3/8       | 1/2           | 2              | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N90955</a> | S545R-0.375-D1-R060.0-Z5 | 3/8       | 3/8       | 1/2           | 2              | 5      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N90956</a> | S545R-0.375-D3-R015.0-Z5 | 3/8       | 3/8       | 1             | 2-1/2          | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N90957</a> | S545R-0.375-D3-R020.0-Z5 | 3/8       | 3/8       | 1             | 2-1/2          | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N90958</a> | S545R-0.375-D3-R030.0-Z5 | 3/8       | 3/8       | 1             | 2-1/2          | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N90942</a> | S545R-0.375-D3-R045.0-Z5 | 3/8       | 3/8       | 1             | 2-1/2          | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N90960</a> | S545R-0.438-D1-R015.0-Z5 | 7/16      | 7/16      | 9/16          | 2-1/2          | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N90961</a> | S545R-0.438-D1-R020.0-Z5 | 7/16      | 7/16      | 9/16          | 2-1/2          | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N90962</a> | S545R-0.438-D1-R030.0-Z5 | 7/16      | 7/16      | 9/16          | 2-1/2          | 5      | ALTIN   | 0.030  | CYLINDRICAL |

## S545R (CONT'D)



- Eccentric primary relief
- Ideal for peripheral finish milling in steel, stainless steel, titanium and high temperature alloys
- Cutting Data - Page 130
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N90963</a> | S545R-0.438-D1-R045.0-Z5 | 7/16      | 7/16      | 9/16          | 2-1/2          | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N90964</a> | S545R-0.438-D1-R060.0-Z5 | 7/16      | 7/16      | 9/16          | 2-1/2          | 5      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N90965</a> | S545R-0.438-D1-R090.0-Z5 | 7/16      | 7/16      | 9/16          | 2-1/2          | 5      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N90967</a> | S545R-0.438-D1-R125.0-Z5 | 7/16      | 7/16      | 9/16          | 2-1/2          | 5      | ALTIN   | 0.125  | CYLINDRICAL |
| <a href="#">N90951</a> | S545R-0.438-D2-R015.0-Z5 | 7/16      | 7/16      | 1             | 2-3/4          | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N90972</a> | S545R-0.438-D2-R020.0-Z5 | 7/16      | 7/16      | 1             | 2-3/4          | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N90973</a> | S545R-0.438-D2-R030.0-Z5 | 7/16      | 7/16      | 1             | 2-3/4          | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N90976</a> | S545R-0.438-D2-R045.0-Z5 | 7/16      | 7/16      | 1             | 2-3/4          | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N90977</a> | S545R-0.438-D2-R060.0-Z5 | 7/16      | 7/16      | 1             | 2-3/4          | 5      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N90978</a> | S545R-0.438-D2-R090.0-Z5 | 7/16      | 7/16      | 1             | 2-3/4          | 5      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N90979</a> | S545R-0.438-D2-R125.0-Z5 | 7/16      | 7/16      | 1             | 2-3/4          | 5      | ALTIN   | 0.125  | CYLINDRICAL |
| <a href="#">N90982</a> | S545R-0.500-D1-R015.0-Z5 | 1/2       | 1/2       | 5/8           | 2-1/2          | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N90987</a> | S545R-0.500-D1-R020.0-Z5 | 1/2       | 1/2       | 5/8           | 2-1/2          | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N91004</a> | S545R-0.500-D1-R030.0-Z5 | 1/2       | 1/2       | 5/8           | 2-1/2          | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N91008</a> | S545R-0.500-D1-R045.0-Z5 | 1/2       | 1/2       | 5/8           | 2-1/2          | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N91009</a> | S545R-0.500-D1-R060.0-Z5 | 1/2       | 1/2       | 5/8           | 2-1/2          | 5      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N91010</a> | S545R-0.500-D1-R090.0-Z5 | 1/2       | 1/2       | 5/8           | 2-1/2          | 5      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N91011</a> | S545R-0.500-D1-R125.0-Z5 | 1/2       | 1/2       | 5/8           | 2-1/2          | 5      | ALTIN   | 0.125  | CYLINDRICAL |
| <a href="#">N90959</a> | S545R-0.500-D3-R015.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N91012</a> | S545R-0.500-D3-R020.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N91013</a> | S545R-0.500-D3-R030.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N91015</a> | S545R-0.500-D3-R045.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N91017</a> | S545R-0.500-D3-R060.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N91019</a> | S545R-0.500-D3-R090.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N91021</a> | S545R-0.500-D3-R125.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALTIN   | 0.125  | CYLINDRICAL |
| <a href="#">N91042</a> | S545R-0.625-D1-R015.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N91051</a> | S545R-0.625-D1-R020.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N91060</a> | S545R-0.625-D1-R030.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N91075</a> | S545R-0.625-D1-R045.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N91076</a> | S545R-0.625-D1-R060.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N91077</a> | S545R-0.625-D1-R090.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N91078</a> | S545R-0.625-D1-R125.0-Z5 | 5/8       | 5/8       | 3/4           | 3              | 5      | ALTIN   | 0.125  | CYLINDRICAL |
| <a href="#">N90980</a> | S545R-0.625-D3-R015.0-Z5 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N91079</a> | S545R-0.625-D3-R020.0-Z5 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N91084</a> | S545R-0.625-D3-R030.0-Z5 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N91086</a> | S545R-0.625-D3-R045.0-Z5 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 5      | ALTIN   | 0.045  | CYLINDRICAL |



## S545R (CONT'D)

SOLID CARBIDE

HELIX

45°

RADIUS

CENTER CUTTING

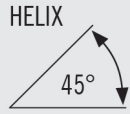


- Eccentric primary relief
- Ideal for peripheral finish milling in steel, stainless steel, titanium and high temperature alloys
- Cutting Data - Page 130
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N91090</a> | S545R-0.625-D3-R060.0-Z5 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 5      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N91091</a> | S545R-0.625-D3-R090.0-Z5 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 5      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N91093</a> | S545R-0.625-D3-R125.0-Z5 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 5      | ALTIN   | 0.125  | CYLINDRICAL |
| <a href="#">N91095</a> | S545R-0.750-D1-R015.0-Z5 | 3/4       | 3/4       | 1             | 3              | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N91096</a> | S545R-0.750-D1-R020.0-Z5 | 3/4       | 3/4       | 1             | 3              | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N91097</a> | S545R-0.750-D1-R030.0-Z5 | 3/4       | 3/4       | 1             | 3              | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N91098</a> | S545R-0.750-D1-R045.0-Z5 | 3/4       | 3/4       | 1             | 3              | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N91099</a> | S545R-0.750-D1-R060.0-Z5 | 3/4       | 3/4       | 1             | 3              | 5      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N91102</a> | S545R-0.750-D1-R090.0-Z5 | 3/4       | 3/4       | 1             | 3              | 5      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N91103</a> | S545R-0.750-D1-R125.0-Z5 | 3/4       | 3/4       | 1             | 3              | 5      | ALTIN   | 0.125  | CYLINDRICAL |
| <a href="#">N91104</a> | S545R-0.750-D1-R190.0-Z5 | 3/4       | 3/4       | 1             | 3              | 5      | ALTIN   | 0.190  | CYLINDRICAL |
| <a href="#">N91039</a> | S545R-0.750-D2-R015.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N91105</a> | S545R-0.750-D2-R020.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N91107</a> | S545R-0.750-D2-R030.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N91108</a> | S545R-0.750-D2-R045.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N91110</a> | S545R-0.750-D2-R060.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N91111</a> | S545R-0.750-D2-R090.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N91116</a> | S545R-0.750-D2-R125.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALTIN   | 0.125  | CYLINDRICAL |
| <a href="#">N91117</a> | S545R-0.750-D2-R190.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALTIN   | 0.190  | CYLINDRICAL |
| <a href="#">N91133</a> | S545R-1.000-D1-R015.0-Z5 | 1         | 1         | 1-1/4         | 4              | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N91135</a> | S545R-1.000-D1-R020.0-Z5 | 1         | 1         | 1-1/4         | 4              | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N91136</a> | S545R-1.000-D1-R030.0-Z5 | 1         | 1         | 1-1/4         | 4              | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N91138</a> | S545R-1.000-D1-R045.0-Z5 | 1         | 1         | 1-1/4         | 4              | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N91139</a> | S545R-1.000-D1-R060.0-Z5 | 1         | 1         | 1-1/4         | 4              | 5      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N91142</a> | S545R-1.000-D1-R090.0-Z5 | 1         | 1         | 1-1/4         | 4              | 5      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N91143</a> | S545R-1.000-D1-R125.0-Z5 | 1         | 1         | 1-1/4         | 4              | 5      | ALTIN   | 0.125  | CYLINDRICAL |
| <a href="#">N91145</a> | S545R-1.000-D1-R190.0-Z5 | 1         | 1         | 1-1/4         | 4              | 5      | ALTIN   | 0.190  | CYLINDRICAL |
| <a href="#">N91094</a> | S545R-1.000-D2-R015.0-Z5 | 1         | 1         | 2             | 4              | 5      | ALTIN   | 0.015  | CYLINDRICAL |
| <a href="#">N91146</a> | S545R-1.000-D2-R020.0-Z5 | 1         | 1         | 2             | 4              | 5      | ALTIN   | 0.020  | CYLINDRICAL |
| <a href="#">N91148</a> | S545R-1.000-D2-R030.0-Z5 | 1         | 1         | 2             | 4              | 5      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N91149</a> | S545R-1.000-D2-R045.0-Z5 | 1         | 1         | 2             | 4              | 5      | ALTIN   | 0.045  | CYLINDRICAL |
| <a href="#">N91152</a> | S545R-1.000-D2-R060.0-Z5 | 1         | 1         | 2             | 4              | 5      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N91155</a> | S545R-1.000-D2-R090.0-Z5 | 1         | 1         | 2             | 4              | 5      | ALTIN   | 0.090  | CYLINDRICAL |
| <a href="#">N91158</a> | S545R-1.000-D2-R125.0-Z5 | 1         | 1         | 2             | 4              | 5      | ALTIN   | 0.125  | CYLINDRICAL |
| <a href="#">N91163</a> | S545R-1.000-D2-R190.0-Z5 | 1         | 1         | 2             | 4              | 5      | ALTIN   | 0.190  | CYLINDRICAL |

## S645M

SOLID  
CARBIDE



CENTER  
CUTTING

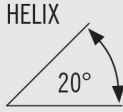


- Eccentric primary relief
- Ideal for peripheral finish milling in steel, stainless steel, titanium and high temperature alloys
- Cutting Data - Page 134
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION         | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|---------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N47858</a> | S645M-030-D4-S.0-Z6 | 3mm       | 3mm       | 12mm          | 38mm           | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47860</a> | S645M-040-D2-S.0-Z6 | 4mm       | 4mm       | 6mm           | 50mm           | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47862</a> | S645M-040-D3-S.0-Z6 | 4mm       | 4mm       | 12mm          | 50mm           | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47864</a> | S645M-050-D3-S.0-Z6 | 5mm       | 5mm       | 14mm          | 50mm           | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47866</a> | S645M-060-D1-S.0-Z6 | 6mm       | 6mm       | 8mm           | 51mm           | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47868</a> | S645M-060-D3-S.0-Z6 | 6mm       | 6mm       | 16mm          | 58mm           | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47870</a> | S645M-080-D1-S.0-Z6 | 8mm       | 8mm       | 10mm          | 59mm           | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47872</a> | S645M-080-D2-S.0-Z6 | 8mm       | 8mm       | 20mm          | 64mm           | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47874</a> | S645M-100-D1-S.0-Z6 | 10mm      | 10mm      | 11mm          | 67mm           | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47876</a> | S645M-100-D2-S.0-Z6 | 10mm      | 10mm      | 22mm          | 73mm           | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47880</a> | S645M-120-D3-S.0-Z6 | 12mm      | 12mm      | 32mm          | 84mm           | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47886</a> | S645M-160-D1-S.0-Z6 | 16mm      | 16mm      | 16mm          | 83mm           | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47888</a> | S645M-160-D2-S.0-Z6 | 16mm      | 16mm      | 36mm          | 89mm           | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47894</a> | S645M-200-D2-S.0-Z6 | 20mm      | 20mm      | 38mm          | 101mm          | 6      | ALTIN   | CYLINDRICAL |
| <a href="#">N47896</a> | S645M-200-D3-S.0-Z6 | 20mm      | 20mm      | 50mm          | 104mm          | 6      | ALTIN   | CYLINDRICAL |

## SR420 & SR420M

SOLID CARBIDE



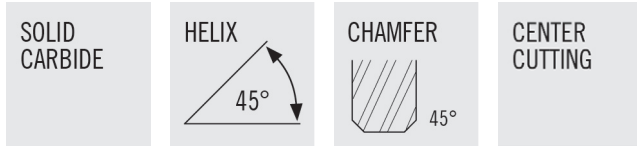
CENTER CUTTING



- Fine-pitch knuckle form
- Designed for steels, stainless steel, and cast iron
- Cutting Data SR420 - Page 131
- Tolerance Specs SR420 - Page 323
- Cutting Data SR420M - Page 135
- Tolerance Specs SR420M - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|-------------|
| <b>INCH - SR420</b>    |                          |           |           |               |                |        |          |         |             |
| <a href="#">N76130</a> | SR420-0.250-D2-C020.0-Z4 | 1/4       | 1/4       | 3/8           | 2              | 4      | UNCOATED | 0.020   | CYLINDRICAL |
| <a href="#">N76178</a> | SR420-0.250-D2-C020.0-Z4 | 1/4       | 1/4       | 3/8           | 2              | 4      | ALTIN    | 0.020   | CYLINDRICAL |
| <a href="#">N76131</a> | SR420-0.250-D3-C020.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | UNCOATED | 0.020   | CYLINDRICAL |
| <a href="#">N76179</a> | SR420-0.250-D3-C020.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | ALTIN    | 0.020   | CYLINDRICAL |
| <a href="#">N76132</a> | SR420-0.313-D1-C020.0-Z4 | 5/16      | 5/16      | 7/16          | 2              | 4      | UNCOATED | 0.020   | CYLINDRICAL |
| <a href="#">N76180</a> | SR420-0.313-D1-C020.0-Z4 | 5/16      | 5/16      | 7/16          | 2              | 4      | ALTIN    | 0.020   | CYLINDRICAL |
| <a href="#">N76133</a> | SR420-0.313-D3-C020.0-Z4 | 5/16      | 5/16      | 13/16         | 2-1/2          | 4      | UNCOATED | 0.020   | CYLINDRICAL |
| <a href="#">N76181</a> | SR420-0.313-D3-C020.0-Z4 | 5/16      | 5/16      | 13/16         | 2-1/2          | 4      | ALTIN    | 0.020   | CYLINDRICAL |
| <a href="#">N76134</a> | SR420-0.375-D1-C020.3-Z4 | 3/8       | 3/8       | 1/2           | 2              | 4      | UNCOATED | 0.020   | WELDON      |
| <a href="#">N76182</a> | SR420-0.375-D1-C020.3-Z4 | 3/8       | 3/8       | 1/2           | 2              | 4      | ALTIN    | 0.020   | WELDON      |
| <a href="#">N76135</a> | SR420-0.375-D3-C020.3-Z4 | 3/8       | 3/8       | 1             | 2-1/2          | 4      | UNCOATED | 0.020   | WELDON      |
| <a href="#">N76183</a> | SR420-0.375-D3-C020.3-Z4 | 3/8       | 3/8       | 1             | 2-1/2          | 4      | ALTIN    | 0.020   | WELDON      |
| <a href="#">N76136</a> | SR420-0.438-D1-C020.3-Z4 | 7/16      | 7/16      | 9/16          | 2-1/2          | 4      | UNCOATED | 0.020   | WELDON      |
| <a href="#">N76184</a> | SR420-0.438-D1-C020.3-Z4 | 7/16      | 7/16      | 9/16          | 2-1/2          | 4      | ALTIN    | 0.020   | WELDON      |
| <a href="#">N76137</a> | SR420-0.438-D2-C020.3-Z4 | 7/16      | 7/16      | 1             | 2-3/4          | 4      | UNCOATED | 0.020   | WELDON      |
| <a href="#">N76185</a> | SR420-0.438-D2-C020.3-Z4 | 7/16      | 7/16      | 1             | 2-3/4          | 4      | ALTIN    | 0.020   | WELDON      |
| <a href="#">N76138</a> | SR420-0.500-D1-C025.3-Z4 | 1/2       | 1/2       | 5/8           | 2-1/2          | 4      | UNCOATED | 0.025   | WELDON      |
| <a href="#">N76186</a> | SR420-0.500-D1-C025.3-Z4 | 1/2       | 1/2       | 5/8           | 2-1/2          | 4      | ALTIN    | 0.025   | WELDON      |
| <a href="#">N76139</a> | SR420-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3              | 4      | UNCOATED | 0.025   | WELDON      |
| <a href="#">N76187</a> | SR420-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3              | 4      | ALTIN    | 0.025   | WELDON      |
| <a href="#">N76140</a> | SR420-0.625-D1-C025.3-Z4 | 5/8       | 5/8       | 3/4           | 3              | 4      | UNCOATED | 0.025   | WELDON      |
| <a href="#">N76188</a> | SR420-0.625-D1-C025.3-Z4 | 5/8       | 5/8       | 3/4           | 3              | 4      | ALTIN    | 0.025   | WELDON      |
| <a href="#">N76141</a> | SR420-0.625-D3-C025.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 4      | UNCOATED | 0.025   | WELDON      |
| <a href="#">N76189</a> | SR420-0.625-D3-C025.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 4      | ALTIN    | 0.025   | WELDON      |
| <a href="#">N76142</a> | SR420-0.750-D1-C025.3-Z4 | 3/4       | 3/4       | 1             | 3              | 4      | UNCOATED | 0.025   | WELDON      |
| <a href="#">N76190</a> | SR420-0.750-D1-C025.3-Z4 | 3/4       | 3/4       | 1             | 3              | 4      | ALTIN    | 0.025   | WELDON      |
| <a href="#">N76143</a> | SR420-0.750-D2-C025.3-Z4 | 3/4       | 3/4       | 1-5/8         | 4              | 4      | UNCOATED | 0.025   | WELDON      |
| <a href="#">N76191</a> | SR420-0.750-D2-C025.3-Z4 | 3/4       | 3/4       | 1-5/8         | 4              | 4      | ALTIN    | 0.025   | WELDON      |
| <a href="#">N76144</a> | SR420-1.000-D1-C025.3-Z5 | 1         | 1         | 1-1/4         | 4              | 5      | UNCOATED | 0.025   | WELDON      |
| <a href="#">N76192</a> | SR420-1.000-D1-C025.3-Z5 | 1         | 1         | 1-1/4         | 4              | 5      | ALTIN    | 0.025   | WELDON      |
| <a href="#">N76145</a> | SR420-1.000-D2-C025.3-Z5 | 1         | 1         | 2             | 5              | 5      | UNCOATED | 0.025   | WELDON      |
| <a href="#">N76193</a> | SR420-1.000-D2-C025.3-Z5 | 1         | 1         | 2             | 5              | 5      | ALTIN    | 0.025   | WELDON      |
| <b>METRIC - SR420M</b> |                          |           |           |               |                |        |          |         |             |
| <a href="#">N47902</a> | SR420M-060-D3-C050.0-Z4  | 6mm       | 6mm       | 16mm          | 58mm           | 4      | ALTIN    | 0.50mm  | CYLINDRICAL |
| <a href="#">N47904</a> | SR420M-080-D2-C050.0-Z4  | 8mm       | 8mm       | 20mm          | 64mm           | 4      | ALTIN    | 0.50mm  | CYLINDRICAL |
| <a href="#">N47906</a> | SR420M-100-D2-C050.0-Z4  | 10mm      | 10mm      | 22mm          | 73mm           | 4      | ALTIN    | 0.50mm  | CYLINDRICAL |
| <a href="#">N47907</a> | SR420M-120-D1-C100.0-Z4  | 12mm      | 12mm      | 12mm          | 74mm           | 4      | ALTIN    | 1.00mm  | CYLINDRICAL |
| <a href="#">N47908</a> | SR420M-120-D3-C100.0-Z4  | 12mm      | 12mm      | 32mm          | 84mm           | 4      | ALTIN    | 1.00mm  | CYLINDRICAL |
| <a href="#">N47910</a> | SR420M-140-D2-C100.0-Z4  | 14mm      | 14mm      | 32mm          | 84mm           | 4      | ALTIN    | 1.00mm  | CYLINDRICAL |
| <a href="#">N47912</a> | SR420M-160-D2-C100.0-Z4  | 16mm      | 16mm      | 36mm          | 93mm           | 4      | ALTIN    | 1.00mm  | CYLINDRICAL |
| <a href="#">N47916</a> | SR420M-200-D3-C100.0-Z4  | 20mm      | 20mm      | 50mm          | 105mm          | 4      | ALTIN    | 1.00mm  | CYLINDRICAL |

## SR545



- Fine-pitch knuckle profile
- Designed for peripheral milling (25% of tool diameter maximum) Stainless, High Temp Alloys, Titanium
- High shearing action to reduce radial deflection
- Fine pitch knuckle design
- Cutting Data - Page 132
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|-------------|
| <a href="#">N99050</a> | SR545-0.375-D1-C020.0-Z5 | 3/8       | 3/8       | 1/2           | 2              | 5      | UNCOATED | 0.020   | CYLINDRICAL |
| <a href="#">N99092</a> | SR545-0.375-D1-C020.0-Z5 | 3/8       | 3/8       | 1/2           | 2              | 5      | ALTIN    | 0.020   | CYLINDRICAL |
| <a href="#">N99051</a> | SR545-0.375-D3-C020.0-Z5 | 3/8       | 3/8       | 1             | 2-1/2          | 5      | UNCOATED | 0.020   | CYLINDRICAL |
| <a href="#">N99093</a> | SR545-0.375-D3-C020.0-Z5 | 3/8       | 3/8       | 1             | 2-1/2          | 5      | ALTIN    | 0.020   | CYLINDRICAL |
| <a href="#">N99053</a> | SR545-0.438-D2-C020.0-Z5 | 7/16      | 7/16      | 1             | 2-3/4          | 5      | UNCOATED | 0.020   | CYLINDRICAL |
| <a href="#">N99095</a> | SR545-0.438-D2-C020.0-Z5 | 7/16      | 7/16      | 1             | 2-3/4          | 5      | ALTIN    | 0.020   | CYLINDRICAL |
| <a href="#">N99054</a> | SR545-0.500-D1-C025.0-Z5 | 1/2       | 1/2       | 5/8           | 2-1/2          | 5      | UNCOATED | 0.025   | CYLINDRICAL |
| <a href="#">N99096</a> | SR545-0.500-D1-C025.0-Z5 | 1/2       | 1/2       | 5/8           | 2-1/2          | 5      | ALTIN    | 0.025   | CYLINDRICAL |
| <a href="#">N99055</a> | SR545-0.500-D3-C025.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | UNCOATED | 0.025   | CYLINDRICAL |
| <a href="#">N99097</a> | SR545-0.500-D3-C025.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | ALTIN    | 0.025   | CYLINDRICAL |
| <a href="#">N99057</a> | SR545-0.625-D3-C025.0-Z5 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 5      | UNCOATED | 0.025   | CYLINDRICAL |
| <a href="#">N99099</a> | SR545-0.625-D3-C025.0-Z5 | 5/8       | 5/8       | 1-5/8         | 3-1/2          | 5      | ALTIN    | 0.025   | CYLINDRICAL |
| <a href="#">N99058</a> | SR545-0.750-D1-C025.0-Z5 | 3/4       | 3/4       | 1             | 3              | 5      | UNCOATED | 0.025   | CYLINDRICAL |
| <a href="#">N99100</a> | SR545-0.750-D1-C025.0-Z5 | 3/4       | 3/4       | 1             | 3              | 5      | ALTIN    | 0.025   | CYLINDRICAL |
| <a href="#">N99059</a> | SR545-0.750-D2-C025.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | UNCOATED | 0.025   | CYLINDRICAL |
| <a href="#">N99101</a> | SR545-0.750-D2-C025.0-Z5 | 3/4       | 3/4       | 1-5/8         | 4              | 5      | ALTIN    | 0.025   | CYLINDRICAL |
| <a href="#">N99061</a> | SR545-1.000-D2-C025.0-Z5 | 1         | 1         | 2             | 4              | 5      | UNCOATED | 0.025   | CYLINDRICAL |
| <a href="#">N99103</a> | SR545-1.000-D2-C025.0-Z5 | 1         | 1         | 2             | 4              | 5      | ALTIN    | 0.025   | CYLINDRICAL |

DISCOUNT CODE D43

# CUTTING DATA - ELITE S SERIES HIGH PERFORMANCE



## NS240R - START VALUES

### SIDE MILLING - FINISHING

| ISO GROUP                  | SMG                  | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>f</sub> (sf/min) | Z <sub>n</sub> = 2      |             |                         |                         |        |        |        |        |        |        |        |        |
|----------------------------|----------------------|---------------------------|---------------------------|-------------------------|-------------------------|-------------|-------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
|                            |                      |                           |                           |                         | 1/4                     | 5/16        | 3/8                     | 1/2                     | 5/8    | 3/4    | 1      | 1 1/4  |        |        |        |        |
| P                          | E / M / A<br>1 - 2   | 5                         | 0.02                      | 660                     | n (rev/min)             | 10080       | 8070                    | 6720                    | 5040   | 4030   | 3360   | 2520   | 2020   |        |        |        |
|                            |                      |                           |                           |                         | f <sub>z</sub> (in)     | 0.0025      | 0.0031                  | 0.0038                  | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |        |        |
|                            |                      |                           |                           | 590 - 720               | v <sub>f</sub> (in/min) | 50.4        | 50.4                    | 50.4                    | 50.4   | 50.4   | 50.4   | 50.4   | 50.4   | 50.5   |        |        |
|                            | E / M / A<br>3 - 4   | 5                         | 0.02                      | 590                     | n (rev/min)             | 9020        | 7210                    | 6010                    | 4510   | 3610   | 3010   | 2250   | 1800   |        |        |        |
|                            |                      |                           |                           |                         | f <sub>z</sub> (in)     | 0.0025      | 0.0031                  | 0.0038                  | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |        |        |
|                            |                      |                           |                           | 520 - 660               | v <sub>f</sub> (in/min) | 45.1        | 45.1                    | 45.1                    | 45.1   | 45.1   | 45.2   | 45.0   | 45.0   |        |        |        |
| E / M / A<br>5 - 6         | 5                    | 0.02                      | 520                       | n (rev/min)             | 7950                    | 6360        | 5300                    | 3970                    | 3180   | 2650   | 1990   | 1590   |        |        |        |        |
|                            |                      |                           |                           | f <sub>z</sub> (in)     | 0.0025                  | 0.0031      | 0.0038                  | 0.0050                  | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |        |        |        |
|                            |                      |                           | 460 - 590                 | v <sub>f</sub> (in/min) | 39.8                    | 39.8        | 39.8                    | 39.7                    | 39.8   | 39.8   | 39.8   | 39.8   | 39.8   |        |        |        |
| M                          | E / M / A<br>8 - 9   | 5                         | 0.02                      | 330                     | n (rev/min)             | 5040        | 4030                    | 3360                    | 2520   | 2020   | 1680   | 1260   | 1010   |        |        |        |
|                            |                      |                           |                           |                         | f <sub>z</sub> (in)     | 0.0025      | 0.0031                  | 0.0038                  | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |        |        |
|                            |                      |                           |                           | 260 - 390               | v <sub>f</sub> (in/min) | 25.2        | 25.2                    | 25.2                    | 25.2   | 25.3   | 25.2   | 25.2   | 25.3   |        |        |        |
|                            | E / M / A<br>10 - 11 | 5                         | 0.02                      | 260                     | n (rev/min)             | 3970        | 3180                    | 2650                    | 1990   | 1590   | 1320   | 990    | 790    |        |        |        |
|                            |                      |                           |                           |                         | f <sub>z</sub> (in)     | 0.0025      | 0.0031                  | 0.0038                  | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |        |        |
|                            |                      |                           |                           | 200 - 330               | v <sub>f</sub> (in/min) | 19.9        | 19.9                    | 19.9                    | 19.9   | 19.9   | 19.8   | 19.8   | 19.8   |        |        |        |
| K                          | E<br>12 - 13         | 5                         | 0.02                      | 390                     | n (rev/min)             | 5960        | 4770                    | 3970                    | 2980   | 2380   | 1990   | 1490   | 1190   |        |        |        |
|                            |                      |                           |                           |                         | f <sub>z</sub> (in)     | 0.0025      | 0.0031                  | 0.0038                  | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |        |        |
|                            |                      |                           |                           | 330 - 460               | v <sub>f</sub> (in/min) | 29.8        | 29.8                    | 29.8                    | 29.8   | 29.8   | 29.9   | 29.8   | 29.8   |        |        |        |
|                            | E<br>14 - 15         | 5                         | 0.02                      | 330                     | n (rev/min)             | 5040        | 4030                    | 3360                    | 2520   | 2020   | 1680   | 1260   | 1010   |        |        |        |
|                            |                      |                           |                           |                         | f <sub>z</sub> (in)     | 0.0025      | 0.0031                  | 0.0038                  | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |        |        |
|                            |                      |                           |                           | 260 - 390               | v <sub>f</sub> (in/min) | 25.2        | 25.2                    | 25.2                    | 25.2   | 25.3   | 25.2   | 25.2   | 25.3   |        |        |        |
| N                          | E / M / A<br>16      | 5                         | 0.02                      | 2620                    | n (rev/min)             | 40030       | 32030                   | 26690                   | 20020  | 16010  | 13340  | 10010  | 8010   |        |        |        |
|                            |                      |                           |                           |                         | f <sub>z</sub> (in)     | 0.0025      | 0.0031                  | 0.0038                  | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |        |        |
|                            |                      |                           |                           | 2300 - 2950             | v <sub>f</sub> (in/min) | 200.2       | 200.2                   | 200.2                   | 200.2  | 200.1  | 200.1  | 200.2  | 200.3  |        |        |        |
|                            | E / M / A<br>17      | 5                         | 0.02                      | 2620                    | n (rev/min)             | 40030       | 32030                   | 26690                   | 20020  | 16010  | 13340  | 10010  | 8010   |        |        |        |
|                            |                      |                           |                           |                         | f <sub>z</sub> (in)     | 0.0025      | 0.0031                  | 0.0038                  | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |        |        |
|                            |                      |                           |                           | 2300 - 2950             | v <sub>f</sub> (in/min) | 200.2       | 200.2                   | 200.2                   | 200.2  | 200.1  | 200.1  | 200.2  | 200.3  |        |        |        |
| E / M / A<br>18            | 5                    | 0.02                      | 1310                      | n (rev/min)             | 20020                   | 16010       | 13340                   | 10010                   | 8010   | 6670   | 5000   | 4000   |        |        |        |        |
|                            |                      |                           |                           | f <sub>z</sub> (in)     | 0.0025                  | 0.0031      | 0.0038                  | 0.0050                  | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |        |        |        |
|                            |                      |                           | 1150 - 1480               | v <sub>f</sub> (in/min) | 100.1                   | 100.1       | 100.1                   | 100.1                   | 100.1  | 100.1  | 100.0  | 100.0  |        |        |        |        |
| S                          | E / M / A<br>19      | 5                         | 0.02                      | 160                     | n (rev/min)             | 2440        | 1960                    | 1630                    | 1220   | 980    | 810    | 610    | 490    |        |        |        |
|                            |                      |                           |                           |                         | f <sub>z</sub> (in)     | 0.0018      | 0.0022                  | 0.0026                  | 0.0035 | 0.0044 | 0.0053 | 0.0070 | 0.0088 |        |        |        |
|                            |                      |                           |                           | 130 - 200               | v <sub>f</sub> (in/min) | 8.5         | 8.6                     | 8.6                     | 8.5    | 8.6    | 8.5    | 8.5    | 8.6    |        |        |        |
|                            |                      |                           |                           | E / M / A<br>20         | 5                       | 0.02        | 160                     | n (rev/min)             | 2440   | 1960   | 1630   | 1220   | 980    | 810    | 610    | 490    |
|                            |                      |                           |                           |                         |                         |             |                         | f <sub>z</sub> (in)     | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0070 | 0.0088 |
|                            |                      |                           |                           |                         |                         |             | 130 - 200               | v <sub>f</sub> (in/min) | 8.5    | 8.6    | 8.6    | 8.5    | 8.6    | 8.5    | 8.5    | 8.6    |
|                            | E / M / A<br>21      | 5                         | 0.02                      | 130                     | n (rev/min)             | 1990        | 1590                    | 1320                    | 990    | 790    | 660    | 500    | 400    |        |        |        |
|                            |                      |                           |                           |                         | f <sub>z</sub> (in)     | 0.0018      | 0.0022                  | 0.0026                  | 0.0035 | 0.0044 | 0.0053 | 0.0070 | 0.0088 |        |        |        |
|                            |                      |                           |                           | 100 - 160               | v <sub>f</sub> (in/min) | 7.0         | 7.0                     | 6.9                     | 6.9    | 6.9    | 6.9    | 7.0    | 7.0    |        |        |        |
|                            | E / M / A<br>22      | 5                         | 0.02                      | 330                     | n (rev/min)             | 5040        | 4030                    | 3360                    | 2520   | 2020   | 1680   | 1260   | 1010   |        |        |        |
|                            |                      |                           |                           |                         | f <sub>z</sub> (in)     | 0.0025      | 0.0031                  | 0.0038                  | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |        |        |
|                            |                      |                           |                           | 260 - 390               | v <sub>f</sub> (in/min) | 25.2        | 25.2                    | 25.2                    | 25.2   | 25.3   | 25.2   | 25.2   | 25.3   |        |        |        |
| A / D<br>GRAPHITE          |                      |                           |                           | 5                       | 0.02                    | 3280        | n (rev/min)             | 50120                   | 40090  | 33410  | 25060  | 20050  | 16710  | 12530  | 10020  |        |
|                            |                      |                           |                           |                         |                         |             | f <sub>z</sub> (in)     | 0.0025                  | 0.0031 | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |
|                            |                      |                           |                           |                         |                         | 2950 - 3610 | v <sub>f</sub> (in/min) | 250.6                   | 250.6  | 250.6  | 250.6  | 250.6  | 250.7  | 250.6  | 250.5  |        |
| A / D<br>PLASTIC<br>(SOFT) | 5                    | 0.02                      | 3280                      | n (rev/min)             | 50120                   | 40090       | 33410                   | 25060                   | 20050  | 16710  | 12530  | 10020  |        |        |        |        |
|                            |                      |                           |                           | f <sub>z</sub> (in)     | 0.0025                  | 0.0031      | 0.0038                  | 0.0050                  | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |        |        |        |
|                            |                      |                           | 2950 - 3610               | v <sub>f</sub> (in/min) | 250.6                   | 250.6       | 250.6                   | 250.6                   | 250.6  | 250.7  | 250.6  | 250.5  |        |        |        |        |
| A / D<br>PLASTIC<br>(HARD) | 5                    | 0.02                      | 1970                      | n (rev/min)             | 30100                   | 24080       | 20070                   | 15050                   | 12040  | 10030  | 7530   | 6020   |        |        |        |        |
|                            |                      |                           |                           | f <sub>z</sub> (in)     | 0.0025                  | 0.0031      | 0.0038                  | 0.0050                  | 0.0063 | 0.0075 | 0.0100 | 0.0125 |        |        |        |        |
|                            |                      |                           | 1640 - 2300               | v <sub>f</sub> (in/min) | 150.5                   | 150.5       | 150.5                   | 150.5                   | 150.5  | 150.5  | 150.6  | 150.5  |        |        |        |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## S335 - START VALUES

|                         |           | SLOTTING                              |                                       |                           |                         |                    |        |        |        |        |        |        |        |
|-------------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        |        |        |
|                         |           |                                       |                                       |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E 1 - 2   | 1.0                                   | 1.00                                  | 395                       | n (rev/min)             | 24142              | 12071  | 6036   | 4024   | 3018   | 2414   | 2012   | 1509   |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0005 | 0.0010 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 18.1               | 18.1   | 18.1   | 18.1   | 18.1   | 18.1   | 18.1   | 18.1   |
|                         | E 3 - 4   | 1.0                                   | 1.00                                  | 330                       | n (rev/min)             | 20170              | 10085  | 5042   | 3362   | 2521   | 2017   | 1681   | 1261   |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0005 | 0.0010 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 15.1               | 15.1   | 15.1   | 15.1   | 15.1   | 15.1   | 15.1   | 15.1   |
|                         | E 5 - 6   | 1.0                                   | 1.00                                  | 260                       | n (rev/min)             | 15891              | 7946   | 3973   | 2649   | 1986   | 1589   | 1324   | 993    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0032 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 9.5                | 9.5    | 9.5    | 9.5    | 9.5    | 9.5    | 9.5    | 9.5    |
| M                       | E 8 - 9   | 1.0                                   | 1.00                                  | 260                       | n (rev/min)             | 15891              | 7946   | 3973   | 2649   | 1986   | 1589   | 1324   | 993    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0007 | 0.0010 | 0.0013 | 0.0016 | 0.0020 | 0.0026 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 7.7                | 7.7    | 7.7    | 7.7    | 7.7    | 7.7    | 7.7    | 7.7    |
|                         | E 10 - 11 | 1.0                                   | 1.00                                  | 230                       | n (rev/min)             | 14058              | 7029   | 3514   | 2343   | 1757   | 1406   | 1171   | 879    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0007 | 0.0010 | 0.0013 | 0.0016 | 0.0020 | 0.0026 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 6.9                | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    |
| K                       | E 12 - 13 | 1.0                                   | 1.00                                  | 385                       | n (rev/min)             | 23531              | 11766  | 5883   | 3922   | 2941   | 2353   | 1961   | 1471   |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0006 | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 19.9               | 19.9   | 19.9   | 19.9   | 19.9   | 19.9   | 19.9   | 19.9   |
|                         | E 14 - 15 | 1.0                                   | 1.00                                  | 340                       | n (rev/min)             | 20781              | 10390  | 5195   | 3463   | 2598   | 2078   | 1732   | 1299   |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0006 | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 17.5               | 17.5   | 17.5   | 17.5   | 17.5   | 17.5   | 17.5   | 17.5   |
| S                       | E 19      | 1.0                                   | 1.00                                  | 110                       | n (rev/min)             | 6723               | 3362   | 1681   | 1121   | 840    | 672    | 560    | 420    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.3                | 2.3    | 2.3    | 2.3    | 2.3    | 2.3    | 2.3    | 2.3    |
|                         | E 20      | 1.0                                   | 1.00                                  | 110                       | n (rev/min)             | 6723               | 3362   | 1681   | 1121   | 840    | 672    | 560    | 420    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.3                | 2.3    | 2.3    | 2.3    | 2.3    | 2.3    | 2.3    | 2.3    |
|                         | E 21      | 1.0                                   | 1.00                                  | 70                        | n (rev/min)             | 4278               | 2139   | 1070   | 713    | 535    | 428    | 357    | 267    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0006 | 0.0008 | 0.0009 | 0.0011 | 0.0015 |
|                         | E 22      | 1.0                                   | 1.00                                  | 180                       | n (rev/min)             | 11002              | 5501   | 2750   | 1834   | 1375   | 1100   | 917    | 688    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0006 | 0.0009 | 0.0011 | 0.0014 | 0.0017 | 0.0023 |
| v <sub>f</sub> (in/min) |           |                                       |                                       |                           | 4.7                     | 4.7                | 4.7    | 4.7    | 4.7    | 4.7    | 4.7    | 4.7    |        |
|                         |           |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |        |
|                         |           |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |        |



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SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## S335 - START VALUES

| SIDE MILLING - ROUGHING |           |                           |                           |                           |                         |                    |        |        |        |        |        |        |        |
|-------------------------|-----------|---------------------------|---------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG       | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        |        |        |
|                         |           |                           |                           |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E 1 - 2   | 1.0                       | 0.20                      | 525                       | n (rev/min)             | 32088              | 16044  | 8022   | 5348   | 4011   | 3209   | 2674   | 2006   |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 10.8               | 10.8   | 10.8   | 10.8   | 10.8   | 10.8   | 10.8   | 10.8   |
|                         | E 3 - 4   | 1.0                       | 0.20                      | 460                       | n (rev/min)             | 28115              | 14058  | 7029   | 4686   | 3514   | 2812   | 2343   | 1757   |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 9.5                | 9.5    | 9.5    | 9.5    | 9.5    | 9.5    | 9.5    | 9.5    |
|                         | E 5 - 6   | 1.0                       | 0.20                      | 330                       | n (rev/min)             | 20170              | 10085  | 5042   | 3362   | 2521   | 2017   | 1681   | 1261   |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 6.8                | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    |
| M                       | E 8 - 9   | 1.0                       | 0.20                      | 280                       | n (rev/min)             | 17114              | 8557   | 4278   | 2852   | 2139   | 1711   | 1426   | 1070   |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0006 | 0.0008 | 0.0011 | 0.0013 | 0.0017 |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 5.4                | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    |
|                         | E 10 - 11 | 1.0                       | 0.20                      | 250                       | n (rev/min)             | 15280              | 7640   | 3820   | 2547   | 1910   | 1528   | 1273   | 955    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0006 | 0.0008 | 0.0011 | 0.0013 | 0.0017 |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 4.8                | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    |
| K                       | E 12 - 13 | 1.0                       | 0.20                      | 340                       | n (rev/min)             | 20781              | 10390  | 5195   | 3463   | 2598   | 2078   | 1732   | 1299   |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 7.0                | 7.0    | 7.0    | 7.0    | 7.0    | 7.0    | 7.0    | 7.0    |
|                         | E 14 - 15 | 1.0                       | 0.20                      | 440                       | n (rev/min)             | 26893              | 13446  | 6723   | 4482   | 3362   | 2689   | 2241   | 1681   |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 9.1                | 9.1    | 9.1    | 9.1    | 9.1    | 9.1    | 9.1    | 9.1    |
| S                       | E 19      | 0.5                       | 0.20                      | 120                       | n (rev/min)             | 7334               | 3667   | 1834   | 1222   | 917    | 733    | 611    | 458    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 2.5                | 2.5    | 2.5    | 2.5    | 2.5    | 2.5    | 2.5    | 2.5    |
|                         | E 20      | 0.5                       | 0.20                      | 120                       | n (rev/min)             | 7334               | 3667   | 1834   | 1222   | 917    | 733    | 611    | 458    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 2.5                | 2.5    | 2.5    | 2.5    | 2.5    | 2.5    | 2.5    | 2.5    |
|                         | E 21      | 0.5                       | 0.20                      | 80                        | n (rev/min)             | 4890               | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0006 | 0.0008 | 0.0009 | 0.0011 | 0.0015 |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 1.4                | 1.4    | 1.4    | 1.4    | 1.4    | 1.4    | 1.4    | 1.4    |
|                         | E 22      | 0.5                       | 0.20                      | 220                       | n (rev/min)             | 13446              | 6723   | 3362   | 2241   | 1681   | 1345   | 1121   | 840    |
| f <sub>z</sub> (in)     |           |                           |                           |                           | 0.0001                  | 0.0003             | 0.0006 | 0.0009 | 0.0011 | 0.0014 | 0.0017 | 0.0023 |        |
| v <sub>f</sub> (in/min) |           |                           |                           |                           | 5.7                     | 5.7                | 5.7    | 5.7    | 5.7    | 5.7    | 5.7    | 5.7    |        |
|                         |           |                           |                           |                           | 160                     | -                  | 280    |        |        |        |        |        |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## SB335 - START VALUES

|                     |                         | SLOTTING                              |                                       |                           |                         |                    |        |        |        |        |        |        |        |
|---------------------|-------------------------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP           | SMG                     | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        |        |        |
|                     |                         |                                       |                                       |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                   | E 1 - 2                 | 1.0                                   | 0.75                                  | 315                       | n (rev/min)             | 19253              | 9626   | 4813   | 3209   | 2407   | 1925   | 1604   | 1203   |
|                     |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0005 | 0.0010 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                     |                         |                                       |                                       | 255 - 375                 | v <sub>f</sub> (in/min) | 14.4               | 14.4   | 14.4   | 14.4   | 14.4   | 14.4   | 14.4   | 14.4   |
|                     | E 3 - 4                 | 1.0                                   | 0.75                                  | 264                       | n (rev/min)             | 16136              | 8068   | 4034   | 2689   | 2017   | 1614   | 1345   | 1008   |
|                     |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0005 | 0.0010 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                     |                         |                                       |                                       | 204 - 324                 | v <sub>f</sub> (in/min) | 12.1               | 12.1   | 12.1   | 12.1   | 12.1   | 12.1   | 12.1   | 12.1   |
| E 5 - 6             | 1.0                     | 0.75                                  | 208                                   | n (rev/min)               | 12713                   | 6356               | 3178   | 2119   | 1589   | 1271   | 1059   | 795    |        |
|                     |                         |                                       |                                       | f <sub>z</sub> (in)       | 0.0002                  | 0.0004             | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0032 |        |
|                     |                         |                                       | 148 - 268                             | v <sub>f</sub> (in/min)   | 7.6                     | 7.6                | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    |
| M                   | E 8 - 9                 | 1.0                                   | 0.75                                  | 208                       | n (rev/min)             | 12713              | 6356   | 3178   | 2119   | 1589   | 1271   | 1059   | 795    |
|                     |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0007 | 0.0010 | 0.0013 | 0.0016 | 0.0020 | 0.0026 |
|                     | 178 - 238               | v <sub>f</sub> (in/min)               | 6.2                                   | 6.2                       | 6.2                     | 6.2                | 6.2    | 6.2    | 6.2    | 6.2    | 6.2    |        |        |
|                     | E 10 - 11               | 1.0                                   | 0.75                                  | 185                       | n (rev/min)             | 11307              | 5654   | 2827   | 1885   | 1413   | 1131   | 942    | 707    |
| f <sub>z</sub> (in) |                         |                                       |                                       |                           | 0.0002                  | 0.0003             | 0.0007 | 0.0010 | 0.0013 | 0.0016 | 0.0020 | 0.0026 |        |
| 155 - 215           | v <sub>f</sub> (in/min) | 5.5                                   | 5.5                                   | 5.5                       | 5.5                     | 5.5                | 5.5    | 5.5    | 5.5    | 5.5    |        |        |        |
| K                   | E 12 - 13               | 1.0                                   | 0.75                                  | 308                       | n (rev/min)             | 18825              | 9412   | 4706   | 3137   | 2353   | 1882   | 1569   | 1177   |
|                     |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0006 | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                     | 248 - 368               | v <sub>f</sub> (in/min)               | 15.9                                  | 15.9                      | 15.9                    | 15.9               | 15.9   | 15.9   | 15.9   | 15.9   | 15.9   |        |        |
|                     | E 14 - 15               | 1.0                                   | 0.75                                  | 272                       | n (rev/min)             | 16625              | 8312   | 4156   | 2771   | 2078   | 1662   | 1385   | 1039   |
| f <sub>z</sub> (in) |                         |                                       |                                       |                           | 0.0003                  | 0.0006             | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |        |
| 212 - 332           | v <sub>f</sub> (in/min) | 14.0                                  | 14.0                                  | 14.0                      | 14.0                    | 14.0               | 14.0   | 14.0   | 14.0   | 14.0   |        |        |        |
| S                   | E 19                    | 1.0                                   | 0.75                                  | 88                        | n (rev/min)             | 5379               | 2689   | 1345   | 896    | 672    | 538    | 448    | 336    |
|                     |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                     | 58 - 118                | v <sub>f</sub> (in/min)               | 1.8                                   | 1.8                       | 1.8                     | 1.8                | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    |        |        |
|                     | E 20                    | 1.0                                   | 0.75                                  | 88                        | n (rev/min)             | 5379               | 2689   | 1345   | 896    | 672    | 538    | 448    | 336    |
|                     |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                     | 58 - 118                | v <sub>f</sub> (in/min)               | 1.8                                   | 1.8                       | 1.8                     | 1.8                | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    |        |        |
|                     | E 21                    | 1.0                                   | 0.75                                  | 56                        | n (rev/min)             | 3423               | 1711   | 856    | 570    | 428    | 342    | 285    | 214    |
|                     |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0006 | 0.0008 | 0.0009 | 0.0011 | 0.0015 |
| 26 - 86             | v <sub>f</sub> (in/min) | 1.0                                   | 1.0                                   | 1.0                       | 1.0                     | 1.0                | 1.0    | 1.0    | 1.0    | 1.0    |        |        |        |
| E 22                | 1.0                     | 0.75                                  | 145                                   | n (rev/min)               | 8862                    | 4431               | 2216   | 1477   | 1108   | 886    | 739    | 554    |        |
|                     |                         |                                       |                                       | f <sub>z</sub> (in)       | 0.0001                  | 0.0003             | 0.0006 | 0.0009 | 0.0011 | 0.0014 | 0.0017 | 0.0023 |        |
| 85 - 205            | v <sub>f</sub> (in/min) | 3.8                                   | 3.8                                   | 3.8                       | 3.8                     | 3.8                | 3.8    | 3.8    | 3.8    | 3.8    |        |        |        |



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SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.



# CUTTING DATA - ELITE S SERIES HIGH PERFORMANCE

## SB335 - START VALUES

| SIDE MILLING - ROUGHING |                         |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |        |
|-------------------------|-------------------------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG                     | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        |        |        |
|                         |                         |                                       |                                       |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E 1 - 2                 | 1.0                                   | 0.20                                  | 420                       | n (rev/min)             | 25670              | 12835  | 6418   | 4278   | 3209   | 2567   | 2139   | 1604   |
|                         |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |                         |                                       |                                       | 360 - 480                 | v <sub>f</sub> (in/min) | 8.7                | 8.7    | 8.7    | 8.7    | 8.7    | 8.7    | 8.7    | 8.7    |
|                         | E 3 - 4                 | 1.0                                   | 0.20                                  | 368                       | n (rev/min)             | 22492              | 11246  | 5623   | 3749   | 2812   | 2249   | 1874   | 1406   |
|                         |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |                         |                                       |                                       | 308 - 428                 | v <sub>f</sub> (in/min) | 7.6                | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    |
|                         | E 5 - 6                 | 1.0                                   | 0.20                                  | 264                       | n (rev/min)             | 16136              | 8068   | 4034   | 2689   | 2017   | 1614   | 1345   | 1008   |
|                         |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |                         |                                       |                                       | 204 - 324                 | v <sub>f</sub> (in/min) | 5.4                | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    |
| M                       | E 8 - 9                 | 1.0                                   | 0.20                                  | 225                       | n (rev/min)             | 13752              | 6876   | 3438   | 2292   | 1719   | 1375   | 1146   | 860    |
|                         |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0006 | 0.0008 | 0.0011 | 0.0013 | 0.0017 |
|                         |                         |                                       |                                       | 195 - 255                 | v <sub>f</sub> (in/min) | 4.3                | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    |
|                         | E 10 - 11               | 1.0                                   | 0.20                                  | 200                       | n (rev/min)             | 12224              | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|                         |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0006 | 0.0008 | 0.0011 | 0.0013 | 0.0017 |
|                         |                         |                                       |                                       | 170 - 230                 | v <sub>f</sub> (in/min) | 3.9                | 3.9    | 3.9    | 3.9    | 3.9    | 3.9    | 3.9    | 3.9    |
| K                       | E 12 - 13               | 1.0                                   | 0.20                                  | 272                       | n (rev/min)             | 16625              | 8312   | 4156   | 2771   | 2078   | 1662   | 1385   | 1039   |
|                         |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |                         |                                       |                                       | 212 - 332                 | v <sub>f</sub> (in/min) | 5.6                | 5.6    | 5.6    | 5.6    | 5.6    | 5.6    | 5.6    | 5.6    |
|                         | E 14 - 15               | 1.0                                   | 0.20                                  | 350                       | n (rev/min)             | 21392              | 10696  | 5348   | 3565   | 2674   | 2139   | 1783   | 1337   |
|                         |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |                         |                                       |                                       | 290 - 410                 | v <sub>f</sub> (in/min) | 7.2                | 7.2    | 7.2    | 7.2    | 7.2    | 7.2    | 7.2    | 7.2    |
| S                       | E 19                    | 0.5                                   | 0.20                                  | 96                        | n (rev/min)             | 5868               | 2934   | 1467   | 978    | 733    | 587    | 489    | 367    |
|                         |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         | 66 - 126                | v <sub>f</sub> (in/min)               | 2.0                                   | 2.0                       | 2.0                     | 2.0                | 2.0    | 2.0    | 2.0    | 2.0    |        |        |        |
|                         | E 20                    | 0.5                                   | 0.20                                  | 96                        | n (rev/min)             | 5868               | 2934   | 1467   | 978    | 733    | 587    | 489    | 367    |
|                         |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         | 66 - 126                | v <sub>f</sub> (in/min)               | 2.0                                   | 2.0                       | 2.0                     | 2.0                | 2.0    | 2.0    | 2.0    | 2.0    |        |        |        |
|                         | E 21                    | 0.5                                   | 0.20                                  | 64                        | n (rev/min)             | 3912               | 1956   | 978    | 652    | 489    | 391    | 326    | 244    |
|                         |                         |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0006 | 0.0008 | 0.0009 | 0.0011 | 0.0015 |
|                         | 34 - 94                 | v <sub>f</sub> (in/min)               | 1.1                                   | 1.1                       | 1.1                     | 1.1                | 1.1    | 1.1    | 1.1    | 1.1    |        |        |        |
|                         | E 22                    | 0.5                                   | 0.20                                  | 175                       | n (rev/min)             | 10696              | 5348   | 2674   | 1783   | 1337   | 1070   | 891    | 669    |
| f <sub>z</sub> (in)     |                         |                                       |                                       |                           | 0.0001                  | 0.0003             | 0.0006 | 0.0009 | 0.0011 | 0.0014 | 0.0017 | 0.0023 |        |
| 115 - 235               | v <sub>f</sub> (in/min) | 4.6                                   | 4.6                                   | 4.6                       | 4.6                     | 4.6                | 4.6    | 4.6    | 4.6    |        |        |        |        |

SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
v<sub>f</sub> [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

## SN335 - START VALUES

|           |           | SLOTTING                              |                                       |                           |                         |                    |        |        |        |        |        |        |        |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | V <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        |        |        |
|           |           |                                       |                                       |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P         | E 1 - 2   | 1.0                                   | 1.00                                  | 316                       | n (rev/min)             | 19314              | 9657   | 4828   | 3219   | 2414   | 1931   | 1609   | 1207   |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 10.9               | 10.9   | 10.9   | 10.9   | 10.9   | 10.9   | 10.9   | 10.9   |
|           | E 3 - 4   | 1.0                                   | 1.00                                  | 264                       | n (rev/min)             | 16136              | 8068   | 4034   | 2689   | 2017   | 1614   | 1345   | 1008   |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 9.1                | 9.1    | 9.1    | 9.1    | 9.1    | 9.1    | 9.1    | 9.1    |
|           | E 5 - 6   | 1.0                                   | 1.00                                  | 210                       | n (rev/min)             | 12835              | 6418   | 3209   | 2139   | 1604   | 1284   | 1070   | 802    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 5.8                | 5.8    | 5.8    | 5.8    | 5.8    | 5.8    | 5.8    | 5.8    |
| M         | E 8 - 9   | 1.0                                   | 1.00                                  | 210                       | n (rev/min)             | 12835              | 6418   | 3209   | 2139   | 1604   | 1284   | 1070   | 802    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0005 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 4.8                | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    |
|           | E 10 - 11 | 1.0                                   | 1.00                                  | 185                       | n (rev/min)             | 11307              | 5654   | 2827   | 1885   | 1413   | 1131   | 942    | 707    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0005 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 4.2                | 4.2    | 4.2    | 4.2    | 4.2    | 4.2    | 4.2    | 4.2    |
| K         | E 12 - 13 | 1.0                                   | 1.00                                  | 310                       | n (rev/min)             | 18947              | 9474   | 4737   | 3158   | 2368   | 1895   | 1579   | 1184   |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0009 | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 12.1               | 12.1   | 12.1   | 12.1   | 12.1   | 12.1   | 12.1   | 12.1   |
|           | E 14 - 15 | 1.0                                   | 1.00                                  | 272                       | n (rev/min)             | 16625              | 8312   | 4156   | 2771   | 2078   | 1662   | 1385   | 1039   |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0009 | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 10.6               | 10.6   | 10.6   | 10.6   | 10.6   | 10.6   | 10.6   | 10.6   |
| S         | E 19      | 1.0                                   | 1.00                                  | 88                        | n (rev/min)             | 5379               | 2689   | 1345   | 896    | 672    | 538    | 448    | 336    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 1.4                | 1.4    | 1.4    | 1.4    | 1.4    | 1.4    | 1.4    | 1.4    |
|           | E 20      | 1.0                                   | 1.00                                  | 88                        | n (rev/min)             | 5379               | 2689   | 1345   | 896    | 672    | 538    | 448    | 336    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 1.4                | 1.4    | 1.4    | 1.4    | 1.4    | 1.4    | 1.4    | 1.4    |
|           | E 21      | 1.0                                   | 1.00                                  | 56                        | n (rev/min)             | 3423               | 1711   | 856    | 570    | 428    | 342    | 285    | 214    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0001 | 0.0003 | 0.0004 | 0.0006 | 0.0007 | 0.0008 | 0.0011 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.7                | 0.7    | 0.7    | 0.7    | 0.7    | 0.7    | 0.7    | 0.7    |
|           | E 22      | 1.0                                   | 1.00                                  | 144                       | n (rev/min)             | 8801               | 4401   | 2200   | 1467   | 1100   | 880    | 733    | 550    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0006 | 0.0009 | 0.0011 | 0.0013 | 0.0017 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.8                | 2.8    | 2.8    | 2.8    | 2.8    | 2.8    | 2.8    | 2.8    |



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SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## SN335 - START VALUES

|                         |           | SIDE MILLING - ROUGHING               |                                       |                           |                         |                    |        |        |        |        |        |        |        |
|-------------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | V <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        |        |        |
|                         |           |                                       |                                       |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E 1 - 2   | 1.0                                   | 0.20                                  | 420                       | n (rev/min)             | 25670              | 12835  | 6418   | 4278   | 3209   | 2567   | 2139   | 1604   |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 6.7                | 6.7    | 6.7    | 6.7    | 6.7    | 6.7    | 6.7    | 6.7    |
|                         | E 3 - 4   | 1.0                                   | 0.20                                  | 368                       | n (rev/min)             | 22492              | 11246  | 5623   | 3749   | 2812   | 2249   | 1874   | 1406   |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 5.9                | 5.9    | 5.9    | 5.9    | 5.9    | 5.9    | 5.9    | 5.9    |
|                         | E 5 - 6   | 1.0                                   | 0.20                                  | 264                       | n (rev/min)             | 16136              | 8068   | 4034   | 2689   | 2017   | 1614   | 1345   | 1008   |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 4.2                | 4.2    | 4.2    | 4.2    | 4.2    | 4.2    | 4.2    | 4.2    |
| M                       | E 8 - 9   | 1.0                                   | 0.20                                  | 224                       | n (rev/min)             | 13691              | 6845   | 3423   | 2282   | 1711   | 1369   | 1141   | 856    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0003 | 0.0005 | 0.0007 | 0.0008 | 0.0010 | 0.0013 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 3.3                | 3.3    | 3.3    | 3.3    | 3.3    | 3.3    | 3.3    | 3.3    |
|                         | E 10 - 11 | 1.0                                   | 0.20                                  | 200                       | n (rev/min)             | 12224              | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0003 | 0.0005 | 0.0007 | 0.0008 | 0.0010 | 0.0013 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 3.0                | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    |
| K                       | E 12 - 13 | 1.0                                   | 0.20                                  | 272                       | n (rev/min)             | 16625              | 8312   | 4156   | 2771   | 2078   | 1662   | 1385   | 1039   |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 4.4                | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    |
|                         | E 14 - 15 | 1.0                                   | 0.20                                  | 352                       | n (rev/min)             | 21514              | 10757  | 5379   | 3586   | 2689   | 2151   | 1793   | 1345   |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 5.6                | 5.6    | 5.6    | 5.6    | 5.6    | 5.6    | 5.6    | 5.6    |
| S                       | E 19      | 0.5                                   | 0.20                                  | 96                        | n (rev/min)             | 5868               | 2934   | 1467   | 978    | 733    | 587    | 489    | 367    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 1.5                | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    |
|                         | E 20      | 0.5                                   | 0.20                                  | 96                        | n (rev/min)             | 5868               | 2934   | 1467   | 978    | 733    | 587    | 489    | 367    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 1.5                | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    |
|                         | E 21      | 0.5                                   | 0.20                                  | 64                        | n (rev/min)             | 3912               | 1956   | 978    | 652    | 489    | 391    | 326    | 244    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0001 | 0.0003 | 0.0004 | 0.0006 | 0.0007 | 0.0008 | 0.0011 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.8                | 0.8    | 0.8    | 0.8    | 0.8    | 0.8    | 0.8    | 0.8    |
|                         | E 22      | 0.5                                   | 0.20                                  | 176                       | n (rev/min)             | 10757              | 5379   | 2689   | 1793   | 1345   | 1076   | 896    | 672    |
| f <sub>z</sub> (in)     |           |                                       |                                       |                           | 0.0001                  | 0.0002             | 0.0004 | 0.0006 | 0.0009 | 0.0011 | 0.0013 | 0.0017 |        |
| v <sub>f</sub> (in/min) |           |                                       |                                       |                           | 3.4                     | 3.4                | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - ELITE S SERIES HIGH PERFORMANCE

## S545 / S545R - START VALUES

### SIDE MILLING - ROUGHING

| ISO GROUP               | SMG                     | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | V <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 5 |        |        |        |        |        |        |        |
|-------------------------|-------------------------|---------------------------|---------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
|                         |                         |                           |                           |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E 1 - 2                 | 1.0                       | 0.25                      | 500                       | n (rev/min)             | 30560              | 15280  | 7640   | 5093   | 3820   | 3056   | 2547   | 1910   |
|                         |                         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0006 | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                         |                         |                           |                           |                           | V <sub>f</sub> (in/min) | 43.0               | 43.0   | 43.0   | 43.0   | 43.0   | 43.0   | 43.0   | 43.0   |
|                         | E 3 - 4                 | 1.0                       | 0.25                      | 380                       | n (rev/min)             | 23226              | 11613  | 5806   | 3871   | 2903   | 2323   | 1935   | 1452   |
|                         |                         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0005 | 0.0010 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 |
|                         |                         |                           |                           |                           | V <sub>f</sub> (in/min) | 29.0               | 29.0   | 29.0   | 29.0   | 29.0   | 29.0   | 29.0   | 29.0   |
|                         | E 5 - 6                 | 1.0                       | 0.20                      | 300                       | n (rev/min)             | 18336              | 9168   | 4584   | 3056   | 2292   | 1834   | 1528   | 1146   |
|                         |                         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0019 | 0.0023 | 0.0031 |
|                         |                         |                           |                           |                           | V <sub>f</sub> (in/min) | 17.8               | 17.8   | 17.8   | 17.8   | 17.8   | 17.8   | 17.8   | 17.8   |
| H                       | M / A / D 7a (48-52HRC) | 1.0                       | 0.10                      | 150                       | n (rev/min)             | 9168               | 4584   | 2292   | 1528   | 1146   | 917    | 764    | 573    |
|                         |                         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0019 | 0.0023 | 0.0031 |
|                         |                         |                           |                           |                           | V <sub>f</sub> (in/min) | 8.9                | 8.9    | 8.9    | 8.9    | 8.9    | 8.9    | 8.9    | 8.9    |
| M                       | E 8 - 9                 | 1.0                       | 0.20                      | 250                       | n (rev/min)             | 15280              | 7640   | 3820   | 2547   | 1910   | 1528   | 1273   | 955    |
|                         |                         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0024 | 0.0032 |
|                         |                         |                           |                           |                           | V <sub>f</sub> (in/min) | 15.3               | 15.3   | 15.3   | 15.3   | 15.3   | 15.3   | 15.3   | 15.3   |
|                         | E 10 - 11               | 1.0                       | 0.20                      | 200                       | n (rev/min)             | 12224              | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|                         |                         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                         |                         |                           |                           |                           | V <sub>f</sub> (in/min) | 9.2                | 9.2    | 9.2    | 9.2    | 9.2    | 9.2    | 9.2    | 9.2    |
| K                       | E 12 - 13               | 1.0                       | 0.25                      | 300                       | n (rev/min)             | 18336              | 9168   | 4584   | 3056   | 2292   | 1834   | 1528   | 1146   |
|                         |                         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0005             | 0.0009 | 0.0018 | 0.0027 | 0.0036 | 0.0045 | 0.0054 | 0.0072 |
|                         |                         |                           |                           |                           | V <sub>f</sub> (in/min) | 41.3               | 41.3   | 41.3   | 41.3   | 41.3   | 41.3   | 41.3   | 41.3   |
|                         | E 12 - 13               | 1.0                       | 0.25                      | 180                       | n (rev/min)             | 11002              | 5501   | 2750   | 1834   | 1375   | 1100   | 917    | 688    |
|                         |                         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0012 | 0.0016 | 0.0019 | 0.0023 | 0.0031 |
|                         |                         |                           |                           |                           | V <sub>f</sub> (in/min) | 10.7               | 10.7   | 10.7   | 10.7   | 10.7   | 10.7   | 10.7   | 10.7   |
| N                       | E / M / A 16            | 2.0                       | 0.05                      | 800                       | n (rev/min)             | 11002              | 5501   | 2750   | 1834   | 1375   | 1100   | 917    | 688    |
|                         |                         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0005             | 0.0010 | 0.0020 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                         |                         |                           |                           |                           | V <sub>f</sub> (in/min) | 27.5               | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   |
|                         | E / M / A 17            | 2.0                       | 0.05                      | 800                       | n (rev/min)             | 11002              | 5501   | 2750   | 1834   | 1375   | 1100   | 917    | 688    |
|                         |                         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0005             | 0.0010 | 0.0020 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0080 |
|                         |                         |                           |                           |                           | V <sub>f</sub> (in/min) | 27.5               | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   |
| S                       | E 19                    | 1.0                       | 0.05                      | 90                        | n (rev/min)             | 5501               | 2750   | 1375   | 917    | 688    | 550    | 458    | 344    |
|                         |                         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 |
|                         |                         |                           |                           |                           | V <sub>f</sub> (in/min) | 2.4                | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    |
|                         | E 20                    | 1.0                       | 0.05                      | 90                        | n (rev/min)             | 5501               | 2750   | 1375   | 917    | 688    | 550    | 458    | 344    |
|                         |                         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 |
|                         |                         |                           |                           |                           | V <sub>f</sub> (in/min) | 2.4                | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    |
|                         | E 21                    | 1.0                       | 0.05                      | 90                        | n (rev/min)             | 5501               | 2750   | 1375   | 917    | 688    | 550    | 458    | 344    |
|                         |                         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 |
|                         |                         |                           |                           |                           | V <sub>f</sub> (in/min) | 2.4                | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    |
|                         | E 22                    | 1.0                       | 0.15                      | 120                       | n (rev/min)             | 7334               | 3667   | 1834   | 1222   | 917    | 733    | 611    | 458    |
| f <sub>z</sub> (in)     |                         |                           |                           |                           | 0.0002                  | 0.0004             | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |        |
| V <sub>f</sub> (in/min) |                         |                           |                           |                           | 6.9                     | 6.9                | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    |        |



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# CUTTING DATA - ELITE S SERIES HIGH PERFORMANCE

## SR420 - START VALUES

|           |           | SLOTTING                              |                                       |                           |                         |        |        |        |        |        |        |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) | Z <sub>n</sub> = 4      |        |        |        |        |        |        |
|           |           |                                       |                                       |                           | 1/4                     | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |
| P         | E 1 - 2   | 1.00                                  | 1.00                                  | 300                       | n (rev/min)             | 4584   | 3056   | 2292   | 1834   | 1528   | 1146   |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0008 | 0.0012 | 0.0016 | 0.0020 | 0.0023 | 0.0031 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 14.3   | 14.3   | 14.3   | 14.3   | 14.3   | 14.3   |
|           | E 3 - 4   | 1.00                                  | 1.00                                  | 250                       | n (rev/min)             | 3820   | 2547   | 1910   | 1528   | 1273   | 955    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0005 | 0.0008 | 0.0010 | 0.0013 | 0.0016 | 0.0021 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 8.3    | 8.3    | 8.3    | 8.3    | 8.3    | 8.3    |
|           | E 5 - 6   | 1.00                                  | 1.00                                  | 380                       | n (rev/min)             | 5806   | 3871   | 2903   | 2323   | 1935   | 1452   |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0004 | 0.0007 | 0.0009 | 0.0011 | 0.0013 | 0.0018 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 10.2   | 10.2   | 10.2   | 10.2   | 10.2   | 10.2   |
| M         | E 8 - 9   | 0.50                                  | 1.00                                  | 380                       | n (rev/min)             | 5806   | 3871   | 2903   | 2323   | 1935   | 1452   |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0005 | 0.0008 | 0.0011 | 0.0014 | 0.0016 | 0.0022 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 12.5   | 12.5   | 12.5   | 12.5   | 12.5   | 12.5   |
|           | E 10 - 11 | 0.30                                  | 1.00                                  | 200                       | n (rev/min)             | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    |
| K         | E 12 - 13 | 1.00                                  | 1.00                                  | 380                       | n (rev/min)             | 5806   | 3871   | 2903   | 2323   | 1935   | 1452   |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0012 | 0.0017 | 0.0023 | 0.0029 | 0.0035 | 0.0046 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 26.9   | 26.9   | 26.9   | 26.9   | 26.9   | 26.9   |
|           | E 14 - 15 | 0.30                                  | 1.00                                  | 150                       | n (rev/min)             | 2292   | 1528   | 1146   | 917    | 764    | 573    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0007 | 0.0010 | 0.0014 | 0.0017 | 0.0020 | 0.0027 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 6.2    | 6.2    | 6.2    | 6.2    | 6.2    | 6.2    |

|   |           | SIDE MILLING - ROUGHING |      |     |                         |        |        |        |        |        |        |
|---|-----------|-------------------------|------|-----|-------------------------|--------|--------|--------|--------|--------|--------|
| P | E 1 - 2   | 1.00                    | 0.40 | 300 | n (rev/min)             | 4584   | 3056   | 2292   | 1834   | 1528   | 1146   |
|   |           |                         |      |     | f <sub>z</sub> (in)     | 0.0010 | 0.0015 | 0.0020 | 0.0024 | 0.0029 | 0.0039 |
|   |           |                         |      |     | v <sub>f</sub> (in/min) | 17.9   | 17.9   | 17.9   | 17.9   | 17.9   | 17.9   |
|   | E 3 - 4   | 1.00                    | 0.40 | 250 | n (rev/min)             | 3820   | 2547   | 1910   | 1528   | 1273   | 955    |
|   |           |                         |      |     | f <sub>z</sub> (in)     | 0.0007 | 0.0010 | 0.0014 | 0.0017 | 0.0020 | 0.0027 |
|   |           |                         |      |     | v <sub>f</sub> (in/min) | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   |
|   | E 5 - 6   | 1.00                    | 0.40 | 175 | n (rev/min)             | 2674   | 1783   | 1337   | 1070   | 891    | 669    |
|   |           |                         |      |     | f <sub>z</sub> (in)     | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |
|   |           |                         |      |     | v <sub>f</sub> (in/min) | 5.9    | 5.9    | 5.9    | 5.9    | 5.9    | 5.9    |
| M | E 8 - 9   | 1.00                    | 0.40 | 380 | n (rev/min)             | 5806   | 3871   | 2903   | 2323   | 1935   | 1452   |
|   |           |                         |      |     | f <sub>z</sub> (in)     | 0.0007 | 0.0010 | 0.0014 | 0.0017 | 0.0020 | 0.0027 |
|   |           |                         |      |     | v <sub>f</sub> (in/min) | 15.7   | 15.7   | 15.7   | 15.7   | 15.7   | 15.7   |
|   | E 10 - 11 | 1.00                    | 0.30 | 200 | n (rev/min)             | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|   |           |                         |      |     | f <sub>z</sub> (in)     | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|   |           |                         |      |     | v <sub>f</sub> (in/min) | 5.5    | 5.5    | 5.5    | 5.5    | 5.5    | 5.5    |
| K | E 12 - 13 | 1.00                    | 0.40 | 380 | n (rev/min)             | 5806   | 3871   | 2903   | 2323   | 1935   | 1452   |
|   |           |                         |      |     | f <sub>z</sub> (in)     | 0.0015 | 0.0022 | 0.0029 | 0.0036 | 0.0044 | 0.0058 |
|   |           |                         |      |     | v <sub>f</sub> (in/min) | 33.7   | 33.7   | 33.7   | 33.7   | 33.7   | 33.7   |
|   | E 14 - 15 | 1.00                    | 0.30 | 150 | n (rev/min)             | 2292   | 1528   | 1146   | 917    | 764    | 573    |
|   |           |                         |      |     | f <sub>z</sub> (in)     | 0.0009 | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 |
|   |           |                         |      |     | v <sub>f</sub> (in/min) | 7.8    | 7.8    | 7.8    | 7.8    | 7.8    | 7.8    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## SR545 - START VALUES

| SIDE MILLING - ROUGHING |              |                                       |                                       |                           |                         |                    |        |        |        |        |        |
|-------------------------|--------------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG          | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 5 |        |        |        |        |        |
|                         |              |                                       |                                       |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E<br>1 - 2   | 1.00                                  | 0.30                                  | 300                       | n (rev/min)             | 4584               | 3056   | 2292   | 1834   | 1528   | 1146   |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0010             | 0.0015 | 0.0020 | 0.0024 | 0.0029 | 0.0039 |
|                         |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 22.3               | 22.3   | 22.3   | 22.3   | 22.3   | 22.3   |
|                         | E<br>3 - 4   | 1.00                                  | 0.30                                  | 250                       | n (rev/min)             | 3820               | 2547   | 1910   | 1528   | 1273   | 955    |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0007             | 0.0010 | 0.0014 | 0.0017 | 0.0020 | 0.0027 |
|                         |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 12.9               | 12.9   | 12.9   | 12.9   | 12.9   | 12.9   |
| E<br>5 - 6              | 1.00         | 0.30                                  | 175                                   | n (rev/min)               | 2674                    | 1783               | 1337   | 1070   | 891    | 669    |        |
|                         |              |                                       |                                       | f <sub>z</sub> (in)       | 0.0006                  | 0.0008             | 0.0011 | 0.0014 | 0.0017 | 0.0022 |        |
|                         |              |                                       |                                       | v <sub>f</sub> (in/min)   | 7.4                     | 7.4                | 7.4    | 7.4    | 7.4    | 7.4    |        |
| M                       | E<br>8 - 9   | 1.00                                  | 0.30                                  | 380                       | n (rev/min)             | 5806               | 3871   | 2903   | 2323   | 1935   | 1452   |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0007             | 0.0010 | 0.0014 | 0.0017 | 0.0020 | 0.0027 |
|                         |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 19.6               | 19.6   | 19.6   | 19.6   | 19.6   | 19.6   |
|                         | E<br>10 - 11 | 1.00                                  | 0.25                                  | 200                       | n (rev/min)             | 3056               | 2037   | 1528   | 1222   | 1019   | 764    |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0005             | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 |
|                         |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 6.9                | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    |
| K                       | E<br>12 - 13 | 1.00                                  | 0.30                                  | 380                       | n (rev/min)             | 5806               | 3871   | 2903   | 2323   | 1935   | 1452   |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0015             | 0.0022 | 0.0029 | 0.0036 | 0.0044 | 0.0058 |
|                         |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 42.1               | 42.1   | 42.1   | 42.1   | 42.1   | 42.1   |
|                         | E<br>14 - 15 | 1.00                                  | 0.25                                  | 150                       | n (rev/min)             | 2292               | 1528   | 1146   | 917    | 764    | 573    |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 |
|                         |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 9.7                | 9.7    | 9.7    | 9.7    | 9.7    | 9.7    |
| S                       | E<br>22      | 1.0                                   | 0.20                                  | 275                       | n (rev/min)             | 4202               | 2801   | 2101   | 1681   | 1401   | 1051   |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 |
|                         |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 17.9               | 17.9   | 17.9   | 17.9   | 17.9   | 17.9   |



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SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - ELITE S SERIES HIGH PERFORMANCE

## S545M - START VALUES

| SIDE MILLING - ROUGHING |                               |                                       |                                       |                          |                    |        |        |        |        |        |
|-------------------------|-------------------------------|---------------------------------------|---------------------------------------|--------------------------|--------------------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG                           | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (m / min) | Z <sub>n</sub> = 5 |        |        |        |        |        |
|                         |                               |                                       |                                       |                          | 4                  | 6      | 8      | 10     | 12     |        |
| P                       | E<br>1 - 2                    | 1.0                                   | 0.25                                  | 490<br>395 - 690         | n (min-1)          | 11886  | 7924   | 5943   | 4754   | 3962   |
|                         |                               |                                       |                                       |                          | fz (in)            | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 |
|                         |                               |                                       |                                       |                          | vf (in/min)        | 42.1   | 42.1   | 42.1   | 42.1   | 42.1   |
|                         | E<br>3 - 4                    | 1.0                                   | 0.25                                  | 395<br>330 - 690         | n (min-1)          | 9582   | 6388   | 4791   | 3833   | 3194   |
|                         |                               |                                       |                                       |                          | fz (in)            | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 |
|                         |                               |                                       |                                       |                          | vf (in/min)        | 34.0   | 34.0   | 34.0   | 34.0   | 34.0   |
|                         | E<br>5 - 6                    | 1.0                                   | 0.20                                  | 295<br>195 - 395         | n (min-1)          | 7156   | 4771   | 3578   | 2862   | 2385   |
|                         |                               |                                       |                                       |                          | fz (in)            | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 |
|                         |                               |                                       |                                       |                          | vf (in/min)        | 25.4   | 25.4   | 25.4   | 25.4   | 25.4   |
| H                       | M / A / D<br>7a<br>(48-52HRC) | 1.0                                   | 0.10                                  | 165<br>65 - 195          | n (min-1)          | 4002   | 2668   | 2001   | 1601   | 1334   |
|                         |                               |                                       |                                       |                          | fz (in)            | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 |
|                         |                               |                                       |                                       |                          | vf (in/min)        | 14.2   | 14.2   | 14.2   | 14.2   | 14.2   |
| M                       | E<br>8 - 9                    | 1.0                                   | 0.20                                  | 260<br>165 - 360         | n (min-1)          | 6307   | 4205   | 3153   | 2523   | 2102   |
|                         |                               |                                       |                                       |                          | fz (in)            | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 |
|                         |                               |                                       |                                       |                          | vf (in/min)        | 22.3   | 22.3   | 22.3   | 22.3   | 22.3   |
|                         | E<br>10 - 11                  | 1.0                                   | 0.20                                  | 195<br>165 - 360         | n (min-1)          | 4730   | 3153   | 2365   | 1892   | 1577   |
|                         |                               |                                       |                                       |                          | fz (in)            | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 |
|                         |                               |                                       |                                       |                          | vf (in/min)        | 16.8   | 16.8   | 16.8   | 16.8   | 16.8   |
| K                       | E<br>12 - 13                  | 1.0                                   | 0.25                                  | 295<br>230 - 360         | n (min-1)          | 7156   | 4771   | 3578   | 2862   | 2385   |
|                         |                               |                                       |                                       |                          | fz (in)            | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 |
|                         |                               |                                       |                                       |                          | vf (in/min)        | 25.4   | 25.4   | 25.4   | 25.4   | 25.4   |
|                         | E<br>12 - 13                  | 1.0                                   | 0.25                                  | 165<br>100 - 230         | n (min-1)          | 4002   | 2668   | 2001   | 1601   | 1334   |
|                         |                               |                                       |                                       |                          | fz (in)            | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 |
|                         |                               |                                       |                                       |                          | vf (in/min)        | 14.2   | 14.2   | 14.2   | 14.2   | 14.2   |
| N                       | E / M / A<br>16               | 2.0                                   | 0.05                                  | 785<br>655 - 1310        | n (min-1)          | 19042  | 12694  | 9521   | 7617   | 6347   |
|                         |                               |                                       |                                       |                          | fz (in)            | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 |
|                         |                               |                                       |                                       |                          | vf (in/min)        | 67.5   | 67.5   | 67.5   | 67.5   | 67.5   |
|                         | E / M / A<br>17               | 2.0                                   | 0.05                                  | 785<br>655 - 1310        | n (min-1)          | 19042  | 12694  | 9521   | 7617   | 6347   |
|                         |                               |                                       |                                       |                          | fz (in)            | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 |
|                         |                               |                                       |                                       |                          | vf (in/min)        | 67.5   | 67.5   | 67.5   | 67.5   | 67.5   |
| S                       | E<br>19                       | 1.0                                   | 0.05                                  | 100<br>65 - 130          | n (min-1)          | 2426   | 1617   | 1213   | 970    | 809    |
|                         |                               |                                       |                                       |                          | fz (in)            | 0.0180 | 0.0270 | 0.0360 | 0.0450 | 0.0540 |
|                         |                               |                                       |                                       |                          | vf (in/min)        | 218.3  | 218.3  | 218.3  | 218.3  | 218.3  |
|                         | E<br>20                       | 1.0                                   | 0.05                                  | 100<br>65 - 130          | n (min-1)          | 2426   | 1617   | 1213   | 970    | 809    |
|                         |                               |                                       |                                       |                          | fz (in)            | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 |
|                         |                               |                                       |                                       |                          | vf (in/min)        | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    |
|                         | E<br>21                       | 1.0                                   | 0.05                                  | 100<br>65 - 130          | n (min-1)          | 2426   | 1617   | 1213   | 970    | 809    |
|                         |                               |                                       |                                       |                          | fz (in)            | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 |
|                         |                               |                                       |                                       |                          | vf (in/min)        | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    |
|                         | E<br>22                       | 1.0                                   | 0.15                                  | 130<br>100 - 165         | n (min-1)          | 3153   | 2102   | 1577   | 1261   | 1051   |
| fz (in)                 |                               |                                       |                                       |                          | 0.0007             | 0.0011 | 0.0014 | 0.0018 | 0.0021 |        |
| vf (in/min)             |                               |                                       |                                       |                          | 11.2               | 11.2   | 11.2   | 11.2   | 11.2   |        |

SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
vf [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - ELITE S SERIES HIGH PERFORMANCE

## S645M - START VALUES

|            |                               | SIDE MILLING - ROUGHING   |                           |                           |                    |        |        |        |        |        |        |        |        |        |        |       |
|------------|-------------------------------|---------------------------|---------------------------|---------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| ISO GROUP  | SMG                           | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) | Z <sub>n</sub> = 6 |        |        |        |        |        |        |        |        |        |        |       |
|            |                               |                           |                           |                           | 3                  | 4      | 5      | 6      | 8      | 10     | 12     | 14     | 16     | 20     |        |       |
| P          | E<br>1 - 2                    | 1.0                       | 0.25                      | 490                       | n (min-1)          | 15848  | 11886  | 9509   | 7924   | 5943   | 4754   | 3962   | 3396   | 2971   | 2377   |       |
|            |                               |                           |                           |                           | fz (in)            | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 |       |
|            |                               |                           |                           |                           | vf (in/min)        | 50.5   | 50.5   | 50.5   | 50.5   | 50.5   | 50.5   | 50.5   | 50.5   | 50.5   | 50.5   | 50.5  |
|            | E<br>3 - 4                    | 1.0                       | 0.25                      | 395                       | n (min-1)          | 12775  | 9582   | 7665   | 6388   | 4791   | 3833   | 3194   | 2738   | 2395   | 1916   |       |
|            |                               |                           |                           |                           | fz (in)            | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 |       |
|            |                               |                           |                           |                           | vf (in/min)        | 40.7   | 40.7   | 40.7   | 40.7   | 40.7   | 40.7   | 40.7   | 40.7   | 40.7   | 40.7   | 40.7  |
| E<br>5 - 6 | 1.0                           | 0.20                      | 295                       | n (min-1)                 | 9541               | 7156   | 5725   | 4771   | 3578   | 2862   | 2385   | 2045   | 1789   | 1431   |        |       |
|            |                               |                           |                           | fz (in)                   | 0.0005             | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 |        |       |
|            |                               |                           |                           | vf (in/min)               | 30.4               | 30.4   | 30.4   | 30.4   | 30.4   | 30.4   | 30.4   | 30.4   | 30.4   | 30.4   | 30.4   |       |
| H          | M / A / D<br>7a<br>(48-52HRC) | 1.0                       | 0.10                      | 165                       | n (min-1)          | 5337   | 4002   | 3202   | 2668   | 2001   | 1601   | 1334   | 1144   | 1001   | 800    |       |
|            |                               |                           |                           |                           | fz (in)            | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 |       |
|            |                               |                           |                           |                           | vf (in/min)        | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0  |
| M          | E<br>8 - 9                    | 1.0                       | 0.20                      | 260                       | n (min-1)          | 8409   | 6307   | 5045   | 4205   | 3153   | 2523   | 2102   | 1802   | 1577   | 1261   |       |
|            |                               |                           |                           |                           | fz (in)            | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 |       |
|            |                               |                           |                           |                           | vf (in/min)        | 26.8   | 26.8   | 26.8   | 26.8   | 26.8   | 26.8   | 26.8   | 26.8   | 26.8   | 26.8   | 26.8  |
|            | E<br>10 - 11                  | 1.0                       | 0.20                      | 195                       | n (min-1)          | 6307   | 4730   | 3784   | 3153   | 2365   | 1892   | 1577   | 1351   | 1183   | 946    |       |
|            |                               |                           |                           |                           | fz (in)            | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 |       |
|            |                               |                           |                           |                           | vf (in/min)        | 20.1   | 20.1   | 20.1   | 20.1   | 20.1   | 20.1   | 20.1   | 20.1   | 20.1   | 20.1   | 20.1  |
| K          | E<br>12 - 13                  | 1.0                       | 0.25                      | 295                       | n (min-1)          | 9541   | 7156   | 5725   | 4771   | 3578   | 2862   | 2385   | 2045   | 1789   | 1431   |       |
|            |                               |                           |                           |                           | fz (in)            | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 |       |
|            |                               |                           |                           |                           | vf (in/min)        | 30.4   | 30.4   | 30.4   | 30.4   | 30.4   | 30.4   | 30.4   | 30.4   | 30.4   | 30.4   | 30.4  |
|            | E<br>14 - 15                  | 1.0                       | 0.25                      | 165                       | n (min-1)          | 5337   | 4002   | 3202   | 2668   | 2001   | 1601   | 1334   | 1144   | 1001   | 800    |       |
|            |                               |                           |                           |                           | fz (in)            | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 |       |
|            |                               |                           |                           |                           | vf (in/min)        | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0   | 17.0  |
| N          | E / M / A<br>16               | 2.0                       | 0.05                      | 785                       | n (min-1)          | 25389  | 19042  | 15233  | 12694  | 9521   | 7617   | 6347   | 5440   | 4760   | 3808   |       |
|            |                               |                           |                           |                           | fz (in)            | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 |       |
|            |                               |                           |                           |                           | vf (in/min)        | 81.0   | 81.0   | 81.0   | 81.0   | 81.0   | 81.0   | 81.0   | 81.0   | 81.0   | 81.0   | 81.0  |
|            | E / M / A<br>17               | 2.0                       | 0.05                      | 785                       | n (min-1)          | 25389  | 19042  | 15233  | 12694  | 9521   | 7617   | 6347   | 5440   | 4760   | 3808   |       |
|            |                               |                           |                           |                           | fz (in)            | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 |       |
|            |                               |                           |                           |                           | vf (in/min)        | 81.0   | 81.0   | 81.0   | 81.0   | 81.0   | 81.0   | 81.0   | 81.0   | 81.0   | 81.0   | 81.0  |
| S          | E<br>19                       | 1.0                       | 0.05                      | 100                       | n (min-1)          | 3234   | 2426   | 1941   | 1617   | 1213   | 970    | 809    | 693    | 606    | 485    |       |
|            |                               |                           |                           |                           | fz (in)            | 0.0135 | 0.0180 | 0.0225 | 0.0270 | 0.0360 | 0.0450 | 0.0540 | 0.0630 | 0.0720 | 0.0900 |       |
|            |                               |                           |                           |                           | vf (in/min)        | 262.0  | 262.0  | 262.0  | 262.0  | 262.0  | 262.0  | 262.0  | 262.0  | 262.0  | 262.0  | 262.0 |
|            | E<br>20                       | 1.0                       | 0.05                      | 100                       | n (min-1)          | 3234   | 2426   | 1941   | 1617   | 1213   | 970    | 809    | 693    | 606    | 485    |       |
|            |                               |                           |                           |                           | fz (in)            | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 |       |
|            |                               |                           |                           |                           | vf (in/min)        | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   | 10.3  |
|            | E<br>21                       | 1.0                       | 0.05                      | 100                       | n (min-1)          | 3234   | 2426   | 1941   | 1617   | 1213   | 970    | 809    | 693    | 606    | 485    |       |
|            |                               |                           |                           |                           | fz (in)            | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 |       |
|            |                               |                           |                           |                           | vf (in/min)        | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   | 10.3   | 10.3  |
|            | E<br>22                       | 1.0                       | 0.15                      | 130                       | n (min-1)          | 4205   | 3153   | 2523   | 2102   | 1577   | 1261   | 1051   | 901    | 788    | 631    |       |
|            |                               |                           |                           |                           | fz (in)            | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0025 | 0.0028 | 0.0035 |       |
|            |                               |                           |                           |                           | vf (in/min)        | 13.4   | 13.4   | 13.4   | 13.4   | 13.4   | 13.4   | 13.4   | 13.4   | 13.4   | 13.4   | 13.4  |



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# CUTTING DATA - ELITE S SERIES HIGH PERFORMANCE

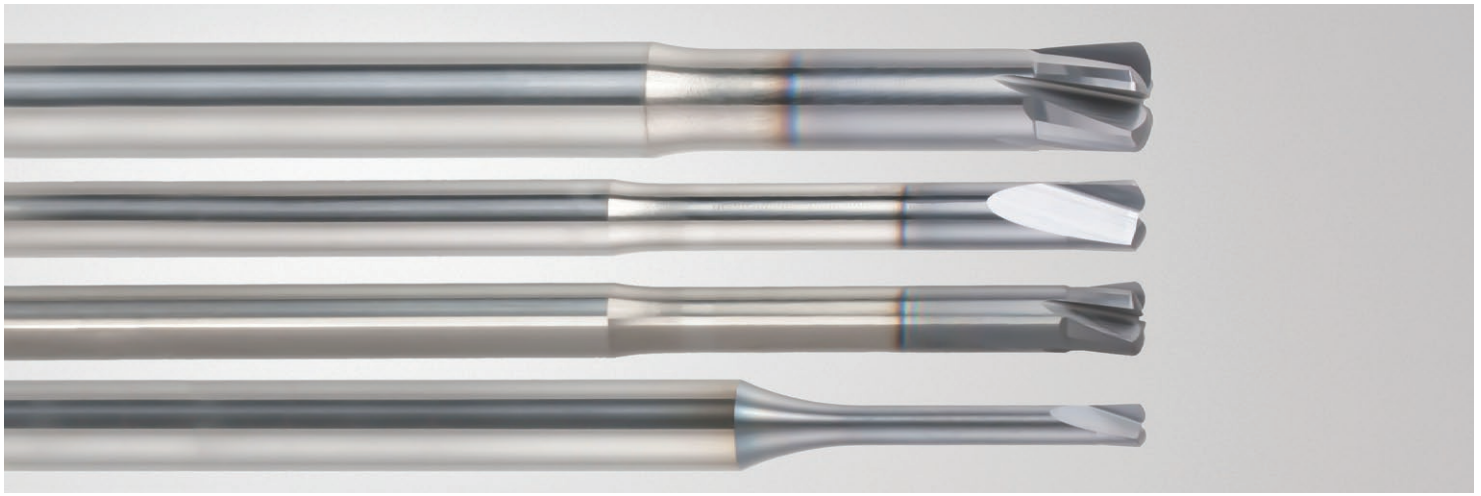
## SR420M - START VALUES

|                         |              | SLOTTING                  |                           |                     |             |        |        |        |        |        |        |        |
|-------------------------|--------------|---------------------------|---------------------------|---------------------|-------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG          | $a_p \times D_c$<br>(max) | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) | $Z_n = 4$   |        |        |        |        |        |        |        |
|                         |              |                           |                           |                     | 6           | 8      | 10     | 12     | 14     | 16     | 20     |        |
| P                       | E<br>1 - 2   | 1.00                      | 1.00                      | 295                 | n (min-1)   | 4771   | 3578   | 2862   | 2385   | 2045   | 1789   | 1431   |
|                         |              |                           |                           |                     | fz (in)     | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0017 | 0.0020 | 0.0024 |
|                         |              |                           |                           | 230 - 360           | vf (in/min) | 14.0   | 14.0   | 14.0   | 14.0   | 14.0   | 14.0   | 14.0   |
|                         | E<br>3 - 4   | 1.00                      | 1.00                      | 260                 | n (min-1)   | 4205   | 3153   | 2523   | 2102   | 1802   | 1577   | 1261   |
|                         |              |                           |                           |                     | fz (in)     | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0017 | 0.0020 | 0.0024 |
|                         |              |                           |                           | 195 - 295           | vf (in/min) | 12.3   | 12.3   | 12.3   | 12.3   | 12.3   | 12.3   | 12.3   |
| E<br>5 - 6              | 1.00         | 1.00                      | 165                       | n (min-1)           | 2668        | 2001   | 1601   | 1334   | 1144   | 1001   | 800    |        |
|                         |              |                           |                           | fz (in)             | 0.0007      | 0.0010 | 0.0012 | 0.0015 | 0.0017 | 0.0020 | 0.0024 |        |
|                         |              |                           | 130 - 230                 | vf (in/min)         | 7.8         | 7.8    | 7.8    | 7.8    | 7.8    | 7.8    | 7.8    |        |
| M                       | E<br>8 - 9   | 0.50                      | 1.00                      | 395                 | n (min-1)   | 6388   | 4791   | 3833   | 3194   | 2738   | 2395   | 1916   |
|                         |              |                           |                           |                     | fz (in)     | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0017 | 0.0020 | 0.0024 |
|                         | E<br>10 - 11 | 0.30                      | 1.00                      | 195                 | n (min-1)   | 3153   | 2365   | 1892   | 1577   | 1351   | 1183   | 946    |
|                         |              |                           |                           |                     | fz (in)     | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0017 | 0.0020 | 0.0024 |
| K                       | E<br>12 - 13 | 1.00                      | 1.00                      | 395                 | n (min-1)   | 6388   | 4791   | 3833   | 3194   | 2738   | 2395   | 1916   |
|                         |              |                           |                           |                     | fz (in)     | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0017 | 0.0020 | 0.0024 |
|                         |              |                           |                           | 330 - 425           | vf (in/min) | 18.7   | 18.7   | 18.7   | 18.7   | 18.7   | 18.7   | 18.7   |
|                         | E<br>14 - 15 | 0.30                      | 1.00                      | 165                 | n (min-1)   | 2668   | 2001   | 1601   | 1334   | 1144   | 1001   | 800    |
|                         |              |                           |                           |                     | fz (in)     | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0017 | 0.0020 | 0.0024 |
|                         |              |                           |                           | 100 - 195           | vf (in/min) | 7.8    | 7.8    | 7.8    | 7.8    | 7.8    | 7.8    | 7.8    |
| SIDE MILLING - ROUGHING |              |                           |                           |                     |             |        |        |        |        |        |        |        |
| P                       | E<br>1 - 2   | 1.00                      | 0.40                      | 295                 | n (min-1)   | 4771   | 3578   | 2862   | 2385   | 2045   | 1789   | 1431   |
|                         |              |                           |                           |                     | fz (in)     | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0017 | 0.0020 | 0.0024 |
|                         |              |                           |                           | 230 - 360           | vf (in/min) | 14.0   | 14.0   | 14.0   | 14.0   | 14.0   | 14.0   | 14.0   |
|                         | E<br>3 - 4   | 1.00                      | 0.40                      | 260                 | n (min-1)   | 4205   | 3153   | 2523   | 2102   | 1802   | 1577   | 1261   |
|                         |              |                           |                           |                     | fz (in)     | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0017 | 0.0020 | 0.0024 |
|                         |              |                           |                           | 195 - 295           | vf (in/min) | 12.3   | 12.3   | 12.3   | 12.3   | 12.3   | 12.3   | 12.3   |
| E<br>5 - 6              | 1.00         | 0.40                      | 165                       | n (min-1)           | 2668        | 2001   | 1601   | 1334   | 1144   | 1001   | 800    |        |
|                         |              |                           |                           | fz (in)             | 0.0007      | 0.0010 | 0.0012 | 0.0015 | 0.0017 | 0.0020 | 0.0024 |        |
|                         |              |                           | 130 - 230                 | vf (in/min)         | 7.8         | 7.8    | 7.8    | 7.8    | 7.8    | 7.8    | 7.8    |        |
| M                       | E<br>8 - 9   | 1.00                      | 0.40                      | 395                 | n (min-1)   | 6388   | 4791   | 3833   | 3194   | 2738   | 2395   | 1916   |
|                         |              |                           |                           |                     | fz (in)     | 0.0006 | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0017 | 0.0021 |
|                         | E<br>10 - 11 | 1.00                      | 0.30                      | 195                 | n (min-1)   | 3153   | 2365   | 1892   | 1577   | 1351   | 1183   | 946    |
|                         |              |                           |                           |                     | fz (in)     | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0017 | 0.0020 | 0.0024 |
| K                       | E<br>12 - 13 | 1.00                      | 0.40                      | 395                 | n (min-1)   | 6388   | 4791   | 3833   | 3194   | 2738   | 2395   | 1916   |
|                         |              |                           |                           |                     | fz (in)     | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0017 | 0.0020 | 0.0024 |
|                         |              |                           |                           | 330 - 425           | vf (in/min) | 18.7   | 18.7   | 18.7   | 18.7   | 18.7   | 18.7   | 18.7   |
|                         | E<br>14 - 15 | 1.00                      | 0.30                      | 165                 | n (min-1)   | 2668   | 2001   | 1601   | 1334   | 1144   | 1001   | 800    |
|                         |              |                           |                           |                     | fz (in)     | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0017 | 0.0020 | 0.0024 |
|                         |              |                           |                           | 100 - 195           | vf (in/min) | 7.8    | 7.8    | 7.8    | 7.8    | 7.8    | 7.8    | 7.8    |

SMG = Seco Material Group  
 $n$  [min-1] = RPM  
 $v_c$  (sf/min) = Surface feet/min

$f_z$  [in] = Feed/tooth  
 $a_p/D_c$  = % of diameter  
 $v_f$  [in/min] = Feed rate  
 $a_e/D_c$  = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.



## SOLID CARBIDE HIGH FEED MILL

# SN200R, 400R & 500R

The SN200R, SN400R and SN500R series offers a complete range of 2-, 4- and 5-flute end mills to cover a broad range of applications and materials. Available in 3, 5 and 7 times diameter reach, these end mills feature a defined radius ( $r_p$ ) directing radial cutting pressure axially up into the tool holder and spindle. This feature allows for increased metal removal rates in deep pockets and long reach applications.

### PRODUCT OVERVIEW

- Solid carbide high feed tools excel in face, slot and plunge milling
- High feed capabilities yield significant productivity gains
- Reduced production costs when processing deep and shallow pockets
- Longer tool life than previous cutters when applied at the same table feed rates
- Low radial forces minimize vibration and machine wear
- Wide application area covered, from steel to exotic materials
- AlTiN coating for high heat and abrasion resistance
- Edge prep to increase cutting edge strength
- Modifications on shank only

### YOUR BENEFITS

- Long tool overhang for deep cavity milling
- Axially directed cutting forces
- High heat and abrasion resistant
- Reduced cycle time, higher metal removal rates
- Smoother cutting in long reach applications
- Long and predictable tool life

### RANGE OVERVIEW

- 2-, 4- and 5-flute end mill diameters from 1/16"-1/2" diameter
- 3xD, 5xD and 7xD length versions available

| MATERIAL GROUPS      |
|----------------------|
| Steel 1-6            |
| Hardened steel 7a    |
| Stainless steel 8-11 |
| Cast Iron 12-15      |
| Superalloys 19-22    |

FOCUS ON ISO P, S AND K MATERIALS INCLUDING STAINLESS STEEL, INCONEL AND TITANIUM.

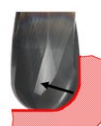
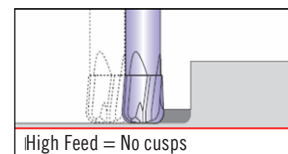
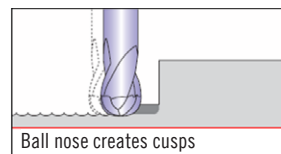
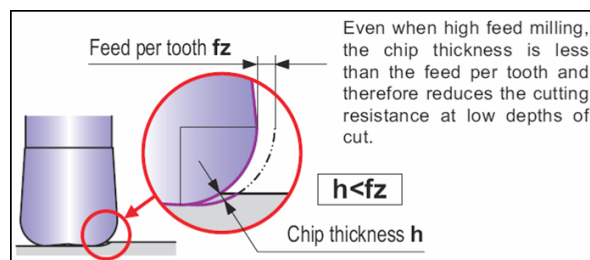
## HOW DOES HIGH FEED MILLING WORK?

The key to high feed milling cutters is the lead angle (or large radius) that allows you to have higher feed rates based on chip thinning.

When milling with a ball end mill, varying the depth of cut results in a chip-thinning effect. Large depths of cut involve bigger chip thicknesses, while shallow depths of cut mean smaller chip thickness. Machining with smaller depths of cuts, allows you to increase the feed rate to get the proper chip thickness (load).

### CHATTER AND SURFACE FINISH

High feed end mills have a low cutting resistance compared to ballnose endmills. This enables higher feed rates & longer overhangs to be achieved with less risk of vibration.



Ball nose directs force sideways, creating chatter.



High feed directs force upwards, minimizing chatter.

## CHOOSING THE RIGHT HIGH FEED TOOL

| Product | Product Family   | APMX     | Range       | Material suitability | Machine suitability |   | Ramping capability | Plunging suitability |
|---------|--|----------|-------------|----------------------|---------------------|---|--------------------|----------------------|
|         |  |          |             |                      |                     |   |                    |                      |
|         | <b>MZN410R &amp; MZN510R</b><br>- 4- and 5-flute versions<br>- 1/8" - 5/8" diameters<br>- 2 mm - 12 mm<br>- AlTiN coating<br>- Open flute cavity                         | 5.5%*DCX | 1/8" - 5/8" | P K S H              | ✓                   | = | ✓                  | ✗                    |
|         | <b>SN200R, 400R &amp; 500R</b><br>- 2-, 4- and 5-flute versions<br>- 1/16"-1/2" diameter range<br>- 3xD, 5xD and 7xD<br>- Deep pockets and long reach<br>- AlTiN coating | 9%*DCX   | 1/16"-1/2"  | P M K S H            | ✓                   | = | ✓                  | ✓                    |

## SN200R

SOLID CARBIDE

RADIUS

NON CENTER CUTTING



- 3, 5, and 7 x Diameter of reach
  - Defined radius (rp)
  - Wide range of materials including Steels (<52 Rc), Stainless Steels, Titanium, and Cast Iron
  - Face, slot, and plunge milling
  - Long reach applications
  - Deep cavity milling
- Cutting Data - Page 140-144
  - Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|--------|-------------|
| <a href="#">N13984</a> | SN200R-0.063-G1-H007.0-Z2 | 1/16      | 1/4       | .004          | 2              | .055     | .188  | 2      | ALTIN   | 0.0074 | CYLINDRICAL |
| <a href="#">N13985</a> | SN200R-0.063-G2-H007.0-Z2 | 1/16      | 1/4       | .004          | 2              | .055     | .313  | 2      | ALTIN   | 0.0074 | CYLINDRICAL |
| <a href="#">N13986</a> | SN200R-0.063-J3-H007.0-Z2 | 1/16      | 1/4       | .004          | 2              | .055     | .438  | 2      | ALTIN   | 0.0074 | CYLINDRICAL |
| <a href="#">N13987</a> | SN200R-0.094-G1-H011.0-Z2 | 3/32      | 1/4       | .006          | 2              | .082     | .281  | 2      | ALTIN   | 0.0111 | CYLINDRICAL |
| <a href="#">N13988</a> | SN200R-0.094-G2-H011.0-Z2 | 3/32      | 1/4       | .006          | 2              | .082     | .469  | 2      | ALTIN   | 0.0111 | CYLINDRICAL |
| <a href="#">N13989</a> | SN200R-0.094-J3-H011.0-Z2 | 3/32      | 1/4       | .006          | 2-1/2          | .082     | .656  | 2      | ALTIN   | 0.0111 | CYLINDRICAL |
| <a href="#">N13992</a> | SN200R-0.125-G1-H015.0-Z2 | 1/8       | 1/4       | .008          | 2              | .082     | .375  | 2      | ALTIN   | 0.0148 | CYLINDRICAL |
| <a href="#">N13993</a> | SN200R-0.125-G2-H015.0-Z2 | 1/8       | 1/4       | .008          | 2-1/2          | .109     | .625  | 2      | ALTIN   | 0.0148 | CYLINDRICAL |
| <a href="#">N13994</a> | SN200R-0.125-J3-H015.0-Z2 | 1/8       | 1/4       | .008          | 2-1/2          | .109     | .875  | 2      | ALTIN   | 0.0148 | CYLINDRICAL |
| <a href="#">N13997</a> | SN200R-0.156-G1-H020.0-Z2 | 5/32      | 1/4       | .010          | 2              | .136     | .469  | 2      | ALTIN   | 0.0200 | CYLINDRICAL |
| <a href="#">N13998</a> | SN200R-0.156-G2-H020.0-Z2 | 5/32      | 1/4       | .010          | 2-1/2          | .136     | .781  | 2      | ALTIN   | 0.0200 | CYLINDRICAL |
| <a href="#">N13999</a> | SN200R-0.156-J3-H020.0-Z2 | 5/32      | 1/4       | .010          | 2-1/2          | .136     | 1.094 | 2      | ALTIN   | 0.0200 | CYLINDRICAL |
| <a href="#">N14004</a> | SN200R-0.188-G1-H023.0-Z2 | 3/16      | 1/4       | .012          | 2              | .166     | .562  | 2      | ALTIN   | 0.0230 | CYLINDRICAL |
| <a href="#">N14005</a> | SN200R-0.188-G2-H023.0-Z2 | 3/16      | 1/4       | .012          | 2-1/2          | .166     | .937  | 2      | ALTIN   | 0.0230 | CYLINDRICAL |
| <a href="#">N14006</a> | SN200R-0.188-J3-H023.0-Z2 | 3/16      | 1/4       | .012          | 3              | .166     | 1.313 | 2      | ALTIN   | 0.0230 | CYLINDRICAL |
| <a href="#">N14009</a> | SN200R-0.250-E1-H032.0-Z2 | 1/4       | 1/4       | .014          | 2-1/2          | .218     | .750  | 2      | ALTIN   | 0.0322 | CYLINDRICAL |
| <a href="#">N14012</a> | SN200R-0.250-E2-H032.0-Z2 | 1/4       | 1/4       | .014          | 3              | .218     | 1.250 | 2      | ALTIN   | 0.0322 | CYLINDRICAL |
| <a href="#">N14013</a> | SN200R-0.250-J3-H032.0-Z2 | 1/4       | 1/4       | .014          | 3-1/2          | .218     | 1.750 | 2      | ALTIN   | 0.0322 | CYLINDRICAL |
| <a href="#">N14016</a> | SN200R-0.313-G1-H037.0-Z2 | 5/16      | 3/8       | .016          | 2-1/2          | .273     | .938  | 2      | ALTIN   | 0.0373 | CYLINDRICAL |
| <a href="#">N14017</a> | SN200R-0.313-G2-H037.0-Z2 | 5/16      | 3/8       | .016          | 3-1/2          | .273     | 1.563 | 2      | ALTIN   | 0.0373 | CYLINDRICAL |
| <a href="#">N14018</a> | SN200R-0.313-J3-H037.0-Z2 | 5/16      | 3/8       | .016          | 4              | .273     | 2.188 | 2      | ALTIN   | 0.0373 | CYLINDRICAL |
| <a href="#">N14023</a> | SN200R-0.375-E1-H043.0-Z2 | 3/8       | 3/8       | .018          | 3              | .329     | 1.125 | 2      | ALTIN   | 0.0432 | CYLINDRICAL |
| <a href="#">N14024</a> | SN200R-0.375-E2-H043.0-Z2 | 3/8       | 3/8       | .018          | 3-1/2          | .329     | 1.875 | 2      | ALTIN   | 0.0432 | CYLINDRICAL |
| <a href="#">N14025</a> | SN200R-0.375-J3-H043.0-Z2 | 3/8       | 3/8       | .018          | 4-1/2          | .329     | 2.625 | 2      | ALTIN   | 0.0432 | CYLINDRICAL |
| <a href="#">N14029</a> | SN200R-0.500-E1-H061.0-Z2 | 1/2       | 1/2       | .020          | 3-1/2          | .444     | 1.500 | 2      | ALTIN   | 0.0614 | CYLINDRICAL |
| <a href="#">N14032</a> | SN200R-0.500-E2-H061.0-Z2 | 1/2       | 1/2       | .020          | 4-1/2          | .444     | 2.500 | 2      | ALTIN   | 0.0614 | CYLINDRICAL |
| <a href="#">N14033</a> | SN200R-0.500-J3-H061.0-Z2 | 1/2       | 1/2       | .020          | 6              | .444     | 3.500 | 2      | ALTIN   | 0.0614 | CYLINDRICAL |

DISCOUNT CODE D43

## SN400R

SOLID CARBIDE

NON CENTER CUTTING



- 3, 5 x Diameter of reach
- Defined radius (rp)
- Wide range of materials including Steels (<52 Rc), Stainless Steels, Titanium, and Cast Iron
- Face, slot, and plunge milling
- Long reach applications
- Deep cavity milling

- Cutting Data - Page 140-144
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|--------|-------------|
| <a href="#">N13995</a> | SN400R-0.125-G1-H015.0-Z4 | 1/8       | 1/4       | .008          | 2              | .109     | .375  | 4      | ALTIN   | 0.0148 | CYLINDRICAL |
| <a href="#">N13996</a> | SN400R-0.125-G2-H015.0-Z4 | 1/8       | 1/4       | .008          | 2-1/2          | .109     | .625  | 4      | ALTIN   | 0.0148 | CYLINDRICAL |
| <a href="#">N14002</a> | SN400R-0.156-G1-H020.0-Z4 | 5/32      | 1/4       | .010          | 2              | .136     | .469  | 4      | ALTIN   | 0.0200 | CYLINDRICAL |
| <a href="#">N14003</a> | SN400R-0.156-G2-H020.0-Z4 | 5/32      | 1/4       | .010          | 2-1/2          | .136     | .781  | 4      | ALTIN   | 0.0200 | CYLINDRICAL |
| <a href="#">N14007</a> | SN400R-0.188-G1-H023.0-Z4 | 3/16      | 1/4       | .012          | 2              | .166     | .562  | 4      | ALTIN   | 0.0230 | CYLINDRICAL |
| <a href="#">N14008</a> | SN400R-0.188-G2-H023.0-Z4 | 3/16      | 1/4       | .012          | 2-1/2          | .166     | .937  | 4      | ALTIN   | 0.0230 | CYLINDRICAL |
| <a href="#">N14014</a> | SN400R-0.250-E1-H032.0-Z4 | 1/4       | 1/4       | .014          | 2-1/2          | .218     | .750  | 4      | ALTIN   | 0.0322 | CYLINDRICAL |
| <a href="#">N14015</a> | SN400R-0.250-E2-H032.0-Z4 | 1/4       | 1/4       | .014          | 3              | .218     | 1.250 | 4      | ALTIN   | 0.0322 | CYLINDRICAL |
| <a href="#">N14019</a> | SN400R-0.313-G1-H037.0-Z4 | 5/16      | 3/8       | .016          | 2-1/2          | .273     | .938  | 4      | ALTIN   | 0.0373 | CYLINDRICAL |
| <a href="#">N14022</a> | SN400R-0.313-G2-H037.0-Z4 | 5/16      | 3/8       | .016          | 3-1/2          | .273     | 1.563 | 4      | ALTIN   | 0.0373 | CYLINDRICAL |
| <a href="#">N14026</a> | SN400R-0.375-E1-H043.0-Z4 | 3/8       | 3/8       | .018          | 3              | .329     | 1.125 | 4      | ALTIN   | 0.0432 | CYLINDRICAL |
| <a href="#">N14028</a> | SN400R-0.375-E2-H043.0-Z4 | 3/8       | 3/8       | .018          | 3-1/2          | .329     | 1.875 | 4      | ALTIN   | 0.0432 | CYLINDRICAL |
| <a href="#">N14034</a> | SN400R-0.500-E1-H061.0-Z4 | 1/2       | 1/2       | .020          | 3-1/2          | .444     | 1.500 | 4      | ALTIN   | 0.0614 | CYLINDRICAL |
| <a href="#">N14036</a> | SN400R-0.500-E2-H061.0-Z4 | 1/2       | 1/2       | .020          | 4-1/2          | .444     | 2.500 | 4      | ALTIN   | 0.0614 | CYLINDRICAL |

## SN500R

SOLID CARBIDE

NON CENTER CUTTING



- 3 x Diameter of reach
- Defined radius (rp)
- Wide range of materials including Steels (<52 Rc), Stainless Steels, Titanium, and Cast Iron
- Face, slot, and plunge milling
- Long reach applications
- Deep cavity milling

- Cutting Data - Page 140-144
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|--------|-------------|
| <a href="#">N14027</a> | SN500R-0.375-E1-H043.0-Z5 | 3/8       | 3/8       | .018          | 3              | .329     | 1.125 | 5      | ALTIN   | 0.0432 | CYLINDRICAL |
| <a href="#">N14035</a> | SN500R-0.500-E1-H061.0-Z5 | 1/2       | 1/2       | .020          | 3-1/2          | .444     | 1.500 | 5      | ALTIN   | 0.0614 | CYLINDRICAL |

## CUTTING DATA -SN200R, SN400R, SN500R SLOT MILLING - START VALUES

|           |                | SLOT MILLING     |                  |             |             |             |             |        |        |        |        |        |        |        |        |
|-----------|----------------|------------------|------------------|-------------|-------------|-------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG            | ae (Max)         | vc (sf / min)    |             | Zn = 2      |             |             |        |        |        |        |        |        |        |        |
|           |                |                  |                  |             | 1/16        | 3/32        | 1/8         | 5/32   | 3/16   | 1/4    | 5/16   | 3/8    | 1/2    |        |        |
| P         | M/A/D<br>1 - 2 | 1.00 x DCX       | 984              | n [rev/min] | 60157       | 40105       | 30079       | 24062  | 20052  | 15039  | 12031  | 10026  | 7520   |        |        |
|           |                |                  |                  | fz [in]     | 0.0021      | 0.0031      | 0.0041      | 0.0052 | 0.0062 | 0.0083 | 0.0103 | 0.0124 | 0.0165 |        |        |
|           |                |                  | 820              | 1148        | vf [in/min] | 248         | 248         | 248    | 248    | 248    | 248    | 248    | 248    | 248    |        |
|           |                | M/A/D<br>3 - 4   | 1.00 x DCX       | 738         | n [rev/min] | 45118       | 30079       | 22559  | 18047  | 15039  | 11280  | 9024   | 7520   | 5640   |        |
|           |                |                  |                  |             | fz [in]     | 0.0019      | 0.0028      | 0.0038 | 0.0047 | 0.0056 | 0.0075 | 0.0094 | 0.0113 | 0.0150 |        |
|           |                |                  |                  | 656         | 820         | vf [in/min] | 169         | 169    | 169    | 169    | 169    | 169    | 169    | 169    | 169    |
|           | M/A/D<br>5 - 6 |                  | 1.00 x DCX       | 574         | n [rev/min] | 35092       | 23395       | 17546  | 14036  | 11697  | 8773   | 7018   | 5849   | 4386   |        |
|           |                |                  |                  |             | fz [in]     | 0.0017      | 0.0025      | 0.0034 | 0.0042 | 0.0051 | 0.0068 | 0.0084 | 0.0101 | 0.0135 |        |
|           |                |                  |                  | 492         | 656         | vf [in/min] | 118         | 118    | 118    | 118    | 118    | 118    | 118    | 118    | 118    |
|           |                | H                | M/A/D<br>7a      | 1.00 x DCX  | 312         | n [rev/min] | 19050       | 12700  | 9525   | 7620   | 6350   | 4762   | 3810   | 3175   | 2381   |
|           |                |                  |                  |             |             | fz [in]     | 0.0015      | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 |
|           |                |                  |                  |             | 262         | 361         | vf [in/min] | 57     | 57     | 57     | 57     | 57     | 57     | 57     | 57     |
| M         | E/M/A<br>8 - 9 |                  |                  | 1.00 x DCX  | 410         | n [rev/min] | 25066       | 16710  | 12533  | 10026  | 8355   | 6266   | 5013   | 4178   | 3133   |
|           |                |                  |                  |             |             | fz [in]     | 0.0015      | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 |
|           |                |                  |                  |             | 361         | 459         | vf [in/min] | 75     | 75     | 75     | 75     | 75     | 75     | 75     | 75     |
|           | M              |                  | E/M/A<br>10 - 11 | 1.00 x DCX  | 312         | n [rev/min] | 19050       | 12700  | 9525   | 7620   | 6350   | 4762   | 3810   | 3175   | 2381   |
|           |                |                  |                  |             |             | fz [in]     | 0.0015      | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 |
|           |                |                  |                  |             | 262         | 361         | vf [in/min] | 57     | 57     | 57     | 57     | 57     | 57     | 57     | 57     |
| K         |                |                  | E/M/A<br>12 - 13 | 1.00 x DCX  | 574         | n [rev/min] | 35092       | 23395  | 17546  | 14036  | 11697  | 8773   | 7018   | 5849   | 4386   |
|           |                |                  |                  |             |             | fz [in]     | 0.0019      | 0.0028 | 0.0038 | 0.0047 | 0.0056 | 0.0075 | 0.0094 | 0.0113 | 0.0150 |
|           |                |                  |                  |             | 492         | 656         | vf [in/min] | 132    | 132    | 132    | 132    | 132    | 132    | 132    | 132    |
|           | K              | E/M/A<br>14 - 15 | 1.00 x DCX       | 410         | n [rev/min] | 25066       | 16710       | 12533  | 10026  | 8355   | 6266   | 5013   | 4178   | 3133   |        |
|           |                |                  |                  |             | fz [in]     | 0.0017      | 0.0025      | 0.0034 | 0.0042 | 0.0051 | 0.0068 | 0.0084 | 0.0101 | 0.0135 |        |
|           |                |                  |                  | 328         | 492         | vf [in/min] | 85          | 85     | 85     | 85     | 85     | 85     | 85     | 85     | 85     |
| S         |                | E<br>19          | 1.00 x DCX       | 164         | n [rev/min] | 10026       | 6684        | 5013   | 4010   | 3342   | 2507   | 2005   | 1671   | 1253   |        |
|           |                |                  |                  |             | fz [in]     | 0.0011      | 0.0017      | 0.0023 | 0.0028 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 |        |
|           |                |                  |                  | 131         | 197         | vf [in/min] | 23          | 23     | 23     | 23     | 23     | 23     | 23     | 23     | 23     |
|           | E<br>20        |                  | 1.00 x DCX       | 164         | n [rev/min] | 10026       | 6684        | 5013   | 4010   | 3342   | 2507   | 2005   | 1671   | 1253   |        |
|           |                |                  |                  |             | fz [in]     | 0.0011      | 0.0017      | 0.0023 | 0.0028 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 |        |
|           |                |                  |                  | 131         | 197         | vf [in/min] | 23          | 23     | 23     | 23     | 23     | 23     | 23     | 23     | 23     |
|           |                | E<br>21          | 1.00 x DCX       | 98          | n [rev/min] | 6016        | 4010        | 3008   | 2406   | 2005   | 1504   | 1203   | 1003   | 752    |        |
|           |                |                  |                  |             | fz [in]     | 0.0011      | 0.0017      | 0.0023 | 0.0028 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 |        |
|           |                |                  |                  | 66          | 131         | vf [in/min] | 14          | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     |
|           | E<br>22        |                  | 1.00 x DCX       | 377         | n [rev/min] | 23060       | 15374       | 11530  | 9224   | 7687   | 5765   | 4612   | 3843   | 2883   |        |
|           |                |                  |                  |             | fz [in]     | 0.0011      | 0.0017      | 0.0023 | 0.0028 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 |        |
|           |                |                  |                  | 328         | 427         | vf [in/min] | 52          | 52     | 52     | 52     | 52     | 52     | 52     | 52     | 52     |
|           |                |                  |                  | ap max**    | 0.0020      | 0.0030      | 0.0040      | 0.0050 | 0.0060 | 0.0070 | 0.0080 | 0.0090 | 0.0100 |        |        |

\*\*Reduce APMX 20% and Feed per tooth 15% when using 5 x D version

\*\*Reduce APMX 40% and Feed per tooth 30% when using 7 x D version



DOWNLOAD THE "SOLID MILLING" APP FREE ON GOOGLE & APPLE STORES.  
GET CUTTING DATA RECOMMENDATIONS/CALCULATIONS, TIPS & TRICKS, TECHNICAL VIDEOS, AND MORE!

## CUTTING DATA -SN200R, SN400R, SN500R SLOT MILLING - START VALUES

| ISO GROUP | SMG              | a <sub>e</sub> (Max) | v <sub>c</sub> (sf / min) | SLOT MILLING |             |             |        |        |        |        |        |        |        |        |
|-----------|------------------|----------------------|---------------------------|--------------|-------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
|           |                  |                      |                           | n [rev/min]  | Zn = 4      |             |        |        |        | Zn = 5 |        |        |        |        |
|           |                  |                      |                           |              | 1/8         | 5/32        | 3/16   | 1/4    | 5/16   | 3/8    | 1/2    | 3/8    | 1/2    |        |
| P         | M/A/D<br>1 - 2   | 1.00 x DCX           | 984                       | n [rev/min]  | 30079       | 24062       | 20052  | 15039  | 12031  | 10026  | 7520   | 10026  | 7520   |        |
|           |                  |                      |                           | fz [in]      | 0.0041      | 0.0052      | 0.0062 | 0.0083 | 0.0103 | 0.0124 | 0.0165 | 0.0124 | 0.0165 |        |
|           |                  |                      | 820                       | 1148         | vf [in/min] | 496         | 496    | 496    | 496    | 496    | 496    | 496    | 620    | 620    |
|           | M/A/D<br>3 - 4   | 1.00 x DCX           | 738                       | n [rev/min]  | 22559       | 18047       | 15039  | 11280  | 9024   | 7520   | 5640   | 7520   | 5640   |        |
|           |                  |                      |                           | fz [in]      | 0.0038      | 0.0047      | 0.0056 | 0.0075 | 0.0094 | 0.0113 | 0.0150 | 0.0113 | 0.0150 |        |
|           |                  |                      | 656                       | 820          | vf [in/min] | 338         | 338    | 338    | 338    | 338    | 338    | 338    | 423    | 423    |
|           |                  | M/A/D<br>5 - 6       | 1.00 x DCX                | 574          | n [rev/min] | 17546       | 14036  | 11697  | 8773   | 7018   | 5849   | 4386   | 5849   | 4386   |
|           |                  |                      |                           |              | fz [in]     | 0.0034      | 0.0042 | 0.0051 | 0.0068 | 0.0084 | 0.0101 | 0.0135 | 0.0101 | 0.0135 |
|           |                  |                      |                           | 492          | 656         | vf [in/min] | 237    | 237    | 237    | 237    | 237    | 237    | 237    | 296    |
| H         | M/A/D<br>7a      | 1.00 x DCX           | 312                       | n [rev/min]  | 9525        | 7620        | 6350   | 4762   | 3810   | 3175   | 2381   | 3175   | 2381   |        |
|           |                  |                      |                           | fz [in]      | 0.0030      | 0.0038      | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 | 0.0090 | 0.0120 |        |
|           |                  |                      | 262                       | 361          | vf [in/min] | 114         | 114    | 114    | 114    | 114    | 114    | 114    | 143    | 143    |
| M         | E/M/A<br>8 - 9   | 1.00 x DCX           | 410                       | n [rev/min]  | 12533       | 10026       | 8355   | 6266   | 5013   | 4178   | 3133   | 4178   | 3133   |        |
|           |                  |                      |                           | fz [in]      | 0.0030      | 0.0038      | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 | 0.0090 | 0.0120 |        |
|           |                  |                      | 361                       | 459          | vf [in/min] | 150         | 150    | 150    | 150    | 150    | 150    | 150    | 188    | 188    |
|           | E/M/A<br>10 - 11 | 1.00 x DCX           | 312                       | n [rev/min]  | 9525        | 7620        | 6350   | 4762   | 3810   | 3175   | 2381   | 3175   | 2381   |        |
|           |                  |                      |                           | fz [in]      | 0.0030      | 0.0038      | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 | 0.0090 | 0.0120 |        |
|           |                  |                      | 262                       | 361          | vf [in/min] | 114         | 114    | 114    | 114    | 114    | 114    | 114    | 143    | 143    |
| K         | E/M/A<br>12 - 13 | 1.00 x DCX           | 574                       | n [rev/min]  | 17546       | 14036       | 11697  | 8773   | 7018   | 5849   | 4386   | 5849   | 4386   |        |
|           |                  |                      |                           | fz [in]      | 0.0038      | 0.0047      | 0.0056 | 0.0075 | 0.0094 | 0.0113 | 0.0150 | 0.0113 | 0.0150 |        |
|           |                  |                      | 492                       | 656          | vf [in/min] | 263         | 263    | 263    | 263    | 263    | 263    | 263    | 329    | 329    |
|           | E/M/A<br>14 - 15 | 1.00 x DCX           | 410                       | n [rev/min]  | 12533       | 10026       | 8355   | 6266   | 5013   | 4178   | 3133   | 4178   | 3133   |        |
|           |                  |                      |                           | fz [in]      | 0.0034      | 0.0042      | 0.0051 | 0.0068 | 0.0084 | 0.0101 | 0.0135 | 0.0101 | 0.0135 |        |
|           |                  |                      | 328                       | 492          | vf [in/min] | 169         | 169    | 169    | 169    | 169    | 169    | 169    | 211    | 211    |
| S         | E<br>19          | 1.00 x DCX           | 164                       | n [rev/min]  | 5013        | 4010        | 3342   | 2507   | 2005   | 1671   | 1253   | 1671   | 1253   |        |
|           |                  |                      |                           | fz [in]      | 0.0023      | 0.0028      | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 | 0.0068 | 0.0090 |        |
|           |                  |                      | 131                       | 197          | vf [in/min] | 45          | 45     | 45     | 45     | 45     | 45     | 45     | 56     | 56     |
|           | E<br>20          | 1.00 x DCX           | 164                       | n [rev/min]  | 5013        | 4010        | 3342   | 2507   | 2005   | 1671   | 1253   | 1671   | 1253   |        |
|           |                  |                      |                           | fz [in]      | 0.0023      | 0.0028      | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 | 0.0068 | 0.0090 |        |
|           |                  |                      | 131                       | 197          | vf [in/min] | 45          | 45     | 45     | 45     | 45     | 45     | 45     | 56     | 56     |
|           | E<br>21          | 1.00 x DCX           | 98                        | n [rev/min]  | 3008        | 2406        | 2005   | 1504   | 1203   | 1003   | 752    | 1003   | 752    |        |
|           |                  |                      |                           | fz [in]      | 0.0023      | 0.0028      | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 | 0.0068 | 0.0090 |        |
|           |                  |                      | 66                        | 131          | vf [in/min] | 27          | 27     | 27     | 27     | 27     | 27     | 27     | 34     | 34     |
|           | E<br>22          | 1.00 x DCX           | 377                       | n [rev/min]  | 11530       | 9224        | 7687   | 5765   | 4612   | 3843   | 2883   | 3843   | 2883   |        |
|           |                  |                      |                           | fz [in]      | 0.0023      | 0.0028      | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 | 0.0068 | 0.0090 |        |
|           |                  |                      | 328                       | 427          | vf [in/min] | 104         | 104    | 104    | 104    | 104    | 104    | 104    | 130    | 130    |

\*\*Reduce APMX 20% and Feed per tooth 15% when using 5 x D version  
 \*\*Reduce APMX 40% and Feed per tooth 30% when using 7 x D version

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>f</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## CUTTING DATA -SN200R, SN400R, SN500R SIDE MILLING - START VALUES

| ISO GROUP     | SMG         | a <sub>e</sub> (Max) | v <sub>c</sub> (sf / min) | SIDE MILLING |             |             |        |        |        |        |        |        |        |        |
|---------------|-------------|----------------------|---------------------------|--------------|-------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
|               |             |                      |                           | Zn = 2       |             |             |        |        |        |        |        |        |        |        |
|               |             |                      |                           | 1/16         | 3/32        | 1/8         | 5/32   | 3/16   | 1/4    | 5/16   | 3/8    | 1/2    |        |        |
| P             | M/A/D 1 - 2 | 0.30 x DCX           | 984                       | n [rev/min]  | 60157       | 40105       | 30079  | 24062  | 20052  | 15039  | 12031  | 10026  | 7520   |        |
|               |             |                      |                           | fz [in]      | 0.0034      | 0.0052      | 0.0069 | 0.0086 | 0.0103 | 0.0138 | 0.0172 | 0.0206 | 0.0275 |        |
|               |             |                      | 820                       | 1148         | vf [in/min] | 414         | 414    | 414    | 414    | 414    | 414    | 414    | 414    | 414    |
|               |             | 0.30 x DCX           | 738                       | ap max**     | 0.0040      | 0.0060      | 0.0080 | 0.0100 | 0.0120 | 0.0140 | 0.0160 | 0.0180 | 0.0200 |        |
|               |             |                      |                           | n [rev/min]  | 45118       | 30079       | 22559  | 18047  | 15039  | 11280  | 9024   | 7520   | 5640   |        |
|               |             |                      | 656                       | 820          | fz [in]     | 0.0031      | 0.0047 | 0.0063 | 0.0078 | 0.0094 | 0.0125 | 0.0156 | 0.0188 | 0.0250 |
|               | M/A/D 3 - 4 | 0.30 x DCX           | 574                       | 820          | vf [in/min] | 282         | 282    | 282    | 282    | 282    | 282    | 282    | 282    | 282    |
|               |             |                      |                           |              | ap max**    | 0.0040      | 0.0060 | 0.0080 | 0.0100 | 0.0120 | 0.0140 | 0.0160 | 0.0180 | 0.0200 |
|               |             |                      | 0.30 x DCX                | 492          | 656         | n [rev/min] | 35092  | 23395  | 17546  | 14036  | 11697  | 8773   | 7018   | 5849   |
|               |             | fz [in]              |                           |              |             | 0.0028      | 0.0042 | 0.0056 | 0.0070 | 0.0084 | 0.0113 | 0.0141 | 0.0169 | 0.0225 |
|               |             | 492                  |                           | 656          | vf [in/min] | 197         | 197    | 197    | 197    | 197    | 197    | 197    | 197    | 197    |
|               |             | H                    | M/A/D 7a                  | 0.30 x DCX   | 312         | n [rev/min] | 19050  | 12700  | 9525   | 7620   | 6350   | 4762   | 3810   | 3175   |
| fz [in]       | 0.0025      |                      |                           |              |             | 0.0038      | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 | 0.0150 | 0.0200 |        |
| 262           | 361         |                      |                           |              | vf [in/min] | 95          | 95     | 95     | 95     | 95     | 95     | 95     | 95     | 95     |
| 0.30 x DCX    | 410         |                      |                           | 459          | ap max**    | 0.0032      | 0.0048 | 0.0064 | 0.0080 | 0.0096 | 0.0112 | 0.0128 | 0.0144 | 0.0160 |
|               |             |                      |                           |              | n [rev/min] | 25066       | 16710  | 12533  | 10026  | 8355   | 6266   | 5013   | 4178   | 3133   |
|               | 361         |                      |                           | 459          | fz [in]     | 0.0025      | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 | 0.0150 | 0.0200 |
| E/M/A 8 - 9   | 0.30 x DCX  |                      | 459                       | 361          | vf [in/min] | 125         | 125    | 125    | 125    | 125    | 125    | 125    | 125    | 125    |
|               |             |                      |                           |              | ap max**    | 0.0032      | 0.0048 | 0.0064 | 0.0080 | 0.0096 | 0.0112 | 0.0128 | 0.0144 | 0.0160 |
|               |             |                      | 0.30 x DCX                | 262          | 361         | n [rev/min] | 28073  | 18716  | 14037  | 11229  | 9358   | 7018   | 5615   | 4679   |
|               | fz [in]     |                      |                           |              |             | 0.0025      | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 | 0.0150 | 0.0200 |
|               | 262         |                      |                           | 361          | vf [in/min] | 140         | 140    | 140    | 140    | 140    | 140    | 140    | 140    | 140    |
|               | K           |                      | E/M/A 12 - 13             | 0.30 x DCX   | 574         | n [rev/min] | 35092  | 23395  | 17546  | 14036  | 11697  | 8773   | 7018   | 5849   |
| fz [in]       |             | 0.0025               |                           |              |             | 0.0038      | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 | 0.0150 | 0.0200 |        |
| 492           |             | 656                  |                           |              | vf [in/min] | 175         | 175    | 175    | 175    | 175    | 175    | 175    | 175    | 175    |
| 0.30 x DCX    |             | 410                  |                           | 492          | ap max**    | 0.0040      | 0.0060 | 0.0080 | 0.0100 | 0.0120 | 0.0140 | 0.0160 | 0.0180 | 0.0200 |
|               |             |                      |                           |              | n [rev/min] | 25066       | 16710  | 12533  | 10026  | 8355   | 6266   | 5013   | 4178   | 3133   |
|               |             | 328                  |                           | 492          | fz [in]     | 0.0019      | 0.0028 | 0.0038 | 0.0047 | 0.0056 | 0.0075 | 0.0094 | 0.0113 | 0.0150 |
| E/M/A 14 - 15 |             | 0.30 x DCX           | 164                       | 197          | vf [in/min] | 94          | 94     | 94     | 94     | 94     | 94     | 94     | 94     | 94     |
|               |             |                      |                           |              | ap max**    | 0.0040      | 0.0060 | 0.0080 | 0.0100 | 0.0120 | 0.0140 | 0.0160 | 0.0180 | 0.0200 |
|               |             |                      | 0.30 x DCX                | 131          | 197         | n [rev/min] | 10026  | 6684   | 5013   | 4010   | 3342   | 2507   | 2005   | 1671   |
|               |             | fz [in]              |                           |              |             | 0.0015      | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 |
|               |             | 131                  |                           | 197          | vf [in/min] | 30          | 30     | 30     | 30     | 30     | 30     | 30     | 30     | 30     |
|               |             | S                    | E 19                      | 0.30 x DCX   | 164         | n [rev/min] | 10026  | 6684   | 5013   | 4010   | 3342   | 2507   | 2005   | 1671   |
| fz [in]       | 0.0015      |                      |                           |              |             | 0.0023      | 0.0030 | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 |        |
| 131           | 197         |                      |                           |              | vf [in/min] | 30          | 30     | 30     | 30     | 30     | 30     | 30     | 30     | 30     |
| 0.30 x DCX    | 98          |                      |                           | 131          | ap max**    | 0.0020      | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0070 | 0.0080 | 0.0090 | 0.0100 |
|               |             |                      |                           |              | n [rev/min] | 6016        | 4010   | 3008   | 2406   | 2005   | 1504   | 1203   | 1003   | 752    |
|               | 66          |                      |                           | 131          | fz [in]     | 0.0015      | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 |
| E 20          | 0.30 x DCX  |                      | 377                       | 427          | vf [in/min] | 18          | 18     | 18     | 18     | 18     | 18     | 18     | 18     | 18     |
|               |             |                      |                           |              | ap max**    | 0.0020      | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0070 | 0.0080 | 0.0090 | 0.0100 |
|               |             |                      | 0.30 x DCX                | 377          | 427         | n [rev/min] | 23060  | 15374  | 11530  | 9224   | 7687   | 5765   | 4612   | 3843   |
|               | fz [in]     |                      |                           |              |             | 0.0022      | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0088 | 0.0109 | 0.0131 | 0.0175 |
|               | 328         |                      |                           | 427          | vf [in/min] | 101         | 101    | 101    | 101    | 101    | 101    | 101    | 101    | 101    |
|               | E 21        |                      | 0.30 x DCX                | 377          | 427         | ap max**    | 0.0020 | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0070 | 0.0080 | 0.0090 |
| n [rev/min]   |             | 23060                |                           |              |             | 15374       | 11530  | 9224   | 7687   | 5765   | 4612   | 3843   | 2883   |        |
| 328           |             | 427                  |                           | fz [in]      | 0.0022      | 0.0033      | 0.0044 | 0.0055 | 0.0066 | 0.0088 | 0.0109 | 0.0131 | 0.0175 |        |
| E 22          |             | 0.30 x DCX           | 377                       | 427          | vf [in/min] | 101         | 101    | 101    | 101    | 101    | 101    | 101    | 101    | 101    |
|               |             |                      |                           |              | ap max**    | 0.0020      | 0.0030 | 0.0040 | 0.0050 | 0.0060 | 0.0070 | 0.0080 | 0.0090 | 0.0100 |
|               |             |                      | 328                       | 427          | n [rev/min] | 23060       | 15374  | 11530  | 9224   | 7687   | 5765   | 4612   | 3843   | 2883   |

\*\*Reduce APMX 20% and Feed per tooth 15% when using 5 x D version

\*\*Reduce APMX 40% and Feed per tooth 30% when using 7 x D version



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SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.



## CUTTING DATA -SN200R, SN400R, SN500R SIDE MILLING - START VALUES

| SIDE MILLING |                |                      |                           |             |             |             |        |        |        |        |        |        |        |        |
|--------------|----------------|----------------------|---------------------------|-------------|-------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP    | SMG            | a <sub>e</sub> (Max) | v <sub>c</sub> (sf / min) |             | Zn = 4      |             |        |        |        |        | Zn = 5 |        |        |        |
|              |                |                      |                           |             | 1/8         | 5/32        | 3/16   | 1/4    | 5/16   | 3/8    | 1/2    | 3/8    | 1/2    |        |
| P            | M/A/D<br>1 - 2 | 0.30 x DCX           | 984                       | n [rev/min] | 30079       | 24062       | 20052  | 15039  | 12031  | 10026  | 7520   | 10026  | 7520   |        |
|              |                |                      |                           | fz [in]     | 0.0069      | 0.0086      | 0.0103 | 0.0138 | 0.0172 | 0.0206 | 0.0275 | 0.0206 | 0.0275 |        |
|              |                |                      | 820                       | 1148        | vf [in/min] | 827         | 827    | 827    | 827    | 827    | 827    | 827    | 1034   | 1034   |
|              |                | 0.30 x DCX           | 738                       | n [rev/min] | 22559       | 18047       | 15039  | 11280  | 9024   | 7520   | 5640   | 7520   | 5640   | 5640   |
|              |                |                      |                           | fz [in]     | 0.0063      | 0.0078      | 0.0094 | 0.0125 | 0.0156 | 0.0188 | 0.0250 | 0.0188 | 0.0250 |        |
|              |                |                      | 656                       | 820         | vf [in/min] | 564         | 564    | 564    | 564    | 564    | 564    | 564    | 705    | 705    |
|              | 0.30 x DCX     | 574                  | n [rev/min]               | 17546       | 14036       | 11697       | 8773   | 7018   | 5849   | 4386   | 5849   | 4386   | 4386   |        |
|              |                |                      | fz [in]                   | 0.0056      | 0.0070      | 0.0084      | 0.0113 | 0.0141 | 0.0169 | 0.0225 | 0.0169 | 0.0225 |        |        |
|              |                | 492                  | 656                       | vf [in/min] | 395         | 395         | 395    | 395    | 395    | 395    | 395    | 493    | 493    |        |
|              | H              | M/A/D<br>7a          | 0.30 x DCX                | 312         | n [rev/min] | 9525        | 7620   | 6350   | 4762   | 3810   | 3175   | 2381   | 3175   | 2381   |
|              |                |                      |                           |             | fz [in]     | 0.0050      | 0.0063 | 0.0075 | 0.0100 | 0.0125 | 0.0150 | 0.0200 | 0.0150 | 0.0200 |
|              |                |                      |                           | 262         | 361         | vf [in/min] | 190    | 190    | 190    | 190    | 190    | 190    | 190    | 238    |
| 0.30 x DCX   |                |                      | 410                       | n [rev/min] | 12533       | 10026       | 8355   | 6266   | 5013   | 4178   | 3133   | 4178   | 3133   | 3133   |
|              |                |                      |                           | fz [in]     | 0.0050      | 0.0063      | 0.0075 | 0.0100 | 0.0125 | 0.0150 | 0.0200 | 0.0150 | 0.0200 |        |
|              |                |                      | 361                       | 459         | vf [in/min] | 251         | 251    | 251    | 251    | 251    | 251    | 251    | 313    | 313    |
| 0.30 x DCX   |                | 459                  | n [rev/min]               | 14037       | 11229       | 9358        | 7018   | 5615   | 4679   | 3509   | 4679   | 3509   | 3509   |        |
|              |                |                      | fz [in]                   | 0.0050      | 0.0063      | 0.0075      | 0.0100 | 0.0125 | 0.0150 | 0.0200 | 0.0150 | 0.0200 |        |        |
|              |                | 262                  | 361                       | vf [in/min] | 281         | 281         | 281    | 281    | 281    | 281    | 281    | 351    | 351    |        |
| M            |                | E/M/A<br>8 - 9       | 0.30 x DCX                | 574         | n [rev/min] | 17546       | 14036  | 11697  | 8773   | 7018   | 5849   | 4386   | 5849   | 4386   |
|              |                |                      |                           |             | fz [in]     | 0.0050      | 0.0063 | 0.0075 | 0.0100 | 0.0125 | 0.0150 | 0.0200 | 0.0150 | 0.0200 |
|              |                |                      |                           | 492         | 656         | vf [in/min] | 351    | 351    | 351    | 351    | 351    | 351    | 351    | 439    |
|              | 0.30 x DCX     |                      | 410                       | n [rev/min] | 12533       | 10026       | 8355   | 6266   | 5013   | 4178   | 3133   | 4178   | 3133   | 3133   |
|              |                |                      |                           | fz [in]     | 0.0038      | 0.0047      | 0.0056 | 0.0075 | 0.0094 | 0.0113 | 0.0150 | 0.0113 | 0.0150 |        |
|              |                |                      | 328                       | 492         | vf [in/min] | 188         | 188    | 188    | 188    | 188    | 188    | 188    | 235    | 235    |
|              | 0.30 x DCX     | 164                  | n [rev/min]               | 5013        | 4010        | 3342        | 2507   | 2005   | 1671   | 1253   | 1671   | 1253   |        |        |
|              |                |                      | fz [in]                   | 0.0030      | 0.0038      | 0.0045      | 0.0060 | 0.0075 | 0.0090 | 0.0120 | 0.0090 | 0.0120 |        |        |
|              |                | 131                  | 197                       | vf [in/min] | 60          | 60          | 60     | 60     | 60     | 60     | 60     | 75     | 75     |        |
|              | K              | E/M/A<br>12 - 13     | 0.30 x DCX                | 164         | n [rev/min] | 5013        | 4010   | 3342   | 2507   | 2005   | 1671   | 1253   | 1671   | 1253   |
|              |                |                      |                           |             | fz [in]     | 0.0030      | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 | 0.0090 | 0.0120 |
|              |                |                      |                           | 131         | 197         | vf [in/min] | 60     | 60     | 60     | 60     | 60     | 60     | 60     | 75     |
| 0.30 x DCX   |                |                      | 98                        | n [rev/min] | 3008        | 2406        | 2005   | 1504   | 1203   | 1003   | 752    | 1003   | 752    |        |
|              |                |                      |                           | fz [in]     | 0.0030      | 0.0038      | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 | 0.0090 | 0.0120 |        |
|              |                |                      | 66                        | 131         | vf [in/min] | 36          | 36     | 36     | 36     | 36     | 36     | 36     | 45     | 45     |
| 0.30 x DCX   |                | 377                  | n [rev/min]               | 11530       | 9224        | 7687        | 5765   | 4612   | 3843   | 2883   | 3843   | 2883   |        |        |
|              |                |                      | fz [in]                   | 0.0044      | 0.0055      | 0.0066      | 0.0088 | 0.0109 | 0.0131 | 0.0175 | 0.0131 | 0.0175 |        |        |
|              |                | 328                  | 427                       | vf [in/min] | 202         | 202         | 202    | 202    | 202    | 202    | 202    | 252    | 252    |        |
| S            |                | E<br>19              | 0.30 x DCX                | 164         | n [rev/min] | 5013        | 4010   | 3342   | 2507   | 2005   | 1671   | 1253   | 1671   | 1253   |
|              |                |                      |                           |             | fz [in]     | 0.0030      | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 | 0.0090 | 0.0120 |
|              |                |                      |                           | 131         | 197         | vf [in/min] | 60     | 60     | 60     | 60     | 60     | 60     | 60     | 75     |
|              | 0.30 x DCX     |                      | 98                        | n [rev/min] | 3008        | 2406        | 2005   | 1504   | 1203   | 1003   | 752    | 1003   | 752    |        |
|              |                |                      |                           | fz [in]     | 0.0030      | 0.0038      | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 | 0.0090 | 0.0120 |        |
|              |                |                      | 66                        | 131         | vf [in/min] | 36          | 36     | 36     | 36     | 36     | 36     | 36     | 45     | 45     |
|              | 0.30 x DCX     | 377                  | n [rev/min]               | 11530       | 9224        | 7687        | 5765   | 4612   | 3843   | 2883   | 3843   | 2883   |        |        |
|              |                |                      | fz [in]                   | 0.0044      | 0.0055      | 0.0066      | 0.0088 | 0.0109 | 0.0131 | 0.0175 | 0.0131 | 0.0175 |        |        |
|              |                | 328                  | 427                       | vf [in/min] | 202         | 202         | 202    | 202    | 202    | 202    | 202    | 252    | 252    |        |

\*\*Reduce APMX 20% and Feed per tooth 15% when using 5 x D version

\*\*Reduce APMX 40% and Feed per tooth 30% when using 7 x D version

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## CUTTING DATA - SN200R PLUNGE MILLING - START VALUES

| ISO GROUP | SMG              | a <sub>e</sub> (Max) | v <sub>c</sub> (sf / min) | PLUNGE MILLING |             |             |             |        |        |        |        |        |        |        |        |
|-----------|------------------|----------------------|---------------------------|----------------|-------------|-------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
|           |                  |                      |                           | Zn = 2         |             |             |             |        |        |        |        |        |        |        |        |
|           |                  |                      |                           | 1/16           | 3/32        | 1/8         | 5/32        | 3/16   | 1/4    | 5/16   | 3/8    | 1/2    |        |        |        |
| P         | M/A/D<br>1 - 2   | 0.30 x DCX           | 699                       | n [rev/min]    | 42712       | 28475       | 21356       | 17084  | 14237  | 10678  | 8542   | 7119   | 5339   |        |        |
|           |                  |                      |                           | fz [in]        | 0.0006      | 0.0009      | 0.0013      | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |        |        |
|           |                  |                      | 576                       | 822            | vf [in/min] | 53          | 53          | 53     | 53     | 53     | 53     | 53     | 53     | 53     |        |
|           |                  | M/A/D<br>3 - 4       | 0.30 x DCX                | 518            | n [rev/min] | 31683       | 21122       | 15841  | 12673  | 10561  | 7921   | 6337   | 5280   | 3960   |        |
|           |                  |                      |                           |                | fz [in]     | 0.0006      | 0.0009      | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |        |
|           |                  |                      |                           | 459            | 577         | vf [in/min] | 40          | 40     | 40     | 40     | 40     | 40     | 40     | 40     | 40     |
|           | M/A/D<br>5 - 6   | 0.30 x DCX           | 410                       | n [rev/min]    | 25066       | 16710       | 12533       | 10026  | 8355   | 6266   | 5013   | 4178   | 3133   |        |        |
|           |                  |                      |                           | fz [in]        | 0.0006      | 0.0009      | 0.0013      | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 |        |        |
|           |                  |                      | 361                       | 459            | vf [in/min] | 31          | 31          | 31     | 31     | 31     | 31     | 31     | 31     | 31     |        |
|           | H                | M/A/D<br>7a          | 0.30 x DCX                | 213            | n [rev/min] | 13034       | 8689        | 6517   | 5213   | 4345   | 3259   | 2607   | 2172   | 1629   |        |
|           |                  |                      |                           |                | fz [in]     | 0.0004      | 0.0007      | 0.0009 | 0.0011 | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 |        |
|           |                  |                      |                           | 180            | 246         | vf [in/min] | 11          | 11     | 11     | 11     | 11     | 11     | 11     | 11     | 11     |
| M         |                  |                      | E/M/A<br>8 - 9            | 0.30 x DCX     | 289         | n [rev/min] | 17646       | 11764  | 8823   | 7058   | 5882   | 4412   | 3529   | 2941   | 2206   |
|           |                  |                      |                           |                |             | fz [in]     | 0.0004      | 0.0007 | 0.0009 | 0.0011 | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 |
|           |                  |                      |                           |                | 246         | 331         | vf [in/min] | 15     | 15     | 15     | 15     | 15     | 15     | 15     | 15     |
|           | E/M/A<br>10 - 11 | 0.30 x DCX           |                           | 246            | n [rev/min] | 15039       | 10026       | 7520   | 6016   | 5013   | 3760   | 3008   | 2507   | 1880   |        |
|           |                  |                      |                           |                | fz [in]     | 0.0004      | 0.0007      | 0.0009 | 0.0011 | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 |        |
|           |                  |                      |                           | 180            | 246         | vf [in/min] | 13          | 13     | 13     | 13     | 13     | 13     | 13     | 13     | 13     |
|           | K                | E/M/A<br>12 - 13     | 0.30 x DCX                | 410            | n [rev/min] | 25066       | 16710       | 12533  | 10026  | 8355   | 6266   | 5013   | 4178   | 3133   |        |
|           |                  |                      |                           |                | fz [in]     | 0.0004      | 0.0007      | 0.0009 | 0.0011 | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 |        |
|           |                  |                      |                           | 361            | 459         | vf [in/min] | 22          | 22     | 22     | 22     | 22     | 22     | 22     | 22     | 22     |
|           |                  |                      | E/M/A<br>14 - 15          | 0.30 x DCX     | 295         | n [rev/min] | 18047       | 12031  | 9024   | 7219   | 6016   | 4512   | 3609   | 3008   | 2256   |
|           |                  |                      |                           |                |             | fz [in]     | 0.0004      | 0.0006 | 0.0008 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|           |                  |                      |                           |                | 230         | 361         | vf [in/min] | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     |
| S         |                  | E<br>19              | 0.30 x DCX                | 115            | n [rev/min] | 7018        | 4679        | 3509   | 2807   | 2339   | 1755   | 1404   | 1170   | 877    |        |
|           |                  |                      |                           |                | fz [in]     | 0.0004      | 0.0006      | 0.0008 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |        |
|           |                  |                      |                           | 98             | 131         | vf [in/min] | 5           | 5      | 5      | 5      | 5      | 5      | 5      | 5      | 5      |
|           |                  |                      | E<br>20                   | 0.30 x DCX     | 115         | n [rev/min] | 7018        | 4679   | 3509   | 2807   | 2339   | 1755   | 1404   | 1170   | 877    |
|           |                  |                      |                           |                |             | fz [in]     | 0.0004      | 0.0006 | 0.0008 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|           |                  |                      |                           |                | 98          | 131         | vf [in/min] | 5      | 5      | 5      | 5      | 5      | 5      | 5      | 5      |
|           | E<br>21          | 0.30 x DCX           | 75                        | n [rev/min]    | 4612        | 3075        | 2306        | 1845   | 1537   | 1153   | 922    | 769    | 577    |        |        |
|           |                  |                      |                           | fz [in]        | 0.0004      | 0.0006      | 0.0008      | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |        |        |
|           |                  |                      | 49                        | 102            | vf [in/min] | 3           | 3           | 3      | 3      | 3      | 3      | 3      | 3      | 3      |        |
|           |                  | E<br>22              | 0.30 x DCX                | 262            | n [rev/min] | 16042       | 10695       | 8021   | 6417   | 5347   | 4010   | 3208   | 2674   | 2005   |        |
|           |                  |                      |                           |                | fz [in]     | 0.0004      | 0.0007      | 0.0009 | 0.0011 | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 |        |
|           |                  |                      |                           | 230            | 295         | vf [in/min] | 14          | 14     | 14     | 14     | 14     | 14     | 14     | 14     | 14     |

\*\*\*pd: plunge depth

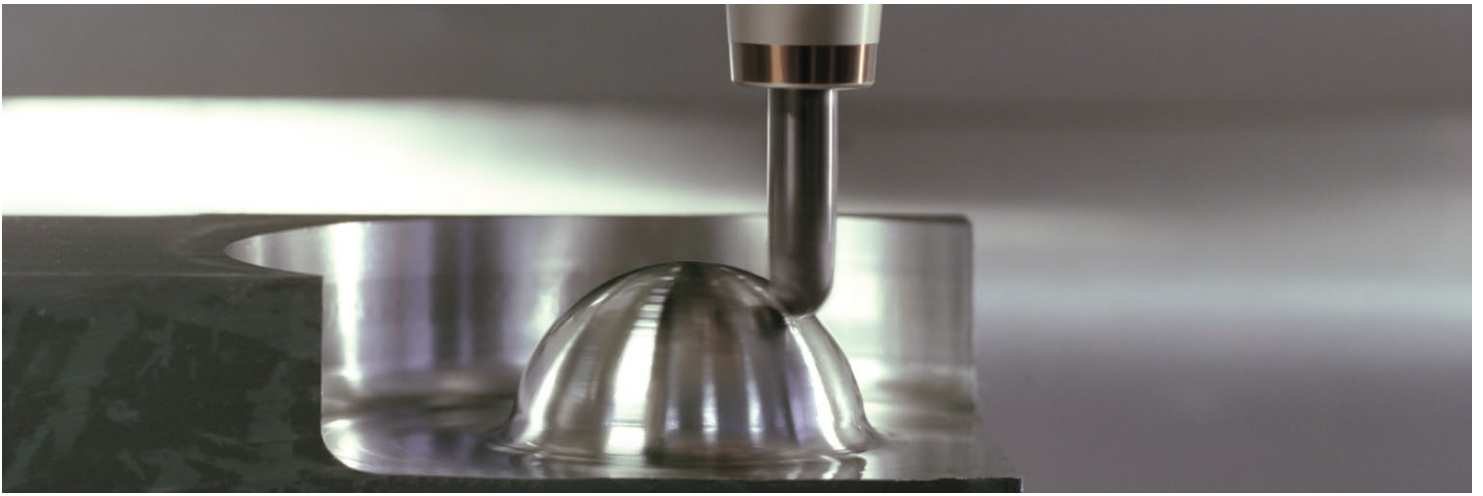


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GET CUTTING DATA RECOMMENDATIONS/CALCULATIONS, TIPS & TRICKS, TECHNICAL VIDEOS, AND MORE!

SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
vf [in/min] = Feed rate  
a<sub>p</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.



# REDUCE CYCLE TIMES WITH HARD MILLING MBZ & MZN

Gain the ability to rough and finish in a single process with Niagara Cutter's MBZ215 and MZN410R for hard milling applications. Instead of traditional methods that require multiple setups, including in some cases Electrical Discharge Machining (EDM), hard milling helps reduce lead times and increase productivity by eliminating multiple setups and difficult polishing processes.

With the increase in Mold and Die manufacturing in the North American market, there is a growing need for a full metric range of MBZ215 and MZN410R/510R products from Niagara Cutter™. Because of this, we have expanded the range to include ball nose end mills from 0.5 mm up to 12 mm in diameter and high feed end mills from 2 mm up to 12 mm in diameter. Both of these product families are effective in hardened steels from 48-65 HRC, cast irons and nickel-based superalloys. With these recent additions, the product family's versatility has now reached new heights in the high speed hard milling sector.

## RANGE OVERVIEW

### MBZ215M - 2-FLUTE, BALL NOSE

- 0.5 - 12 mm diameters, 1 x dia. flute length, 2 and 4 x dia. straight reach length, 6 x dia. 0.9° tapered reach length, 11 - 37 x dia. long tapered reach, cylindrical shank

### MZN410RM - 4-FLUTE, HIGH FEED

- 2 - 12 mm diameters, 0.25 x dia. flute length, 2 and 4 x dia. reach length, cylindrical shank, standard radii available (0.5 mm, 0.75 mm, 1 mm, 1.5 mm, 2 mm and 3 mm)

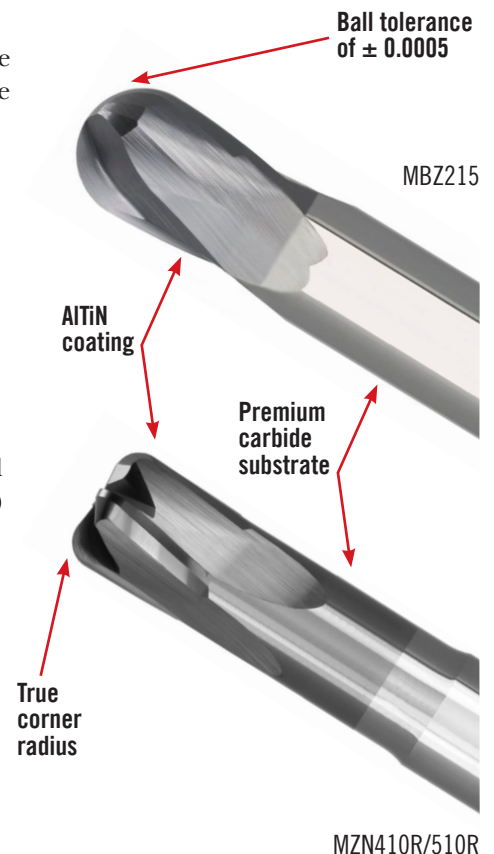
### MZN510RM - 5-FLUTE, HIGH FEED

- 10 - 12 mm diameters, 0.25 x dia. flute length, 2 x dia. reach length, cylindrical shank, standard radii available (2 and 3 mm)

## INDUSTRY APPLICATIONS

- **MOLD & DIE** - With the increase in difficult to machine hardened tool steels, the MZN410RM torical high feed end mill helps reduce semi-finishing and finishing cycle times. With a true radius the MZN410RM can rough closer to near net shape than a true high feed design tool which in turn reduces and sometimes eliminates semi-finishing operations.

| MATERIAL GROUPS           |
|---------------------------|
| Hardened Steels 48-65 HRC |
| Steel 5-6                 |
| Cast Iron 12-15           |
| Superalloys 21            |



# 6 TIPS

## HARD MILLING

Hard milling can be a highly effective strategy for machining complex 2D and 3D part features such as mold cavities, gates, heat-sinks and even die pockets in tool steel above 48 HRC. However, hard milling requires the utmost attention to detail to achieve maximum performance, tool life and tight tolerances down to .0001".

### 1. MAINTAINING A CONSTANT CHIP LOAD/FEED RATE

One of the most overlooked concepts when it comes to hard milling is maintaining a constant chip load/feed rate. Complex surfaces and cutter paths used in the mold and die industry cause machine tools to rapidly fluctuate feed rates resulting in a drastic loss of tool life. Feed rates will always fluctuate unless machining in a straight line. When machining complex surfaces, one must take into consideration that machine tools do not reduce rpm in conjunction with feed rate reductions. A good rule of thumb is if the programmed feed rates cannot be maintained for 80% of the time, the average feed rates need to be reduced. Subsequently, feed rates and rpm need to be reduced in the program. For example: programmed rpm is 30,000 and feed rate is 150 ipm. However, the average maintained feed rate is only 75 ipm. Thus, the rpm needs to be reduced to 15,000. This reduction in rpm can increase the tool life upwards of 50% while having a negligible impact on cycle time.

### 2. DON'T LEAVE TOO MUCH STOCK FOR FINISHING

When machining tool steels above 48 HRC, leaving too much finish stock will not only reduce output but also wreak havoc on surface finishes and tool life. A general guideline for finish stock allowance is 1%-2% of the finish cutter diameter. Most cutting tool manufacturers base their finishing cutting data on 1%-2% of the tooling diameter engagement. Leaving more than this will result in lost productivity. For example: When using a 1/2" diameter tool it is best to not leave more than 0.005"- 0.010" of finish stock.

### 3. LEAVE CONSISTENT STOCK ON ALL SURFACES FOR MAXIMUM TOOL LIFE

Leaving too much finish stock is bad for tool life and surface finishes. Leaving inconsistent stock for finishing is also bad, if not worse. After a complex surface has been roughed, it is important to run a "rest-rough" and even a "semi-finish" tool path, to ensure a consistent finish stock on all surfaces. Take this example into consideration: A complex 3D surface has just been roughed out with a 12 mm ball nose end mill with an intended finish cutter diameter of 8 mm. A safe practice would be to "rest-rough" with a 10 mm ball nose end mill. Then, "semi-finish" with an 8 mm ball nose ensuring there is only 0.003"- 0.006" of stock on all surfaces. Finally, finish mill with a new 8 mm ball nose end mill to achieve a consistent surface finish as well as extend the life of the finish tool. This strategy may even lend itself to using the finish ball nose end mill as a "semi-finish" tool once the finish tool life has been met.



### 4. NOT ALL HARDENED TOOL STEELS ARE CREATED EQUAL

Some common hardened tool steels in the Mold and Die industry present unique challenges. Take for example D2 tool steel that can be heat treated to 60-62 HRC. Because of the added Chromium content, this tool steel is not only hard, but also tough. Furthermore, it machines similar to tool steel that is 62-65 HRC. 420 stainless steel is also very common in the mold industry because it is wear resistant and can be polished to a mirror finish. Although this material is typically heat treated to 48-52 HRC, it still retains its sticky stainless steel properties. This material is prone to causing Built Up Edge (BUE) making running the proper surface feet per minute crucial. Utilizing air/oil mist will also help reduce BUE when machining this material.

### 5. USE RIGID HOLDERS

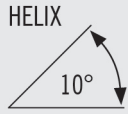
To achieve maximum tool life, high-precision holders are crucial to hard milling. Run-out needs to be kept to less than 0.0004". This type of precision can be achieved by most shrink fit holders, milling chucks, high precision collet chucks and select manufactures end mill holders. A precise holder also ensures the accuracy of the process, whereas a less secure holder may cause unpredictable tool life and produce surfaces that are out of tolerance.

### 6. FOLLOW RECOMMENDED CUTTING PARAMETERS

Through meticulous research and years of first-hand experience, we have developed specific recommended cutting parameters. Cutting data is optimized per the tool's design, specifications and for specific material groups. These specifications should always be used as a starting point. Modifications can be made depending on the application.

## MZN410R / MZN510R

SOLID CARBIDE



CENTER CUTTING



- Strong end tooth design
- Hardened steels (>48 Rc) and nickel based superalloys such as Inconel 718
- Edge preparation for increased cutting edge strength
- 2° back taper with reduced neck diameter for workpiece clearance
- Shrink fit first choice as toolholder
- Cutting Data - Page 149-150
- Tolerance Specs - Page 323

| PRODUCT NUMBER                      | DESCRIPTION                | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|-------------------------------------|----------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|--------|-------------|
| <a href="#">N00305</a>              | MZN410R-0.125-J1-R030.0-Z4 | 1/8       | 1/4       | 0.030         | 2-1/2          | 0.112    | 0.375 | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N00001</a>              | MZN410R-0.125-J2-R030.0-Z4 | 1/8       | 1/4       | 0.030         | 2-1/2          | 0.112    | 0.625 | 4      | ALTIN   | 0.030  | CYLINDRICAL |
| <a href="#">N00002</a>              | MZN410R-0.188-J1-R050.0-Z4 | 3/16      | 1/4       | 0.050         | 2-1/2          | 0.172    | 0.562 | 4      | ALTIN   | 0.050  | CYLINDRICAL |
| <a href="#">N00003</a>              | MZN410R-0.188-J2-R050.0-Z4 | 3/16      | 1/4       | 0.050         | 2-1/2          | 0.172    | 0.937 | 4      | ALTIN   | 0.050  | CYLINDRICAL |
| <a href="#">N00004</a>              | MZN410R-0.250-E1-R060.0-Z4 | 1/4       | 1/4       | 0.060         | 2-1/2          | 0.230    | 0.750 | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N00005</a>              | MZN410R-0.250-E2-R060.0-Z4 | 1/4       | 1/4       | 0.060         | 2-1/2          | 0.230    | 1.250 | 4      | ALTIN   | 0.060  | CYLINDRICAL |
| <a href="#">N00006</a>              | MZN410R-0.313-G1-R080.0-Z4 | 5/16      | 3/8       | 0.080         | 3              | 0.290    | 0.750 | 4      | ALTIN   | 0.080  | CYLINDRICAL |
| <a href="#">N00007</a>              | MZN410R-0.313-G2-R080.0-Z4 | 5/16      | 3/8       | 0.080         | 3              | 0.290    | 1.250 | 4      | ALTIN   | 0.080  | CYLINDRICAL |
| <a href="#">N00008</a>              | MZN410R-0.375-E1-R080.0-Z4 | 3/8       | 3/8       | 0.080         | 3              | 0.348    | 1.125 | 4      | ALTIN   | 0.080  | CYLINDRICAL |
| <a href="#">N00009</a>              | MZN510R-0.375-E1-R080.0-Z5 | 3/8       | 3/8       | 0.080         | 3              | 0.348    | 1.125 | 5      | ALTIN   | 0.080  | CYLINDRICAL |
| <a href="#">N00010</a>              | MZN410R-0.375-E3-R080.0-Z4 | 3/8       | 3/8       | 0.080         | 3              | 0.348    | 1.875 | 4      | ALTIN   | 0.080  | CYLINDRICAL |
| <a href="#">N00011</a>              | MZN410R-0.500-E1-R120.0-Z4 | 1/2       | 1/2       | 0.120         | 4              | 0.468    | 1.500 | 4      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N00012</a>              | MZN510R-0.500-E1-R120.0-Z5 | 1/2       | 1/2       | 0.120         | 4              | 0.468    | 1.500 | 5      | ALTIN   | 0.120  | CYLINDRICAL |
| <a href="#">N00013</a>              | MZN510R-0.625-E1-R120.0-Z5 | 5/8       | 5/8       | 0.120         | 4              | 0.584    | 1.875 | 5      | ALTIN   | 0.120  | CYLINDRICAL |
| <b>METRIC - MZN410RM / MZN510RM</b> |                            |           |           |               |                |          |       |        |         |        |             |
| <a href="#">03169565</a>            | MZN410RM-020-G2-R050.0-Z4  | 2mm       | 6mm       | 0.5mm         | 50mm           | 1.8mm    | 4mm   | 4      | ALTIN   | 0.50MM | CYLINDRICAL |
| <a href="#">03169566</a>            | MZN410RM-030-G2-R075.0-Z4  | 3mm       | 6mm       | 0.75mm        | 50mm           | 2.7mm    | 6mm   | 4      | ALTIN   | 0.75MM | CYLINDRICAL |
| <a href="#">03169567</a>            | MZN410RM-040-G2-R100.0-Z4  | 4mm       | 6mm       | 1mm           | 50mm           | 3.6mm    | 8mm   | 4      | ALTIN   | 1.00MM | CYLINDRICAL |
| <a href="#">03169568</a>            | MZN410RM-060-E2-R150.0-Z4  | 6mm       | 6mm       | 1.5mm         | 55mm           | 5.4mm    | 12mm  | 4      | ALTIN   | 1.50MM | CYLINDRICAL |
| <a href="#">03169569</a>            | MZN410RM-080-E2-R200.0-Z4  | 8mm       | 8mm       | 2mm           | 60mm           | 7.3mm    | 16mm  | 4      | ALTIN   | 2.00MM | CYLINDRICAL |
| <a href="#">03169570</a>            | MZN410RM-100-E2-R200.0-Z4  | 10mm      | 10mm      | 2mm           | 70mm           | 9.2mm    | 20mm  | 4      | ALTIN   | 2.00MM | CYLINDRICAL |
| <a href="#">03169571</a>            | MZN510RM-100-E2-R200.0-Z5  | 10mm      | 10mm      | 2mm           | 70mm           | 9.2mm    | 20mm  | 5      | ALTIN   | 2.00MM | CYLINDRICAL |
| <a href="#">03169572</a>            | MZN510RM-120-E2-R300.0-Z5  | 12mm      | 12mm      | 3mm           | 75mm           | 11mm     | 24mm  | 5      | ALTIN   | 3.00MM | CYLINDRICAL |
| <a href="#">03169573</a>            | MZN410RM-020-G4-R050.0-Z4  | 2mm       | 6mm       | 0.5mm         | 55mm           | 1.8mm    | 8mm   | 4      | ALTIN   | 0.50MM | CYLINDRICAL |
| <a href="#">03169574</a>            | MZN410RM-030-G4-R075.0-Z4  | 3mm       | 6mm       | 0.75mm        | 55mm           | 2.7mm    | 12mm  | 4      | ALTIN   | 0.75MM | CYLINDRICAL |
| <a href="#">03169575</a>            | MZN410RM-040-G4-R100.0-Z4  | 4mm       | 6mm       | 1mm           | 65mm           | 3.6mm    | 16mm  | 4      | ALTIN   | 1.00MM | CYLINDRICAL |
| <a href="#">03169576</a>            | MZN410RM-060-E4-R150.0-Z4  | 6mm       | 6mm       | 1.5mm         | 65mm           | 5.4mm    | 24mm  | 4      | ALTIN   | 1.50MM | CYLINDRICAL |
| <a href="#">03169577</a>            | MZN410RM-080-E4-R200.0-Z4  | 8mm       | 8mm       | 2mm           | 75mm           | 7.3mm    | 32mm  | 4      | ALTIN   | 2.00MM | CYLINDRICAL |
| <a href="#">03169578</a>            | MZN410RM-100-E4-R200.0-Z4  | 10mm      | 10mm      | 2mm           | 100mm          | 9.2mm    | 40mm  | 4      | ALTIN   | 2.00MM | CYLINDRICAL |
| <a href="#">03169579</a>            | MZN410RM-120-E4-R300.0-Z4  | 12mm      | 12mm      | 3mm           | 100mm          | 11mm     | 48mm  | 4      | ALTIN   | 3.00MM | CYLINDRICAL |

## MZN410R / MZN510R - 2 X D START VALUES - Inch

| ISO GROUP      | SMG                               | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |                | SLOTTING  |        |        |        |        |        |           |        |        |
|----------------|-----------------------------------|---------------------------|---------------------|----------------|-----------|--------|--------|--------|--------|--------|-----------|--------|--------|
|                |                                   |                           |                     |                | $Z_n = 4$ |        |        |        |        |        | $Z_n = 5$ |        |        |
|                |                                   |                           |                     |                | 1/8       | 3/16   | 1/4    | 5/16   | 3/8    | 1/2    | 5/8       | 1/2    | 5/8    |
| P              | E / M / A<br>5 - 6                | 1.00                      | 740                 | n (rev/min)    | 22614     | 15076  | 11307  | 9046   | 7538   | 5654   | 4523      | 5654   | 4523   |
|                |                                   |                           |                     | $f_z$ (in)     | 0.0031    | 0.0047 | 0.0063 | 0.0078 | 0.0094 | 0.0125 | 0.0156    | 0.0125 | 0.0156 |
|                |                                   |                           | 690 - 790           | $v_f$ (in/min) | 283       | 283    | 283    | 283    | 283    | 283    | 283       | 353    | 353    |
|                |                                   |                           |                     | Max Ap         | 0.008     | 0.012  | 0.014  | 0.018  | 0.020  | 0.022  | 0.024     | 0.022  | 0.024  |
| H              | M / A / D<br>7a<br>(48-56<br>HRC) | 1.00                      | 440                 | n (rev/min)    | 13446     | 8964   | 6723   | 5379   | 4482   | 3362   | 2689      | 3362   | 2689   |
|                |                                   |                           |                     | $f_z$ (in)     | 0.0031    | 0.0047 | 0.0063 | 0.0078 | 0.0094 | 0.0125 | 0.0156    | 0.0125 | 0.0156 |
|                |                                   |                           | 390 - 490           | $v_f$ (in/min) | 168       | 168    | 168    | 168    | 168    | 168    | 168       | 210    | 210    |
|                | Max Ap                            | 0.008                     |                     | 0.012          | 0.014     | 0.018  | 0.020  | 0.022  | 0.024  | 0.022  | 0.024     |        |        |
|                | 200 - 260                         | n (rev/min)               |                     | 7029           | 4686      | 3514   | 2812   | 2343   | 1757   | 1406   | 1757      | 1406   |        |
|                |                                   | $f_z$ (in)                | 0.0025              | 0.0038         | 0.005     | 0.0063 | 0.0075 | 0.01   | 0.0125 | 0.01   | 0.0125    |        |        |
| $v_f$ (in/min) |                                   | 70                        | 70                  | 70             | 70        | 70     | 70     | 70     | 88     | 88     |           |        |        |
| K              | E / M / A<br>12 - 13              | 1.00                      | 570                 | n (rev/min)    | 17419     | 11613  | 8710   | 6968   | 5806   | 4355   | 3484      | 4355   | 3484   |
|                |                                   |                           |                     | $f_z$ (in)     | 0.0030    | 0.0045 | 0.0060 | 0.0075 | 0.0090 | 0.0120 | 0.0150    | 0.0120 | 0.0150 |
|                |                                   |                           | 490 - 650           | $v_f$ (in/min) | 209       | 209    | 209    | 209    | 209    | 209    | 209       | 261    | 261    |
|                | Max Ap                            | 0.008                     |                     | 0.012          | 0.014     | 0.016  | 0.018  | 0.020  | 0.022  | 0.020  | 0.022     |        |        |
|                | 330 - 490                         | n (rev/min)               |                     | 12530          | 8353      | 6265   | 5012   | 4177   | 3132   | 2506   | 3132      | 2506   |        |
|                |                                   | $f_z$ (in)                | 0.0023              | 0.0034         | 0.0045    | 0.0056 | 0.0068 | 0.0090 | 0.0113 | 0.0090 | 0.0113    |        |        |
| $v_f$ (in/min) |                                   | 113                       | 113                 | 113            | 113       | 113    | 113    | 113    | 141    | 141    |           |        |        |
| S              | E<br>21                           | 1.00                      | 100                 | n (rev/min)    | 3056      | 2037   | 1528   | 1222   | 1019   | 764    | 611       | 764    | 611    |
|                |                                   |                           |                     | $f_z$ (in)     | 0.0010    | 0.0015 | 0.0021 | 0.0026 | 0.0031 | 0.0041 | 0.0051    | 0.0041 | 0.0051 |
|                |                                   |                           | 90 - 110            | $v_f$ (in/min) | 13        | 13     | 13     | 13     | 13     | 13     | 13        | 16     | 16     |
|                |                                   |                           |                     | Max Ap         | 0.004     | 0.006  | 0.007  | 0.008  | 0.010  | 0.015  | 0.015     | 0.015  | 0.015  |



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SMG = Seco Material Group  
n [min-1] = RPM  
 $v_c$  (sf/min) = Surface feet/min

$f_z$  [in] = Feed/tooth  
 $a_p/D_c$  = % of diameter  
 $v_f$  [in/min] = Feed rate  
 $a_p/D_c$  = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

# SOLID END MILLING - CUTTING DATA

## MZN410R / MZN510R - 2 X D START VALUES - Inch

| SIDE MILLING |                                   |                           |                     |     |                |                |        |        |        |        |        |           |        |        |       |
|--------------|-----------------------------------|---------------------------|---------------------|-----|----------------|----------------|--------|--------|--------|--------|--------|-----------|--------|--------|-------|
| ISO GROUP    | SMG                               | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |     |                | $Z_n = 4$      |        |        |        |        |        | $Z_n = 5$ |        |        |       |
|              |                                   |                           |                     |     |                | 1/8            | 3/16   | 1/4    | 5/16   | 3/8    | 1/2    | 5/8       | 1/2    | 5/8    |       |
| P            | E / M / A<br>5 - 6                | 0.50                      | 825                 |     | n (rev/min)    | 25212          | 16808  | 12606  | 10085  | 8404   | 6303   | 5042      | 6303   | 5042   |       |
|              |                                   |                           |                     |     | $f_z$ (in)     | 0.0050         | 0.0075 | 0.0100 | 0.0125 | 0.0150 | 0.0200 | 0.0250    | 0.0200 | 0.0250 |       |
|              |                                   |                           | 770                 | -   | 880            | $v_f$ (in/min) | 504    | 504    | 504    | 504    | 504    | 504       | 504    | 630    | 630   |
|              |                                   |                           |                     |     |                | Max Ap         | 0.005  | 0.006  | 0.008  | 0.001  | 0.013  | 0.014     | 0.016  | 0.017  | 0.017 |
| H            | M / A / D<br>7a<br>(48-56<br>HRC) | 0.50                      | 480                 |     | n (rev/min)    | 14669          | 9779   | 7334   | 5868   | 4890   | 3667   | 2934      | 3667   | 2934   |       |
|              |                                   |                           |                     |     | $f_z$ (in)     | 0.0050         | 0.0075 | 0.0100 | 0.0125 | 0.0150 | 0.0200 | 0.0250    | 0.0200 | 0.0250 |       |
|              |                                   |                           | 430                 | -   | 530            | $v_f$ (in/min) | 293    | 293    | 293    | 293    | 293    | 293       | 293    | 367    | 367   |
|              | Max Ap                            | 0.005                     |                     |     |                | 0.006          | 0.008  | 0.001  | 0.013  | 0.014  | 0.016  | 0.017     | 0.017  |        |       |
|              | M / A / D<br>7b<br>(56-62<br>HRC) | 0.50                      | 260                 |     | n (rev/min)    | 7946           | 5297   | 3973   | 3178   | 2649   | 1986   | 1589      | 1986   | 1589   |       |
|              |                                   |                           |                     |     | $f_z$ (in)     | 0.0038         | 0.0056 | 0.0075 | 0.0094 | 0.0113 | 0.0150 | 0.0188    | 0.0150 | 0.0188 |       |
| 230          |                                   |                           | -                   | 290 | $v_f$ (in/min) | 119            | 119    | 119    | 119    | 119    | 119    | 119       | 149    | 149    |       |
|              | Max Ap                            | 0.004                     |                     |     | 0.006          | 0.007          | 0.009  | 0.011  | 0.015  | 0.019  | 0.015  | 0.019     |        |        |       |
| K            | E / M / A<br>12 - 13              | 0.50                      | 570                 |     | n (rev/min)    | 17419          | 11613  | 8710   | 6968   | 5806   | 4355   | 3484      | 4355   | 3484   |       |
|              |                                   |                           |                     |     | $f_z$ (in)     | 0.0050         | 0.0075 | 0.0100 | 0.0125 | 0.0150 | 0.0200 | 0.0250    | 0.0200 | 0.0250 |       |
|              |                                   |                           | 490                 | -   | 650            | $v_f$ (in/min) | 348    | 348    | 348    | 348    | 348    | 348       | 348    | 435    | 435   |
|              | Max Ap                            | 0.006                     |                     |     |                | 0.008          | 0.010  | 0.014  | 0.016  | 0.018  | 0.020  | 0.022     | 0.022  |        |       |
|              | E / M / A<br>14 - 15              | 0.50                      | 410                 |     | n (rev/min)    | 12530          | 8353   | 6265   | 5012   | 4177   | 3132   | 2506      | 3132   | 2506   |       |
|              |                                   |                           |                     |     | $f_z$ (in)     | 0.0038         | 0.0056 | 0.0075 | 0.0094 | 0.0113 | 0.0150 | 0.0188    | 0.0150 | 0.0188 |       |
| 330          |                                   |                           | -                   | 490 | $v_f$ (in/min) | 188            | 188    | 188    | 188    | 188    | 188    | 188       | 235    | 235    |       |
|              | Max Ap                            | 0.006                     |                     |     | 0.008          | 0.010          | 0.014  | 0.016  | 0.018  | 0.020  | 0.022  | 0.022     |        |        |       |
| S            | E<br>21                           | 0.50                      | 100                 |     | n (rev/min)    | 3056           | 2037   | 1528   | 1222   | 1019   | 764    | 611       | 764    | 611    |       |
|              |                                   |                           |                     |     | $f_z$ (in)     | 0.0026         | 0.0039 | 0.0052 | 0.0065 | 0.0078 | 0.0104 | 0.0130    | 0.0104 | 0.0130 |       |
|              |                                   |                           | 90                  | -   | 110            | $v_f$ (in/min) | 32     | 32     | 32     | 32     | 32     | 32        | 32     | 40     | 40    |
|              |                                   |                           |                     |     |                | Max Ap         | 0.004  | 0.005  | 0.007  | 0.008  | 0.010  | 0.015     | 0.015  | 0.015  | 0.015 |

SMG = Seco Material Group  
 n [min-1] = RPM  
 $v_c$  (sf/min) = Surface feet/min

$f_z$  [in] = Feed/tooth  
 $a_p/D_c$  = % of diameter  
 $v_f$  [in/min] = Feed rate  
 $a_p/D_c$  = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## MZN410R / MZN510R - START VALUES

| SIDE MILLING - ROUGHING |                      |                             |                         |                         |                       |                       |        |        |        |        |        |        |           |        |
|-------------------------|----------------------|-----------------------------|-------------------------|-------------------------|-----------------------|-----------------------|--------|--------|--------|--------|--------|--------|-----------|--------|
| ISO GROUP               | SMG                  | $a_e \times D_c^2$<br>(max) | $v_c$<br>(sf / min)     |                         | $Z_n = 4$             |                       |        |        |        |        |        |        | $Z_n = 5$ |        |
|                         |                      |                             |                         |                         | 1/8                   | 3/16                  | 1/4    | 5/16   | 3/8    | 1/2    | 5/8    | 1/2    | 5/8       |        |
| P                       | E / M / A<br>5 - 6   | 0.30                        | 740                     | n (rev/min)             | 22614                 | 15076                 | 11967  | 9046   | 7538   | 5654   | 4523   | 5654   | 4523      |        |
|                         |                      |                             |                         |                         | 790                   | f <sub>z</sub> (in)   | 0.0050 | 0.0075 | 0.0094 | 0.0125 | 0.0150 | 0.0200 | 0.0250    | 0.0200 |
|                         |                      |                             | 690                     | v <sub>f</sub> (in/min) |                       |                       | 452    | 452    | 452    | 452    | 452    | 452    | 452       | 565    |
|                         |                      |                             |                         |                         | 790                   | max (a <sub>p</sub> ) | 0.0047 | 0.0063 | 0.0079 | 0.0110 | 0.0126 | 0.0142 | 0.0157    | 0.0173 |
| H                       | M / A / D<br>7a      | 0.30                        | 480                     | n (rev/min)             |                       |                       | 14669  | 9779   | 7762   | 5868   | 4890   | 3667   | 2934      | 3667   |
|                         |                      |                             |                         |                         | 520                   | f <sub>z</sub> (in)   | 0.0050 | 0.0075 | 0.0094 | 0.0125 | 0.0150 | 0.0200 | 0.0250    | 0.0200 |
|                         |                      | 430                         | v <sub>f</sub> (in/min) | 293                     |                       |                       | 293    | 293    | 293    | 293    | 293    | 293    | 367       | 367    |
|                         |                      |                             |                         | 520                     | max (a <sub>p</sub> ) | 0.0047                | 0.0063 | 0.0079 | 0.0110 | 0.0126 | 0.0142 | 0.0157 | 0.0173    | 0.0173 |
|                         | M / A / D<br>7b      | 0.30                        | 260                     |                         |                       | n (rev/min)           | 7946   | 5297   | 4205   | 3178   | 2649   | 1986   | 1589      | 1986   |
|                         |                      |                             |                         | 300                     | f <sub>z</sub> (in)   |                       | 0.0038 | 0.0056 | 0.0071 | 0.0094 | 0.0113 | 0.0150 | 0.0188    | 0.0150 |
|                         |                      | 230                         | v <sub>f</sub> (in/min) |                         |                       | 119                   | 119    | 119    | 119    | 119    | 119    | 119    | 149       | 149    |
|                         |                      |                             |                         | 300                     | max (a <sub>p</sub> ) | 0.0047                | 0.0063 | 0.0079 | 0.0110 | 0.0126 | 0.0142 | 0.0157 | 0.0173    | 0.0173 |
| K                       | E / M / A<br>12 - 13 | 0.30                        | 570                     |                         |                       | n (rev/min)           | 17419  | 11613  | 9218   | 6968   | 5806   | 4355   | 3484      | 4355   |
|                         |                      |                             |                         | 660                     | f <sub>z</sub> (in)   |                       | 0.0050 | 0.0075 | 0.0094 | 0.0125 | 0.0150 | 0.0200 | 0.0250    | 0.0200 |
|                         |                      | 490                         | v <sub>f</sub> (in/min) |                         |                       | 348                   | 348    | 348    | 348    | 348    | 348    | 348    | 435       | 435    |
|                         |                      |                             |                         | 660                     | max (a <sub>p</sub> ) | 0.0059                | 0.0079 | 0.0098 | 0.0138 | 0.0157 | 0.0177 | 0.0197 | 0.0217    | 0.0217 |
|                         | E / M / A<br>14 - 15 | 0.30                        | 410                     |                         |                       | n (rev/min)           | 12530  | 8353   | 6630   | 5012   | 4177   | 3132   | 2506      | 3132   |
|                         |                      |                             |                         | 490                     | f <sub>z</sub> (in)   |                       | 0.0038 | 0.0056 | 0.0071 | 0.0094 | 0.0113 | 0.0150 | 0.0188    | 0.0150 |
|                         |                      | 330                         | v <sub>f</sub> (in/min) |                         |                       | 188                   | 188    | 188    | 188    | 188    | 188    | 188    | 235       | 235    |
|                         |                      |                             |                         | 490                     | max (a <sub>p</sub> ) | 0.0059                | 0.0079 | 0.0098 | 0.0138 | 0.0157 | 0.0177 | 0.0197 | 0.0217    | 0.0217 |
| S                       | E<br>21              | 0.30                        | 100                     |                         |                       | n (rev/min)           | 3056   | 2037   | 1617   | 1222   | 1019   | 764    | 611       | 764    |
|                         |                      |                             |                         | 110                     | f <sub>z</sub> (in)   |                       | 0.0026 | 0.0039 | 0.0049 | 0.0065 | 0.0078 | 0.0105 | 0.0130    | 0.0105 |
|                         |                      | 90                          | v <sub>f</sub> (in/min) |                         |                       | 32                    | 32     | 32     | 32     | 32     | 32     | 32     | 40        | 40     |
|                         |                      |                             |                         | 110                     | max (a <sub>p</sub> ) | 0.0038                | 0.0050 | 0.0070 | 0.0077 | 0.0100 | 0.0150 | 0.0150 | 0.0150    | 0.0150 |



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SMG = Seco Material Group  
n [min-1] = RPM  
 $v_c$  (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 $a_p/D_c$  = % of diameter  
v<sub>f</sub> [in/min] = Feed rate  
 $a_p/D_c$  = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.



## MZN410RM / MZN510RM - 2 X D START VALUES - Inch

| ISO GROUP  | SMG                               | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |                | SLOTTING    |        |        |        |        |        |           |        |        |
|------------|-----------------------------------|---------------------------|---------------------|----------------|-------------|--------|--------|--------|--------|--------|-----------|--------|--------|
|            |                                   |                           |                     |                | $Z_n = 4$   |        |        |        |        |        | $Z_n = 5$ |        |        |
|            |                                   |                           |                     |                | 2           | 3      | 4      | 6      | 8      | 10     | 12        | 10     | 12     |
| P          | E / M / A<br>5 - 6                | 1.00                      | 740                 | n (rev/min)    | 35900       | 23934  | 17950  | 11967  | 8975   | 7180   | 5983      | 7180   | 5983   |
|            |                                   |                           |                     | $f_z$ (in)     | 0.0020      | 0.0030 | 0.0039 | 0.0059 | 0.0079 | 0.0098 | 0.0118    | 0.0098 | 0.0118 |
|            |                                   |                           | 690 - 790           | $v_f$ (in/min) | 283         | 283    | 283    | 283    | 283    | 283    | 353       | 353    |        |
|            |                                   |                           |                     | Max Ap         | 0.006       | 0.008  | 0.010  | 0.014  | 0.019  | 0.020  | 0.022     | 0.020  | 0.022  |
| H          | M / A / D<br>7a<br>(48-56<br>HRC) | 1.00                      | 440                 | n (rev/min)    | 21346       | 14231  | 10673  | 7115   | 5337   | 4269   | 3558      | 4269   | 3558   |
|            |                                   |                           |                     | $f_z$ (in)     | 0.0020      | 0.0030 | 0.0039 | 0.0059 | 0.0079 | 0.0098 | 0.0118    | 0.0098 | 0.0118 |
|            |                                   | 390 - 490                 | $v_f$ (in/min)      | 168            | 168         | 168    | 168    | 168    | 168    | 210    | 210       |        |        |
|            |                                   |                           | Max Ap              | 0.006          | 0.008       | 0.010  | 0.014  | 0.019  | 0.020  | 0.022  | 0.020     | 0.022  |        |
|            | M / A / D<br>7b<br>(56-62<br>HRC) | 1.00                      | 230                 | n (rev/min)    | 11158       | 7439   | 5579   | 3719   | 2790   | 2232   | 1860      | 2232   | 1860   |
|            |                                   |                           |                     | $f_z$ (in)     | 0.0016      | 0.0024 | 0.0031 | 0.0047 | 0.0063 | 0.0079 | 0.0094    | 0.0079 | 0.0094 |
|            |                                   | 200 - 260                 | $v_f$ (in/min)      | 70             | 70          | 70     | 70     | 70     | 70     | 88     | 88        |        |        |
|            |                                   |                           | Max Ap              | 0.003          | 0.004       | 0.005  | 0.007  | 0.009  | 0.010  | 0.011  | 0.010     | 0.011  |        |
| K          | E / M / A<br>12 - 13              | 1.00                      | 570                 | n (rev/min)    | 27653       | 18435  | 13826  | 9218   | 6913   | 5531   | 4609      | 5531   | 4609   |
|            |                                   |                           |                     | $f_z$ (in)     | 0.0019      | 0.0028 | 0.0038 | 0.0057 | 0.0076 | 0.0094 | 0.0113    | 0.0094 | 0.0113 |
|            |                                   | 490 - 650                 | $v_f$ (in/min)      | 209            | 209         | 209    | 209    | 209    | 209    | 261    | 261       |        |        |
|            | Max Ap                            |                           | 0.006               | 0.008          | 0.010       | 0.014  | 0.016  | 0.018  | 0.020  | 0.018  | 0.020     |        |        |
|            | E / M / A<br>14 - 15              |                           | 1.00                | 410            | n (rev/min) | 19891  | 13260  | 9945   | 6630   | 4973   | 3978      | 3315   | 3978   |
|            |                                   | $f_z$ (in)                |                     |                | 0.0014      | 0.0021 | 0.0028 | 0.0043 | 0.0057 | 0.0071 | 0.0085    | 0.0071 | 0.0085 |
| 330 - 490  |                                   | $v_f$ (in/min)            | 113                 | 113            | 113         | 113    | 113    | 113    | 141    | 141    |           |        |        |
|            | Max Ap                            | 0.006                     | 0.008               | 0.010          | 0.014       | 0.016  | 0.018  | 0.020  | 0.018  | 0.020  |           |        |        |
|            | S                                 | E<br>21                   | 1.00                | 100            | n (rev/min) | 4851   | 3234   | 2426   | 1617   | 1213   | 970       | 809    | 970    |
| $f_z$ (in) |                                   |                           |                     |                | 0.0006      | 0.0010 | 0.0013 | 0.0019 | 0.0026 | 0.0032 | 0.0039    | 0.0032 | 0.0039 |
| 90 - 110   |                                   |                           | $v_f$ (in/min)      | 13             | 13          | 13     | 13     | 13     | 13     | 16     | 16        |        |        |
|            |                                   |                           | Max Ap              | 0.003          | 0.004       | 0.005  | 0.008  | 0.010  | 0.010  | 0.015  | 0.010     | 0.015  |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 $v_c$  (sf/min) = Surface feet/min

$f_z$  [in] = Feed/tooth  
 $a_p/D_c$  = % of diameter  
 $v_f$  [in/min] = Feed rate  
 $a_p/D_c$  = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## MZN410RM / MZN510RM - 2 X D START VALUES - Inch

| ISO GROUP | SMG                               | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |                | SIDE MILLING |        |        |        |        |        |           |        |        |
|-----------|-----------------------------------|---------------------------|---------------------|----------------|--------------|--------|--------|--------|--------|--------|-----------|--------|--------|
|           |                                   |                           |                     |                | $Z_n = 4$    |        |        |        |        |        | $Z_n = 5$ |        |        |
|           |                                   |                           |                     |                | 2            | 3      | 4      | 6      | 8      | 10     | 12        | 10     | 12     |
| P         | E / M / A<br>5 - 6                | 0.50                      | 825                 | n (rev/min)    | 40024        | 26683  | 20012  | 13341  | 10006  | 8005   | 6671      | 8005   | 6671   |
|           |                                   |                           |                     | $f_z$ (in)     | 0.0031       | 0.0047 | 0.0063 | 0.0094 | 0.0126 | 0.0157 | 0.0189    | 0.0157 | 0.0189 |
|           |                                   |                           | 770 - 880           | $v_f$ (in/min) | 504          | 504    | 504    | 504    | 504    | 504    | 504       | 630    | 630    |
|           |                                   |                           |                     | Max Ap         | 0.006        | 0.008  | 0.010  | 0.014  | 0.019  | 0.020  | 0.022     | 0.020  | 0.022  |
| H         | M / A / D<br>7a<br>(48-56<br>HRC) | 0.50                      | 480                 | n (rev/min)    | 23287        | 15524  | 11643  | 7762   | 5822   | 4657   | 3881      | 4657   | 3881   |
|           |                                   |                           |                     | $f_z$ (in)     | 0.0031       | 0.0047 | 0.0063 | 0.0094 | 0.0126 | 0.0157 | 0.0189    | 0.0157 | 0.0189 |
|           |                                   |                           | 430 - 530           | $v_f$ (in/min) | 293          | 293    | 293    | 293    | 293    | 293    | 293       | 367    | 367    |
|           |                                   |                           |                     | Max Ap         | 0.006        | 0.008  | 0.010  | 0.014  | 0.019  | 0.020  | 0.022     | 0.020  | 0.022  |
|           | M / A / D<br>7b<br>(56-62<br>HRC) | 0.50                      | 260                 | n (rev/min)    | 12614        | 8409   | 6307   | 4205   | 3153   | 2523   | 2102      | 2523   | 2102   |
|           |                                   |                           |                     | $f_z$ (in)     | 0.0024       | 0.0035 | 0.0047 | 0.0071 | 0.0094 | 0.0118 | 0.0142    | 0.0118 | 0.0142 |
|           |                                   |                           | 230 - 290           | $v_f$ (in/min) | 119          | 119    | 119    | 119    | 119    | 119    | 119       | 149    | 149    |
|           |                                   |                           |                     | Max Ap         | 0.003        | 0.004  | 0.005  | 0.007  | 0.009  | 0.010  | 0.011     | 0.010  | 0.011  |
| K         | E / M / A<br>12 - 13              | 0.50                      | 570                 | n (rev/min)    | 27653        | 18435  | 13826  | 9218   | 6913   | 5531   | 4609      | 5531   | 4609   |
|           |                                   |                           |                     | $f_z$ (in)     | 0.0031       | 0.0047 | 0.0063 | 0.0094 | 0.0126 | 0.0157 | 0.0189    | 0.0157 | 0.0189 |
|           |                                   |                           | 490 - 650           | $v_f$ (in/min) | 348          | 348    | 348    | 348    | 348    | 348    | 348       | 435    | 435    |
|           | Max Ap                            | 0.006                     |                     | 0.008          | 0.010        | 0.014  | 0.016  | 0.018  | 0.020  | 0.018  | 0.020     |        |        |
|           | E / M / A<br>14 - 15              | 0.50                      |                     | 410            | n (rev/min)  | 19891  | 13260  | 9945   | 6630   | 4973   | 3978      | 3315   | 3978   |
|           |                                   |                           | $f_z$ (in)          |                | 0.0024       | 0.0035 | 0.0047 | 0.0071 | 0.0094 | 0.0118 | 0.0142    | 0.0118 | 0.0142 |
| 330 - 490 |                                   |                           | $v_f$ (in/min)      | 188            | 188          | 188    | 188    | 188    | 188    | 188    | 235       | 235    |        |
|           | Max Ap                            | 0.006                     | 0.008               | 0.010          | 0.014        | 0.016  | 0.018  | 0.020  | 0.018  | 0.020  |           |        |        |
| S         | E<br>21                           | 0.50                      | 100                 | n (rev/min)    | 4851         | 3234   | 2426   | 1617   | 1213   | 970    | 809       | 970    | 809    |
|           |                                   |                           |                     | $f_z$ (in)     | 0.0016       | 0.0025 | 0.0033 | 0.0049 | 0.0066 | 0.0082 | 0.0098    | 0.0082 | 0.0098 |
|           |                                   |                           | 90 - 110            | $v_f$ (in/min) | 32           | 32     | 32     | 32     | 32     | 32     | 32        | 40     | 40     |
|           |                                   |                           |                     | Max Ap         | 0.003        | 0.004  | 0.005  | 0.008  | 0.010  | 0.010  | 0.015     | 0.010  | 0.015  |



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SMG = Seco Material Group  
n [min-1] = RPM  
 $v_c$  (sf/min) = Surface feet/min

$f_z$  [in] = Feed/tooth  
 $a_p/D_c$  = % of diameter  
 $v_f$  [in/min] = Feed rate  
 $a_p/D_c$  = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

# SOLID END MILLING - CUTTING DATA

## MZN410RM / MZN510RM - 4 X D START VALUES - Inch

| ISO GROUP      | SMG                               | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |                | SLOTTING  |        |        |        |        |        |           |        |        |
|----------------|-----------------------------------|---------------------------|---------------------|----------------|-----------|--------|--------|--------|--------|--------|-----------|--------|--------|
|                |                                   |                           |                     |                | $Z_n = 4$ |        |        |        |        |        | $Z_n = 5$ |        |        |
|                |                                   |                           |                     |                | 2         | 3      | 4      | 6      | 8      | 10     | 12        | 10     | 12     |
| P              | E / M / A<br>5 - 6                | 1.00                      | 740                 | n (rev/min)    | 35900     | 23934  | 17950  | 11967  | 8975   | 7180   | 5983      | 7180   | 5983   |
|                |                                   |                           |                     | $f_z$ (in)     | 0.0017    | 0.0025 | 0.0033 | 0.0050 | 0.0067 | 0.0084 | 0.0100    | 0.0084 | 0.0100 |
|                |                                   |                           | 690 - 790           | $v_f$ (in/min) | 240       | 240    | 240    | 240    | 240    | 240    | 300       | 300    |        |
|                |                                   |                           |                     | Max Ap         | 0.005     | 0.006  | 0.008  | 0.011  | 0.015  | 0.016  | 0.018     | 0.016  | 0.018  |
| H              | M / A / D<br>7a<br>(48-56<br>HRC) | 1.00                      | 440                 | n (rev/min)    | 21346     | 14231  | 10673  | 7115   | 5337   | 4269   | 3558      | 4269   | 3558   |
|                |                                   |                           |                     | $f_z$ (in)     | 0.0017    | 0.0025 | 0.0033 | 0.0050 | 0.0067 | 0.0084 | 0.0100    | 0.0084 | 0.0100 |
|                |                                   |                           | 390 - 490           | $v_f$ (in/min) | 143       | 143    | 143    | 143    | 143    | 143    | 179       | 179    |        |
|                | Max Ap                            | 0.005                     |                     | 0.006          | 0.008     | 0.011  | 0.015  | 0.016  | 0.018  | 0.016  | 0.018     |        |        |
|                | 200 - 260                         | n (rev/min)               |                     | 11158          | 7439      | 5579   | 3719   | 2790   | 2232   | 1860   | 2232      | 1860   |        |
|                |                                   | $f_z$ (in)                | 0.0013              | 0.0020         | 0.0027    | 0.0040 | 0.0054 | 0.0067 | 0.0080 | 0.0067 | 0.0080    |        |        |
| $v_f$ (in/min) |                                   | 60                        | 60                  | 60             | 60        | 60     | 60     | 60     | 75     | 75     |           |        |        |
|                | Max Ap                            | 0.002                     | 0.003               | 0.004          | 0.006     | 0.007  | 0.008  | 0.009  | 0.008  | 0.009  |           |        |        |
|                | K                                 | 1.00                      | 570                 | n (rev/min)    | 27653     | 18435  | 13826  | 9218   | 6913   | 5531   | 4609      | 5531   | 4609   |
|                |                                   |                           |                     | $f_z$ (in)     | 0.0016    | 0.0024 | 0.0032 | 0.0048 | 0.0064 | 0.0080 | 0.0096    | 0.0080 | 0.0096 |
| 490 - 650      |                                   |                           | $v_f$ (in/min)      | 178            | 178       | 178    | 178    | 178    | 178    | 222    | 222       |        |        |
|                |                                   |                           | Max Ap              | 0.005          | 0.006     | 0.008  | 0.011  | 0.013  | 0.014  | 0.016  | 0.014     | 0.016  |        |
|                | 1.00                              | 410                       | n (rev/min)         | 19891          | 13260     | 9945   | 6630   | 4973   | 3978   | 3315   | 3978      | 3315   |        |
|                |                                   |                           | $f_z$ (in)          | 0.0012         | 0.0018    | 0.0024 | 0.0036 | 0.0048 | 0.0060 | 0.0072 | 0.0060    | 0.0072 |        |
|                |                                   | 330 - 490                 | $v_f$ (in/min)      | 96             | 96        | 96     | 96     | 96     | 96     | 120    | 120       |        |        |
|                |                                   |                           | Max Ap              | 0.005          | 0.006     | 0.008  | 0.011  | 0.013  | 0.014  | 0.016  | 0.014     | 0.016  |        |
| S              | E<br>21                           | 1.00                      | 100                 | n (rev/min)    | 4851      | 3234   | 2426   | 1617   | 1213   | 970    | 809       | 970    | 809    |
|                |                                   |                           |                     | $f_z$ (in)     | 0.0005    | 0.0008 | 0.0011 | 0.0016 | 0.0022 | 0.0027 | 0.0033    | 0.0027 | 0.0033 |
|                |                                   |                           | 90 - 110            | $v_f$ (in/min) | 11        | 11     | 11     | 11     | 11     | 11     | 13        | 13     |        |
|                |                                   |                           |                     | Max Ap         | 0.002     | 0.003  | 0.004  | 0.006  | 0.008  | 0.008  | 0.012     | 0.008  | 0.012  |

SMG = Seco Material Group  
 n [min-1] = RPM  
 $v_c$  (sf/min) = Surface feet/min

$f_z$  [in] = Feed/tooth  
 $a_p/D_c$  = % of diameter  
 $v_f$  [in/min] = Feed rate  
 $a_p/D_c$  = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

**MZN410RM / MZN510RM - 4 X D START VALUES - Inch**

| SIDE MILLING |                                |                           |                           |                         |                    |        |        |        |        |        |                    |        |        |
|--------------|--------------------------------|---------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------------------|--------|--------|
| ISO GROUP    | SMG                            | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |        |        |        |        |        | Z <sub>n</sub> = 5 |        |        |
|              |                                |                           |                           |                         | 2                  | 3      | 4      | 6      | 8      | 10     | 12                 | 10     | 12     |
| P            | E / M / A<br>5 - 6             | 0.50                      | 825                       | n (rev/min)             | 40024              | 26683  | 20012  | 13341  | 10006  | 8005   | 6671               | 8005   | 6671   |
|              |                                |                           |                           | f <sub>z</sub> (in)     | 0.0027             | 0.0040 | 0.0054 | 0.0080 | 0.0107 | 0.0134 | 0.0161             | 0.0134 | 0.0161 |
|              |                                |                           | 770 - 880                 | v <sub>f</sub> (in/min) | 429                | 429    | 429    | 429    | 429    | 429    | 429                | 536    | 536    |
|              |                                |                           |                           | Max Ap                  | 0.005              | 0.006  | 0.008  | 0.011  | 0.015  | 0.016  | 0.018              | 0.016  | 0.018  |
| H            | M / A / D<br>7a<br>(48-56 HRC) | 0.50                      | 480                       | n (rev/min)             | 23287              | 15524  | 11643  | 7762   | 5822   | 4657   | 3881               | 4657   | 3881   |
|              |                                |                           |                           | f <sub>z</sub> (in)     | 0.0027             | 0.0040 | 0.0054 | 0.0080 | 0.0107 | 0.0134 | 0.0161             | 0.0134 | 0.0161 |
|              |                                |                           | 430 - 530                 | v <sub>f</sub> (in/min) | 249                | 249    | 249    | 249    | 249    | 249    | 249                | 312    | 312    |
|              | Max Ap                         | 0.005                     |                           | 0.006                   | 0.008              | 0.011  | 0.015  | 0.016  | 0.018  | 0.016  | 0.018              |        |        |
|              | M / A / D<br>7b<br>(56-62 HRC) | 0.50                      | 260                       | n (rev/min)             | 12614              | 8409   | 6307   | 4205   | 3153   | 2523   | 2102               | 2523   | 2102   |
|              |                                |                           |                           | f <sub>z</sub> (in)     | 0.0020             | 0.0030 | 0.0040 | 0.0060 | 0.0080 | 0.0100 | 0.0120             | 0.0100 | 0.0120 |
| 230 - 290    |                                |                           | v <sub>f</sub> (in/min)   | 101                     | 101                | 101    | 101    | 101    | 101    | 101    | 127                | 127    |        |
|              | Max Ap                         | 0.002                     | 0.003                     | 0.004                   | 0.006              | 0.007  | 0.008  | 0.009  | 0.008  | 0.009  |                    |        |        |
| K            | E / M / A<br>12 - 13           | 0.50                      | 570                       | n (rev/min)             | 27653              | 18435  | 13826  | 9218   | 6913   | 5531   | 4609               | 5531   | 4609   |
|              |                                |                           |                           | f <sub>z</sub> (in)     | 0.0027             | 0.0040 | 0.0054 | 0.0080 | 0.0107 | 0.0134 | 0.0161             | 0.0134 | 0.0161 |
|              |                                |                           | 490 - 650                 | v <sub>f</sub> (in/min) | 296                | 296    | 296    | 296    | 296    | 296    | 296                | 370    | 370    |
|              | Max Ap                         | 0.005                     |                           | 0.006                   | 0.008              | 0.011  | 0.013  | 0.014  | 0.016  | 0.014  | 0.016              |        |        |
|              | E / M / A<br>14 - 15           | 0.50                      | 410                       | n (rev/min)             | 19891              | 13260  | 9945   | 6630   | 4973   | 3978   | 3315               | 3978   | 3315   |
|              |                                |                           |                           | f <sub>z</sub> (in)     | 0.0020             | 0.0030 | 0.0040 | 0.0060 | 0.0080 | 0.0100 | 0.0120             | 0.0100 | 0.0120 |
| 330 - 490    |                                |                           | v <sub>f</sub> (in/min)   | 160                     | 160                | 160    | 160    | 160    | 160    | 160    | 200                | 200    |        |
|              | Max Ap                         | 0.005                     | 0.006                     | 0.008                   | 0.011              | 0.013  | 0.014  | 0.016  | 0.014  | 0.016  |                    |        |        |
| S            | E<br>21                        | 0.50                      | 100                       | n (rev/min)             | 4851               | 3234   | 2426   | 1617   | 1213   | 970    | 809                | 970    | 809    |
|              |                                |                           |                           | f <sub>z</sub> (in)     | 0.001              | 0.002  | 0.003  | 0.004  | 0.006  | 0.007  | 0.008              | 0.007  | 0.008  |
|              |                                |                           | 90 - 110                  | v <sub>f</sub> (in/min) | 27                 | 27     | 27     | 27     | 27     | 27     | 27                 | 34     | 34     |
|              |                                |                           |                           | Max Ap                  | 0.002              | 0.003  | 0.004  | 0.006  | 0.008  | 0.008  | 0.012              | 0.008  | 0.012  |

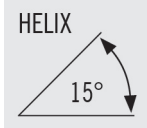

**MZ645 / MZ645R - START VALUES - Inch**

| SIDE MILLING - ROUGHING |                               |                           |                           |                           |                         |                    |         |         |         |         |         |
|-------------------------|-------------------------------|---------------------------|---------------------------|---------------------------|-------------------------|--------------------|---------|---------|---------|---------|---------|
| ISO GROUP               | SMG                           | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 6 |         |         |         |         |         |
|                         |                               |                           |                           |                           |                         | 1/8                | 3/16    | 1/4     | 5/16    | 3/8     | 1/2     |
| P                       | E<br>5 - 6                    | 1.50                      | 0.10                      | 450                       | n (rev/min)             | 13752              | 9168    | 6876    | 5501    | 4584    | 3438    |
|                         |                               |                           |                           |                           | f <sub>z</sub> (in)     | 0.00075            | 0.00113 | 0.00150 | 0.00188 | 0.00225 | 0.00300 |
|                         |                               |                           |                           | 390 - 510                 | v <sub>f</sub> (in/min) | 62                 | 62      | 62      | 62      | 62      | 62      |
| H                       | M / A / D<br>7a<br>(48-56HRC) | 1.00                      | 0.05                      | 450                       | n (rev/min)             | 13752              | 9168    | 6876    | 5501    | 4584    | 3438    |
|                         |                               |                           |                           |                           | f <sub>z</sub> (in)     | 0.00056            | 0.00084 | 0.00113 | 0.00141 | 0.00169 | 0.00225 |
|                         |                               |                           |                           | 435 - 465                 | v <sub>f</sub> (in/min) | 46                 | 46      | 46      | 46      | 46      | 46      |
|                         | M / A / D<br>7b<br>(56-62HRC) | 1.00                      | 0.02                      | 400                       | n (rev/min)             | 12224              | 8149    | 6112    | 4890    | 4075    | 3056    |
|                         |                               |                           |                           |                           | f <sub>z</sub> (in)     | 0.00040            | 0.00060 | 0.00080 | 0.00100 | 0.00120 | 0.00160 |
| 385 - 415               | v <sub>f</sub> (in/min)       | 29                        | 29                        | 29                        | 29                      | 29                 | 29      |         |         |         |         |



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# MB215 & MB215M

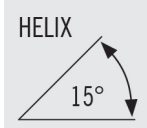

|               |  |   |                |
|---------------|--|---|----------------|
| SOLID CARBIDE |  <p>HELIX<br/>15°</p> |  <p>BALL END</p> | CENTER CUTTING |
|---------------|--|---|----------------|



- Cylindrical Shank
- 7° Draft Angle
- Ideal for milling hardened mold and die steels up to 52HRc
- Rough and finish milling of contours and complex shapes
- Cutting Data MB215 - Page 162
- Tolerance Specs MB215 - Page 323
- Cutting Data MB215M - Page 162
- Tolerance Specs MB215M - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|
| <b>INCH - MB215</b>    |                       |           |           |               |                |          |       |        |         |
| <a href="#">N76671</a> | MB215-0.063-G1-B.0-Z2 | 1/16      | 1/4       | 1/16          | 2-1/2          | 0.059    | 1/8   | 2      | ALTIN   |
| <a href="#">N76673</a> | MB215-0.125-G1-B.0-Z2 | 1/8       | 1/4       | 1/8           | 3              | 0.121    | 1/4   | 2      | ALTIN   |
| <a href="#">N76675</a> | MB215-0.250-E1-B.0-Z2 | 1/4       | 1/4       | 1/4           | 3              | 0.246    | 1/2   | 2      | ALTIN   |
| <a href="#">N76677</a> | MB215-0.375-E1-B.0-Z2 | 3/8       | 3/8       | 3/8           | 3              | 0.367    | 3/4   | 2      | ALTIN   |
| <a href="#">N76679</a> | MB215-0.500-E1-B.0-Z2 | 1/2       | 1/2       | 1/2           | 4              | 0.492    | 1     | 2      | ALTIN   |
| <b>METRIC - MB215M</b> |                       |           |           |               |                |          |       |        |         |
| <a href="#">N76660</a> | MB215M-010-G1-B.0-Z2  | 1mm       | 6mm       | 1mm           | 64mm           | 0.9mm    | 2mm   | 2      | ALTIN   |
| <a href="#">N76661</a> | MB215M-020-G1-B.0-Z2  | 2mm       | 6mm       | 2mm           | 64mm           | 1.9mm    | 4mm   | 2      | ALTIN   |
| <a href="#">N76662</a> | MB215M-030-G1-B.0-Z2  | 3mm       | 6mm       | 3mm           | 64mm           | 2.9mm    | 6mm   | 2      | ALTIN   |
| <a href="#">N76663</a> | MB215M-040-G1-B.0-Z2  | 4mm       | 6mm       | 4mm           | 64mm           | 3.9mm    | 8mm   | 2      | ALTIN   |
| <a href="#">N76665</a> | MB215M-060-E1-B.0-Z2  | 6mm       | 6mm       | 6mm           | 64mm           | 5.9mm    | 12mm  | 2      | ALTIN   |
| <a href="#">N76666</a> | MB215M-080-E1-B.0-Z2  | 8mm       | 8mm       | 8mm           | 80mm           | 7.8mm    | 16mm  | 2      | ALTIN   |
| <a href="#">N76667</a> | MB215M-100-E1-B.0-Z2  | 10mm      | 10mm      | 10mm          | 82mm           | 9.8mm    | 20mm  | 2      | ALTIN   |
| <a href="#">N76668</a> | MB215M-120-E1-B.0-Z2  | 12mm      | 12mm      | 12mm          | 100mm          | 11.8mm   | 24mm  | 2      | ALTIN   |

# MBZ215

|               |  |   |                |
|---------------|--|---|----------------|
| SOLID CARBIDE |  <p>HELIX<br/>15°</p> |  <p>BALL END</p> | CENTER CUTTING |
|---------------|--|---|----------------|



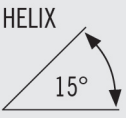
- Cylindrical Shank
- 7° Draft Angle
- Ideal for milling hardened mold and die steels up to 62HRc
- Rough and finish milling of contours and complex shapes
- Cutting Data - Page 163
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING |
|------------------------|------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|
| <a href="#">N76691</a> | MBZ215-0.063-G1-B.0-Z2 | 1/16      | 1/4       | 1/16          | 2-1/2          | 0.059    | 1/8   | 2      | ALTIN   |
| <a href="#">N76693</a> | MBZ215-0.125-G1-B.0-Z2 | 1/8       | 1/4       | 1/8           | 3              | 0.121    | 1/4   | 2      | ALTIN   |
| <a href="#">N76695</a> | MBZ215-0.250-E1-B.0-Z2 | 1/4       | 1/4       | 1/4           | 3              | 0.246    | 1/2   | 2      | ALTIN   |
| <a href="#">N76697</a> | MBZ215-0.375-E1-B.0-Z2 | 3/8       | 3/8       | 3/8           | 3              | 0.367    | 3/4   | 2      | ALTIN   |
| <a href="#">N76699</a> | MBZ215-0.500-E1-B.0-Z2 | 1/2       | 1/2       | 1/2           | 4              | 0.492    | 1     | 2      | ALTIN   |

# MBZ215M


SOLID  
CARBIDE

HELIX



15°

BALL END





CENTER  
CUTTING



- Cylindrical Shank
  - 7° Draft Angle
  - Ideal for milling hardened mold and die steels up to 62HRc
  - Rough and finish milling of contours and complex shapes
- Cutting Data - Page 163
  - Tolerance Specs - Page 323

| PRODUCT NUMBER           | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH  | FLUTES | COATING | SHANK TYPE  |
|--------------------------|------------------------|-----------|-----------|---------------|----------------|----------|--------|--------|---------|-------------|
| <a href="#">03180803</a> | MBZ215M-005-G2-B.0-Z2  | .5mm      | 6mm       | 0.5mm         | 60mm           | 0.45mm   | 1mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180804</a> | MBZ215M-005-G4-B.0-Z2  | .5mm      | 6mm       | 0.5mm         | 60mm           | 0.45mm   | 2mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180805</a> | MBZ215M-005-J6-B.0-Z2  | .5mm      | 6mm       | 0.5mm         | 60mm           | 0.45mm   | 3mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180806</a> | MBZ215M-008-G2-B.0-Z2  | .8mm      | 6mm       | .8mm          | 60mm           | 0.75mm   | 1.6mm  | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180807</a> | MBZ215M-008-G4-B.0-Z2  | .8mm      | 6mm       | .8mm          | 60mm           | 0.75mm   | 3.2mm  | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180808</a> | MBZ215M-008-J6-B.0-Z2  | .8mm      | 6mm       | .8mm          | 60mm           | 0.75mm   | 4.8mm  | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180809</a> | MBZ215M-010-G2-B.0-Z2  | 1mm       | 6mm       | 1mm           | 60mm           | 0.95mm   | 2mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180810</a> | MBZ215M-010-G4-B.0-Z2  | 1mm       | 6mm       | 1mm           | 60mm           | 0.95mm   | 4mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180811</a> | MBZ215M-010-J6-B.0-Z2  | 1mm       | 6mm       | 1mm           | 60mm           | 0.95mm   | 6mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180812</a> | MBZ215M-010-J37-B.0-Z2 | 1mm       | 6mm       | 1mm           | 80mm           | 0.95mm   | 37.2mm | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180813</a> | MBZ215M-015-G2-B.0-Z2  | 1.5mm     | 6mm       | 1.5mm         | 60mm           | 1.4mm    | 3mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180814</a> | MBZ215M-015-G4-B.0-Z2  | 1.5mm     | 6mm       | 1.5mm         | 60mm           | 1.4mm    | 6mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180815</a> | MBZ215M-015-J6-B.0-Z2  | 1.5mm     | 6mm       | 1.5mm         | 60mm           | 1.4mm    | 9mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180816</a> | MBZ215M-020-G2-B.0-Z2  | 2mm       | 6mm       | 2mm           | 60mm           | 1.9mm    | 4mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180817</a> | MBZ215M-020-G4-B.0-Z2  | 2mm       | 6mm       | 2mm           | 60mm           | 1.9mm    | 8mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180818</a> | MBZ215M-020-J6-B.0-Z2  | 2mm       | 6mm       | 2mm           | 60mm           | 1.9mm    | 12mm   | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180819</a> | MBZ215M-020-J19-B.0-Z2 | 2mm       | 6mm       | 2mm           | 80mm           | 1.9mm    | 37.2mm | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180820</a> | MBZ215M-025-G2-B.0-Z2  | 2.5mm     | 6mm       | 2.5mm         | 60mm           | 2.4mm    | 5mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180821</a> | MBZ215M-025-G4-B.0-Z2  | 2.5mm     | 6mm       | 2.5mm         | 60mm           | 2.4mm    | 10mm   | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180822</a> | MBZ215M-025-J6-B.0-Z2  | 2.5mm     | 6mm       | 2.5mm         | 60mm           | 2.4mm    | 15mm   | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180823</a> | MBZ215M-030-G2-B.0-Z2  | 3mm       | 6mm       | 3mm           | 60mm           | 2.8mm    | 6mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180824</a> | MBZ215M-030-G4-B.0-Z2  | 3mm       | 6mm       | 3mm           | 60mm           | 2.8mm    | 12mm   | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180825</a> | MBZ215M-030-J6-B.0-Z2  | 3mm       | 6mm       | 3mm           | 65mm           | 2.8mm    | 18mm   | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180826</a> | MBZ215M-030-J13-B.0-Z2 | 3mm       | 6mm       | 3mm           | 80mm           | 2.8mm    | 39.6mm | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180827</a> | MBZ215M-040-G2-B.0-Z2  | 4mm       | 6mm       | 4mm           | 60mm           | 3.7mm    | 8mm    | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180828</a> | MBZ215M-040-G4-B.0-Z2  | 4mm       | 6mm       | 4mm           | 65mm           | 3.7mm    | 16mm   | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180829</a> | MBZ215M-040-J6-B.0-Z2  | 4mm       | 6mm       | 4mm           | 65mm           | 3.7mm    | 24mm   | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180830</a> | MBZ215M-040-J12-B.0-Z2 | 4mm       | 6mm       | 4mm           | 100mm          | 3.7mm    | 47.8mm | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180831</a> | MBZ215M-050-G2-B.0-Z2  | 5mm       | 6mm       | 5mm           | 60mm           | 4.6mm    | 10mm   | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180832</a> | MBZ215M-050-G4-B.0-Z2  | 5mm       | 6mm       | 5mm           | 65mm           | 4.6mm    | 20mm   | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180833</a> | MBZ215M-050-J6-B.0-Z2  | 5mm       | 6mm       | 5mm           | 75mm           | 4.6mm    | 30mm   | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180834</a> | MBZ215M-050-J11-B.0-Z2 | 5mm       | 8mm       | 5mm           | 100mm          | 4.6mm    | 56.8mm | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180835</a> | MBZ215M-060-D1-B.0-Z2  | 6mm       | 6mm       | 6mm           | 50mm           | -        | -      | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180836</a> | MBZ215M-060-D2-B.0-Z2  | 6mm       | 6mm       | 6mm           | 75mm           | -        | -      | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180837</a> | MBZ215M-060-J6-B.0-Z2  | 6mm       | 8mm       | 6mm           | 75mm           | 5.6mm    | 36mm   | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180838</a> | MBZ215M-060-J9-B.0-Z2  | 6mm       | 8mm       | 6mm           | 100mm          | 5.6mm    | 51.7mm | 2      | ALTIN   | CYLINDRICAL |

**MBZ215M (CON'T)**

|               |  |   |                |
|---------------|--|---|----------------|
| SOLID CARBIDE |  <p>HELIX<br/>15°</p> |  <p>BALL END</p> | CENTER CUTTING |
|---------------|--|---|----------------|



- Cylindrical Shank
- 7° Draft Angle
- Ideal for milling hardened mold and die steels up to 62HRc
- Rough and finish milling of contours and complex shapes
- Cutting Data - Page 163
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| PRODUCT NUMBER           | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH  | FLUTES | COATING | SHANK TYPE  |
|--------------------------|-----------------------|-----------|-----------|---------------|----------------|----------|--------|--------|---------|-------------|
| <a href="#">03180839</a> | MBZ215M-080-D1-B.0-Z2 | 8mm       | 8mm       | 8mm           | 60mm           |          | -      | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180840</a> | MBZ215M-080-D2-B.0-Z2 | 8mm       | 8mm       | 8mm           | 75mm           |          | -      | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180841</a> | MBZ215M-080-J6-B.0-Z2 | 8mm       | 10mm      | 8mm           | 100mm          | 7.4mm    | 48mm   | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180842</a> | MBZ215M-080-J7-B.0-Z2 | 8mm       | 10mm      | 8mm           | 125mm          | 7.4mm    | 57.5mm | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180843</a> | MBZ215M-100-D1-B.0-Z2 | 10mm      | 10mm      | 10mm          | 70mm           |          | -      | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180844</a> | MBZ215M-100-D2-B.0-Z2 | 10mm      | 10mm      | 10mm          | 85mm           |          | -      | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180845</a> | MBZ215M-100-J6-B.0-Z2 | 10mm      | 12mm      | 10mm          | 125mm          | 9.4mm    | 60mm   | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180846</a> | MBZ215M-120-D1-B.0-Z2 | 12mm      | 12mm      | 12mm          | 75mm           |          | -      | 2      | ALTIN   | CYLINDRICAL |
| <a href="#">03180847</a> | MBZ215M-120-D2-B.0-Z2 | 12mm      | 12mm      | 12mm          | 100mm          |          | -      | 2      | ALTIN   | CYLINDRICAL |

## MBZ215 - START VALUES - Inch

| COPY MILLING - ROUGHING |                                |                           |                           |                           |                         |                    |        |        |        |        |        |
|-------------------------|--------------------------------|---------------------------|---------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG                            | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 2 |        |        |        |        |        |
|                         |                                |                           |                           |                           |                         | 1/16               | 1/8    | 3/16   | 1/4    | 3/8    | 1/2    |
| H                       | M / A / D<br>7a<br>(48-56 HRC) | 0.10                      | 0.30                      | 560                       | n (rev/min)             | 33960              | 17110  | 11380  | 8560   | 5700   | 4280   |
|                         |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0012             | 0.0024 | 0.0036 | 0.0048 | 0.0071 | 0.0095 |
|                         |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 81                 | 81     | 81     | 81     | 81     | 81     |
|                         | M / A / D<br>7b<br>(56-62 HRC) | 0.07                      | 0.25                      | 390                       | n (rev/min)             | 23650              | 11920  | 7920   | 5960   | 3970   | 2980   |
|                         |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0019 | 0.0028 | 0.0038 | 0.0056 | 0.0075 |
|                         |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 45                 | 45     | 45     | 45     | 45     | 45     |
|                         | M / A / D<br>7c<br>(62-65 HRC) | 0.05                      | 0.20                      | 260                       | n (rev/min)             | 15770              | 7950   | 5280   | 3970   | 2650   | 1990   |
|                         |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0008             | 0.0016 | 0.0024 | 0.0033 | 0.0049 | 0.0065 |
|                         |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 26                 | 26     | 26     | 26     | 26     | 26     |
|                         | M / A / D<br>7d<br>(>65 HRC)   | 0.04                      | 0.15                      | 160                       | n (rev/min)             | 9700               | 4890   | 3250   | 2440   | 1630   | 1220   |
|                         |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0007             | 0.0014 | 0.0021 | 0.0028 | 0.0041 | 0.0055 |
|                         |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 13                 | 13     | 13     | 13     | 13     | 13     |
| K                       | E<br>12 - 13                   | 0.15                      | 0.30                      | 820                       | n (rev/min)             | 49720              | 25060  | 16660  | 12530  | 8350   | 6260   |
|                         |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0008             | 0.0016 | 0.0024 | 0.0033 | 0.0049 | 0.0065 |
|                         |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 81                 | 81     | 81     | 81     | 81     | 81     |
|                         | E<br>14 - 15                   | 0.14                      | 0.20                      | 660                       | n (rev/min)             | 40020              | 20170  | 13410  | 10080  | 6720   | 5040   |
|                         |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0008             | 0.0015 | 0.0023 | 0.0030 | 0.0045 | 0.0060 |
|                         |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 61                 | 61     | 61     | 61     | 61     | 61     |

| COPY MILLING - FINISHING |                                |                           |                           |                           |                         |                    |        |        |        |        |        |
|--------------------------|--------------------------------|---------------------------|---------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|
| ISO GROUP                | SMG                            | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 2 |        |        |        |        |        |
|                          |                                |                           |                           |                           |                         | 1/16               | 1/8    | 3/16   | 1/4    | 3/8    | 1/2    |
| H                        | M / A / D<br>7a<br>(48-56 HRC) | 0.02                      | 0.01                      | 920                       | n (rev/min)             | 55780              | 28120  | 18690  | 14060  | 9370   | 7030   |
|                          |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0008             | 0.0016 | 0.0024 | 0.0033 | 0.0049 | 0.0065 |
|                          |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 91                 | 91     | 91     | 91     | 91     | 91     |
|                          | M / A / D<br>7b<br>(56-62 HRC) | 0.02                      | 0.01                      | 560                       | n (rev/min)             | 33960              | 17110  | 11380  | 8560   | 5700   | 4280   |
|                          |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0008             | 0.0015 | 0.0023 | 0.0030 | 0.0045 | 0.0060 |
|                          |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 51                 | 51     | 51     | 51     | 51     | 51     |
|                          | M / A / D<br>7c<br>(62-65 HRC) | 0.01                      | 0.01                      | 360                       | n (rev/min)             | 21830              | 11000  | 7310   | 5500   | 3670   | 2750   |
|                          |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0006             | 0.0013 | 0.0019 | 0.0025 | 0.0038 | 0.0050 |
|                          |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 28                 | 28     | 28     | 28     | 28     | 28     |
|                          | M / A / D<br>7d<br>(>65 HRC)   | 0.01                      | 0.01                      | 260                       | n (rev/min)             | 15770              | 7950   | 5280   | 3970   | 2650   | 1990   |
|                          |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0006             | 0.0013 | 0.0019 | 0.0025 | 0.0038 | 0.0050 |
|                          |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 20                 | 20     | 20     | 20     | 20     | 20     |
| K                        | E<br>12 - 13                   | 0.03                      | 0.02                      | 1130                      | n (rev/min)             | 68520              | 34530  | 22960  | 17270  | 11510  | 8630   |
|                          |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0019 | 0.0028 | 0.0038 | 0.0056 | 0.0075 |
|                          |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 129                | 129    | 129    | 129    | 129    | 129    |
|                          | E<br>14 - 15                   | 0.02                      | 0.02                      | 950                       | n (rev/min)             | 57600              | 29030  | 19300  | 14520  | 9680   | 7260   |
|                          |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0018 | 0.0026 | 0.0035 | 0.0053 | 0.0070 |
|                          |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 102                | 102    | 102    | 102    | 102    | 102    |



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# SOLID END MILLING - CUTTING DATA



## MBZ215M - UP TO 4 X D - START VALUES - Inch

| COPY MILLING - ROUGHING        |                                |                           |                           |                           |                         |                         |        |        |        |        |        |        |        |        |        |        |        |        |        |        |     |     |
|--------------------------------|--------------------------------|---------------------------|---------------------------|---------------------------|-------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----|-----|
| ISO GROUP                      | SMG                            | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 2      |        |        |        |        |        |        |        |        |        |        |        |        |        |        |     |     |
|                                |                                |                           |                           |                           |                         | 0.5                     | 0.8    | 1      | 1.5    | 2      | 2.5    | 3      | 3.5    | 4      | 5      | 6      | 8      | 10     | 12     |        |     |     |
| H                              | M / A / D<br>7a<br>(48-56 HRC) | 0.10                      | 0.30                      | 560                       | n (rev/min)             | 108663                  | 67914  | 54332  | 36221  | 27166  | 21733  | 18111  | 15523  | 13583  | 10866  | 9055   | 6791   | 5433   | 4528   |        |     |     |
|                                |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0004                  | 0.0006 | 0.0007 | 0.0011 | 0.0015 | 0.0019 | 0.0022 | 0.0026 | 0.0030 | 0.0037 | 0.0045 | 0.0060 | 0.0075 | 0.0090 |        |     |     |
|                                |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 81                      | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81  | 81  |
|                                |                                |                           |                           |                           | 460 - 660               | n (rev/min)             | 75676  | 47298  | 37838  | 25225  | 18919  | 15135  | 12613  | 10811  | 9460   | 7568   | 6306   | 4730   | 3784   | 3153   |     |     |
|                                |                                |                           |                           |                           |                         | f <sub>z</sub> (in)     | 0.0003 | 0.0005 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0021 | 0.0024 | 0.0030 | 0.0035 | 0.0047 | 0.0059 | 0.0071 |     |     |
|                                |                                |                           |                           |                           |                         | v <sub>f</sub> (in/min) | 45     | 45     | 45     | 45     | 45     | 45     | 45     | 45     | 45     | 45     | 45     | 45     | 45     | 45     | 45  | 45  |
|                                | M / A / D<br>7b<br>(56-62 HRC) | 0.07                      | 0.25                      | 390                       | n (rev/min)             | 50451                   | 31532  | 25225  | 16817  | 12613  | 10090  | 8408   | 7207   | 6306   | 5045   | 4204   | 3153   | 2523   | 2102   |        |     |     |
|                                |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0003                  | 0.0004 | 0.0005 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0026 | 0.0031 | 0.0041 | 0.0051 | 0.0061 |        |     |     |
|                                |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 26                      | 26     | 26     | 26     | 26     | 26     | 26     | 26     | 26     | 26     | 26     | 26     | 26     | 26     | 26     | 26  | 26  |
|                                |                                |                           |                           |                           | 200 - 330               | n (rev/min)             | 31047  | 19404  | 15523  | 10349  | 7762   | 6209   | 5174   | 4435   | 3881   | 3105   | 2587   | 1940   | 1552   | 1294   |     |     |
|                                |                                |                           |                           |                           |                         | f <sub>z</sub> (in)     | 0.0002 | 0.0003 | 0.0004 | 0.0006 | 0.0009 | 0.0011 | 0.0013 | 0.0015 | 0.0017 | 0.0022 | 0.0026 | 0.0035 | 0.0043 | 0.0052 |     |     |
|                                |                                |                           |                           |                           |                         | v <sub>f</sub> (in/min) | 13     | 13     | 13     | 13     | 13     | 13     | 13     | 13     | 13     | 13     | 13     | 13     | 13     | 13     | 13  | 13  |
| M / A / D<br>7c<br>(62-65 HRC) | 0.05                           | 0.20                      | 260                       | n (rev/min)               | 159114                  | 99446                   | 79557  | 53038  | 39778  | 31823  | 26519  | 22731  | 19889  | 15911  | 13259  | 9945   | 7956   | 6630   |        |        |     |     |
|                                |                                |                           |                           | f <sub>z</sub> (in)       | 0.0003                  | 0.0004                  | 0.0005 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0026 | 0.0031 | 0.0041 | 0.0051 | 0.0061 |        |        |     |     |
|                                |                                |                           |                           | v <sub>f</sub> (in/min)   | 81                      | 81                      | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81  |     |
|                                |                                |                           |                           | 660 - 980                 | n (rev/min)             | 128067                  | 80042  | 64034  | 42689  | 32017  | 25613  | 21345  | 18295  | 16008  | 12807  | 10672  | 8004   | 6403   | 5336   |        |     |     |
|                                |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002                  | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0012 | 0.0014 | 0.0017 | 0.0019 | 0.0024 | 0.0028 | 0.0038 | 0.0047 | 0.0057 |        |     |     |
|                                |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 61                      | 61     | 61     | 61     | 61     | 61     | 61     | 61     | 61     | 61     | 61     | 61     | 61     | 61     | 61     | 61  | 61  |
| M / A / D<br>7d<br>(>65 HRC)   | 0.04                           | 0.15                      | 160                       | n (rev/min)               | 178518                  | 111574                  | 89259  | 59506  | 44629  | 35704  | 29753  | 25503  | 22315  | 17852  | 14876  | 11157  | 8926   | 7438   |        |        |     |     |
|                                |                                |                           |                           | f <sub>z</sub> (in)       | 0.0003                  | 0.0004                  | 0.0005 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0026 | 0.0031 | 0.0041 | 0.0051 | 0.0061 |        |        |     |     |
|                                |                                |                           |                           | v <sub>f</sub> (in/min)   | 91                      | 91                      | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91  |     |
|                                |                                |                           |                           | 690 - 1150                | n (rev/min)             | 108663                  | 67914  | 54332  | 36221  | 27166  | 21733  | 18111  | 15523  | 13583  | 10866  | 9055   | 6791   | 5433   | 4528   |        |     |     |
|                                |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002                  | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0012 | 0.0014 | 0.0017 | 0.0019 | 0.0024 | 0.0028 | 0.0038 | 0.0047 | 0.0057 |        |     |     |
|                                |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 51                      | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51  | 51  |
| M / A / D<br>7c<br>(62-65 HRC) | 0.01                           | 0.01                      | 360                       | n (rev/min)               | 69855                   | 43659                   | 34927  | 23285  | 17464  | 13971  | 11642  | 9979   | 8732   | 6985   | 5821   | 4366   | 3493   | 2911   |        |        |     |     |
|                                |                                |                           |                           | f <sub>z</sub> (in)       | 0.0002                  | 0.0003                  | 0.0004 | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0020 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |        |        |     |     |
|                                |                                |                           |                           | v <sub>f</sub> (in/min)   | 28                      | 28                      | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28  |     |
|                                |                                |                           |                           | 300 - 430                 | n (rev/min)             | 50451                   | 31532  | 25225  | 16817  | 12613  | 10090  | 8408   | 7207   | 6306   | 5045   | 4204   | 3153   | 2523   | 2102   |        |     |     |
|                                |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002                  | 0.0003 | 0.0004 | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0020 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |        |     |     |
|                                |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 20                      | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20  | 20  |
| M / A / D<br>7d<br>(>65 HRC)   | 0.01                           | 0.01                      | 260                       | n (rev/min)               | 219267                  | 137042                  | 109633 | 73089  | 54817  | 43853  | 36544  | 31324  | 27408  | 21927  | 18272  | 13704  | 10963  | 9136   |        |        |     |     |
|                                |                                |                           |                           | f <sub>z</sub> (in)       | 0.0003                  | 0.0005                  | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0021 | 0.0024 | 0.0030 | 0.0035 | 0.0047 | 0.0059 | 0.0071 |        |        |     |     |
|                                |                                |                           |                           | v <sub>f</sub> (in/min)   | 129                     | 129                     | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129 |     |
|                                |                                |                           |                           | 1050 - 1210               | n (rev/min)             | 184339                  | 115212 | 92170  | 61446  | 46085  | 36868  | 30723  | 26334  | 23042  | 18434  | 15362  | 11521  | 9217   | 7681   |        |     |     |
|                                |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0003                  | 0.0004 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 | 0.0028 | 0.0033 | 0.0044 | 0.0055 | 0.0066 |        |     |     |
|                                |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 102                     | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102 | 102 |

| COPY MILLING - FINISHING       |                                |                           |                           |                           |                         |                         |        |        |        |        |        |        |        |        |        |        |        |        |        |        |     |     |
|--------------------------------|--------------------------------|---------------------------|---------------------------|---------------------------|-------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----|-----|
| ISO GROUP                      | SMG                            | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 2      |        |        |        |        |        |        |        |        |        |        |        |        |        |        |     |     |
|                                |                                |                           |                           |                           |                         | 0.5                     | 0.8    | 1      | 1.5    | 2      | 2.5    | 3      | 3.5    | 4      | 5      | 6      | 8      | 10     | 12     |        |     |     |
| H                              | M / A / D<br>7a<br>(48-56 HRC) | 0.02                      | 0.01                      | 920                       | n (rev/min)             | 178518                  | 111574 | 89259  | 59506  | 44629  | 35704  | 29753  | 25503  | 22315  | 17852  | 14876  | 11157  | 8926   | 7438   |        |     |     |
|                                |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0003                  | 0.0004 | 0.0005 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0018 | 0.0020 | 0.0026 | 0.0031 | 0.0041 | 0.0051 | 0.0061 |        |     |     |
|                                |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 91                      | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91  | 91  |
|                                |                                |                           |                           |                           | 690 - 1150              | n (rev/min)             | 108663 | 67914  | 54332  | 36221  | 27166  | 21733  | 18111  | 15523  | 13583  | 10866  | 9055   | 6791   | 5433   | 4528   |     |     |
|                                |                                |                           |                           |                           |                         | f <sub>z</sub> (in)     | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0012 | 0.0014 | 0.0017 | 0.0019 | 0.0024 | 0.0028 | 0.0038 | 0.0047 | 0.0057 |     |     |
|                                |                                |                           |                           |                           |                         | v <sub>f</sub> (in/min) | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51     | 51  | 51  |
|                                | M / A / D<br>7b<br>(56-62 HRC) | 0.02                      | 0.01                      | 560                       | n (rev/min)             | 69855                   | 43659  | 34927  | 23285  | 17464  | 13971  | 11642  | 9979   | 8732   | 6985   | 5821   | 4366   | 3493   | 2911   |        |     |     |
|                                |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002                  | 0.0003 | 0.0004 | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0020 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |        |     |     |
|                                |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 28                      | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28     | 28  | 28  |
|                                |                                |                           |                           |                           | 430 - 690               | n (rev/min)             | 50451  | 31532  | 25225  | 16817  | 12613  | 10090  | 8408   | 7207   | 6306   | 5045   | 4204   | 3153   | 2523   | 2102   |     |     |
|                                |                                |                           |                           |                           |                         | f <sub>z</sub> (in)     | 0.0002 | 0.0003 | 0.0004 | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0020 | 0.0024 | 0.0031 | 0.0039 | 0.0047 |     |     |
|                                |                                |                           |                           |                           |                         | v <sub>f</sub> (in/min) | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20     | 20  | 20  |
| M / A / D<br>7c<br>(62-65 HRC) | 0.01                           | 0.01                      | 360                       | n (rev/min)               | 219267                  | 137042                  | 109633 | 73089  | 54817  | 43853  | 36544  | 31324  | 27408  | 21927  | 18272  | 13704  | 10963  | 9136   |        |        |     |     |
|                                |                                |                           |                           | f <sub>z</sub> (in)       | 0.0003                  | 0.0005                  | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0021 | 0.0024 | 0.0030 | 0.0035 | 0.0047 | 0.0059 | 0.0071 |        |        |     |     |
|                                |                                |                           |                           | v <sub>f</sub> (in/min)   | 129                     | 129                     | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129    | 129 |     |
|                                |                                |                           |                           | 300 - 430                 | n (rev/min)             | 184339                  | 115212 | 92170  | 61446  | 46085  | 36868  | 30723  | 26334  | 23042  | 18434  | 15362  | 11521  | 9217   | 7681   |        |     |     |
|                                |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0003                  | 0.0004 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0019 | 0.0022 | 0.0028 | 0.0033 | 0.0044 | 0.0055 | 0.0066 |        |     |     |
|                                |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 102                     | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102    | 102 | 102 |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## MBZ215M - 6 X D - START VALUES - Inch

| COPY MILLING - ROUGHING |                                |                           |                           |                           |                                |                     |        |        |                     |        |        |        |        |        |        |        |        |        |        |        |        |
|-------------------------|--------------------------------|---------------------------|---------------------------|---------------------------|--------------------------------|---------------------|--------|--------|---------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG                            | a <sub>D</sub> x Dc (max) | a <sub>E</sub> x Dc (max) | v <sub>C</sub> (sf / min) |                                | Z <sub>n</sub> = 2  |        |        |                     |        |        |        |        |        |        |        |        |        |        |        |        |
|                         |                                |                           |                           |                           |                                | 0.5                 | 0.8    | 1      | 1.5                 | 2      | 2.5    | 3      | 4      | 5      | 6      | 8      | 10     |        |        |        |        |
| H                       | M / A / D<br>7a<br>(48-56 HRC) | 0.04                      | 0.23                      | 560                       | n (rev/min)                    | 108663              | 67914  | 54332  | 36221               | 27166  | 21733  | 18111  | 13583  | 10866  | 9055   | 6791   | 5433   |        |        |        |        |
|                         |                                |                           |                           |                           | f <sub>Z</sub> (in)            | 0.0003              | 0.0005 | 0.0007 | 0.0010              | 0.0013 | 0.0017 | 0.0020 | 0.0027 | 0.0034 | 0.0040 | 0.0054 | 0.0067 |        |        |        |        |
|                         |                                |                           |                           |                           | v <sub>F</sub> (in/min)        | 73                  | 73     | 73     | 73                  | 73     | 73     | 73     | 73     | 73     | 73     | 73     | 73     | 73     | 73     | 73     |        |
|                         |                                |                           |                           |                           | 460 - 660                      |                     |        |        |                     |        |        |        |        |        |        |        |        |        |        |        |        |
|                         |                                |                           |                           |                           | M / A / D<br>7b<br>(56-62 HRC) | 0.03                | 0.19   | 390    | n (rev/min)         | 75676  | 47298  | 37838  | 25225  | 18919  | 15135  | 12613  | 9460   | 7568   | 6306   | 4730   | 3784   |
|                         |                                |                           |                           |                           |                                |                     |        |        | f <sub>Z</sub> (in) | 0.0003 | 0.0004 | 0.0005 | 0.0008 | 0.0011 | 0.0013 | 0.0016 | 0.0021 | 0.0027 | 0.0032 | 0.0043 | 0.0053 |
|                         | M / A / D<br>7c<br>(62-65 HRC) | 0.02                      | 0.15                      | 260                       | n (rev/min)                    | 50451               | 31532  | 25225  | 16817               | 12613  | 10090  | 8408   | 6306   | 5045   | 4204   | 3153   | 2523   |        |        |        |        |
|                         |                                |                           |                           |                           | f <sub>Z</sub> (in)            | 0.0002              | 0.0004 | 0.0005 | 0.0007              | 0.0009 | 0.0012 | 0.0014 | 0.0018 | 0.0023 | 0.0028 | 0.0037 | 0.0046 |        |        |        |        |
|                         | M / A / D<br>7d<br>(>65 HRC)   | 0.016                     | 0.11                      | 160                       | n (rev/min)                    | 31047               | 19404  | 15523  | 10349               | 7762   | 6209   | 5174   | 3881   | 3105   | 2587   | 1940   | 1552   |        |        |        |        |
|                         |                                |                           |                           |                           | f <sub>Z</sub> (in)            | 0.0002              | 0.0003 | 0.0004 | 0.0006              | 0.0008 | 0.0010 | 0.0012 | 0.0016 | 0.0019 | 0.0023 | 0.0031 | 0.0039 |        |        |        |        |
|                         | K                              | E<br>12 - 13              | 0.06                      | 0.23                      | 820                            | n (rev/min)         | 159114 | 99446  | 79557               | 53038  | 39778  | 31823  | 26519  | 19889  | 15911  | 13259  | 9945   | 7956   |        |        |        |
|                         |                                |                           |                           |                           |                                | f <sub>Z</sub> (in) | 0.0002 | 0.0004 | 0.0005              | 0.0007 | 0.0009 | 0.0012 | 0.0014 | 0.0018 | 0.0023 | 0.0028 | 0.0037 | 0.0046 |        |        |        |
| v <sub>F</sub> (in/min) |                                |                           |                           |                           |                                | 73                  | 73     | 73     | 73                  | 73     | 73     | 73     | 73     | 73     | 73     | 73     | 73     | 73     |        |        |        |
| 660 - 980               |                                |                           |                           |                           |                                |                     |        |        |                     |        |        |        |        |        |        |        |        |        |        |        |        |
| E<br>14 - 15            |                                |                           |                           |                           |                                | 0.05                | 0.15   | 660    | n (rev/min)         | 128067 | 80042  | 64034  | 42689  | 32017  | 25613  | 21345  | 16008  | 12807  | 10672  | 8004   | 6403   |
|                         |                                |                           |                           |                           |                                |                     |        |        | f <sub>Z</sub> (in) | 0.0002 | 0.0003 | 0.0004 | 0.0006 | 0.0009 | 0.0011 | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 | 0.0043 |
|                         |                                |                           |                           | 490 - 820                 | v <sub>F</sub> (in/min)        | 54                  | 54     | 54     | 54                  | 54     | 54     | 54     | 54     | 54     | 54     | 54     | 54     |        |        |        |        |

| COPY MILLING - FINISHING |                                |                           |                           |                           |                                |                     |        |        |                     |        |        |        |        |        |        |        |        |        |        |        |        |
|--------------------------|--------------------------------|---------------------------|---------------------------|---------------------------|--------------------------------|---------------------|--------|--------|---------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP                | SMG                            | a <sub>D</sub> x Dc (max) | a <sub>E</sub> x Dc (max) | v <sub>C</sub> (sf / min) |                                | Z <sub>n</sub> = 2  |        |        |                     |        |        |        |        |        |        |        |        |        |        |        |        |
|                          |                                |                           |                           |                           |                                | 0.5                 | 0.8    | 1      | 1.5                 | 2      | 2.5    | 3      | 4      | 5      | 6      | 8      | 10     |        |        |        |        |
| H                        | M / A / D<br>7a<br>(48-56 HRC) | 0.01                      | 0.01                      | 920                       | n (rev/min)                    | 178518              | 111574 | 89259  | 59506               | 44629  | 35704  | 29753  | 22315  | 17852  | 14876  | 11157  | 8926   |        |        |        |        |
|                          |                                |                           |                           |                           | f <sub>Z</sub> (in)            | 0.0002              | 0.0004 | 0.0005 | 0.0007              | 0.0009 | 0.0012 | 0.0014 | 0.0018 | 0.0023 | 0.0028 | 0.0037 | 0.0046 |        |        |        |        |
|                          |                                |                           |                           |                           | v <sub>F</sub> (in/min)        | 82                  | 82     | 82     | 82                  | 82     | 82     | 82     | 82     | 82     | 82     | 82     | 82     | 82     |        |        |        |
|                          |                                |                           |                           |                           | 690 - 1150                     |                     |        |        |                     |        |        |        |        |        |        |        |        |        |        |        |        |
|                          |                                |                           |                           |                           | M / A / D<br>7b<br>(56-62 HRC) | 0.01                | 0.01   | 560    | n (rev/min)         | 108663 | 67914  | 54332  | 36221  | 27166  | 21733  | 18111  | 13583  | 10866  | 9055   | 6791   | 5433   |
|                          |                                |                           |                           |                           |                                |                     |        |        | f <sub>Z</sub> (in) | 0.0002 | 0.0003 | 0.0004 | 0.0006 | 0.0009 | 0.0011 | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 | 0.0043 |
|                          | M / A / D<br>7c<br>(62-65 HRC) | 0.01                      | 0.01                      | 360                       | n (rev/min)                    | 69855               | 43659  | 34927  | 23285               | 17464  | 13971  | 11642  | 8732   | 6985   | 5821   | 4366   | 3493   |        |        |        |        |
|                          |                                |                           |                           |                           | f <sub>Z</sub> (in)            | 0.0002              | 0.0003 | 0.0004 | 0.0005              | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 | 0.0035 |        |        |        |        |
|                          | M / A / D<br>7d<br>(>65 HRC)   | 0.01                      | 0.01                      | 260                       | n (rev/min)                    | 50451               | 31532  | 25225  | 16817               | 12613  | 10090  | 8408   | 6306   | 5045   | 4204   | 3153   | 2523   |        |        |        |        |
|                          |                                |                           |                           |                           | f <sub>Z</sub> (in)            | 0.0002              | 0.0003 | 0.0004 | 0.0005              | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 | 0.0035 |        |        |        |        |
|                          | K                              | E<br>12 - 13              | 0.01                      | 0.02                      | 1130                           | n (rev/min)         | 219267 | 137042 | 109633              | 73089  | 54817  | 43853  | 36544  | 27408  | 21927  | 18272  | 13704  | 10963  |        |        |        |
|                          |                                |                           |                           |                           |                                | f <sub>Z</sub> (in) | 0.0003 | 0.0004 | 0.0005              | 0.0008 | 0.0011 | 0.0013 | 0.0016 | 0.0021 | 0.0027 | 0.0032 | 0.0043 | 0.0053 |        |        |        |
| v <sub>F</sub> (in/min)  |                                |                           |                           |                           |                                | 117                 | 117    | 117    | 117                 | 117    | 117    | 117    | 117    | 117    | 117    | 117    | 117    | 117    |        |        |        |
| 1050 - 1210              |                                |                           |                           |                           |                                |                     |        |        |                     |        |        |        |        |        |        |        |        |        |        |        |        |
| E<br>14 - 15             |                                |                           |                           |                           |                                | 0.01                | 0.02   | 950    | n (rev/min)         | 184339 | 115212 | 92170  | 61446  | 46085  | 36868  | 30723  | 23042  | 18434  | 15362  | 11521  | 9217   |
|                          |                                |                           |                           |                           |                                |                     |        |        | f <sub>Z</sub> (in) | 0.0002 | 0.0004 | 0.0005 | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 | 0.0050 |
|                          |                                |                           |                           | 870 - 1030                | v <sub>F</sub> (in/min)        | 91                  | 91     | 91     | 91                  | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     |        |        |        |        |



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## MBZ215M - GREATER THAN 6 X D - START VALUES - Inch

| COPY MILLING - ROUGHING      |                                |                                       |                                       |                           |                         |                         |        |        |        |        |        |        |        |
|------------------------------|--------------------------------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP                    | SMG                            | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 2      |        |        |        |        |        |        |        |
|                              |                                |                                       |                                       |                           |                         | 1                       | 2      | 3      | 4      | 5      | 6      | 8      |        |
| H                            | M / A / D<br>7a<br>(48-56 HRC) | 0.01                                  | 0.17                                  | 560                       | n (rev/min)             | 54332                   | 27166  | 18111  | 13583  | 10866  | 9055   | 6791   |        |
|                              |                                |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0006                  | 0.0012 | 0.0018 | 0.0024 | 0.0030 | 0.0036 | 0.0048 |        |
|                              |                                |                                       |                                       |                           | v <sub>f</sub> (in/min) | 66                      | 66     | 66     | 66     | 66     | 66     | 66     |        |
|                              |                                |                                       |                                       |                           | 460 - 660               | n (rev/min)             | 37838  | 18919  | 12613  | 9460   | 7568   | 6306   | 4730   |
|                              |                                |                                       |                                       |                           |                         | f <sub>z</sub> (in)     | 0.0005 | 0.0010 | 0.0014 | 0.0019 | 0.0024 | 0.0029 | 0.0038 |
|                              |                                |                                       |                                       |                           |                         | v <sub>f</sub> (in/min) | 36     | 36     | 36     | 36     | 36     | 36     | 36     |
|                              | M / A / D<br>7c<br>(62-65 HRC) | 0.005                                 | 0.11                                  | 260                       | n (rev/min)             | 25225                   | 12613  | 8408   | 6306   | 5045   | 4204   | 3153   |        |
|                              |                                |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0004                  | 0.0008 | 0.0012 | 0.0017 | 0.0021 | 0.0025 | 0.0033 |        |
|                              |                                |                                       |                                       |                           | v <sub>f</sub> (in/min) | 21                      | 21     | 21     | 21     | 21     | 21     | 21     |        |
|                              |                                |                                       |                                       |                           | 200 - 330               | n (rev/min)             | 15523  | 7762   | 5174   | 3881   | 3105   | 2587   | 1940   |
|                              |                                |                                       |                                       |                           |                         | f <sub>z</sub> (in)     | 0.0004 | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |
|                              |                                |                                       |                                       |                           |                         | v <sub>f</sub> (in/min) | 11     | 11     | 11     | 11     | 11     | 11     | 11     |
| M / A / D<br>7d<br>(>65 HRC) | 0.004                          | 0.08                                  | 160                                   | n (rev/min)               | 79557                   | 39778                   | 26519  | 19889  | 15911  | 13259  | 9945   |        |        |
|                              |                                |                                       |                                       | f <sub>z</sub> (in)       | 0.0004                  | 0.0008                  | 0.0012 | 0.0017 | 0.0021 | 0.0025 | 0.0033 |        |        |
|                              |                                |                                       |                                       | v <sub>f</sub> (in/min)   | 66                      | 66                      | 66     | 66     | 66     | 66     | 66     |        |        |
|                              |                                |                                       |                                       | 660 - 980                 | n (rev/min)             | 64034                   | 32017  | 21345  | 16008  | 12807  | 10672  | 8004   |        |
|                              |                                |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0004                  | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0031 |        |
|                              |                                |                                       |                                       |                           | v <sub>f</sub> (in/min) | 49                      | 49     | 49     | 49     | 49     | 49     | 49     |        |
| K                            | E<br>12 - 13                   | 0.015                                 | 0.17                                  | 820                       | n (rev/min)             | 79557                   | 39778  | 26519  | 19889  | 15911  | 13259  | 9945   |        |
|                              |                                |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0004                  | 0.0008 | 0.0012 | 0.0017 | 0.0021 | 0.0025 | 0.0033 |        |
|                              |                                |                                       |                                       |                           | v <sub>f</sub> (in/min) | 66                      | 66     | 66     | 66     | 66     | 66     | 66     |        |
|                              |                                |                                       |                                       |                           | 660 - 980               | n (rev/min)             | 64034  | 32017  | 21345  | 16008  | 12807  | 10672  | 8004   |
|                              |                                |                                       |                                       |                           |                         | f <sub>z</sub> (in)     | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0031 |
|                              |                                |                                       |                                       |                           |                         | v <sub>f</sub> (in/min) | 49     | 49     | 49     | 49     | 49     | 49     | 49     |
| K                            | E<br>14 - 15                   | 0.014                                 | 0.11                                  | 660                       | n (rev/min)             | 79557                   | 39778  | 26519  | 19889  | 15911  | 13259  | 9945   |        |
|                              |                                |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0004                  | 0.0008 | 0.0012 | 0.0017 | 0.0021 | 0.0025 | 0.0033 |        |
|                              |                                |                                       |                                       |                           | v <sub>f</sub> (in/min) | 66                      | 66     | 66     | 66     | 66     | 66     | 66     |        |
|                              |                                |                                       |                                       |                           | 490 - 820               | n (rev/min)             | 64034  | 32017  | 21345  | 16008  | 12807  | 10672  | 8004   |
|                              |                                |                                       |                                       |                           |                         | f <sub>z</sub> (in)     | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0031 |
|                              |                                |                                       |                                       |                           |                         | v <sub>f</sub> (in/min) | 49     | 49     | 49     | 49     | 49     | 49     | 49     |

| COPY MILLING - FINISHING       |                                |                                       |                                       |                           |                         |                         |        |        |        |        |        |        |        |
|--------------------------------|--------------------------------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP                      | SMG                            | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 2      |        |        |        |        |        |        |        |
|                                |                                |                                       |                                       |                           |                         | 1                       | 2      | 3      | 4      | 5      | 6      | 8      |        |
| H                              | M / A / D<br>7a<br>(48-56 HRC) | 0.010                                 | 0.010                                 | 920                       | n (rev/min)             | 89259                   | 44629  | 29753  | 22315  | 17852  | 14876  | 11157  |        |
|                                |                                |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0004                  | 0.0008 | 0.0012 | 0.0017 | 0.0021 | 0.0025 | 0.0033 |        |
|                                |                                |                                       |                                       |                           | v <sub>f</sub> (in/min) | 74                      | 74     | 74     | 74     | 74     | 74     | 74     |        |
|                                |                                |                                       |                                       |                           | 690 - 1150              | n (rev/min)             | 54332  | 27166  | 18111  | 13583  | 10866  | 9055   | 6791   |
|                                |                                |                                       |                                       |                           |                         | f <sub>z</sub> (in)     | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0031 |
|                                |                                |                                       |                                       |                           |                         | v <sub>f</sub> (in/min) | 42     | 42     | 42     | 42     | 42     | 42     | 42     |
|                                | M / A / D<br>7b<br>(56-62 HRC) | 0.010                                 | 0.010                                 | 560                       | n (rev/min)             | 34927                   | 17464  | 11642  | 8732   | 6985   | 5821   | 4366   |        |
|                                |                                |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003                  | 0.0006 | 0.0010 | 0.0013 | 0.0016 | 0.0019 | 0.0026 |        |
|                                |                                |                                       |                                       |                           | v <sub>f</sub> (in/min) | 22                      | 22     | 22     | 22     | 22     | 22     | 22     |        |
|                                |                                |                                       |                                       |                           | 430 - 690               | n (rev/min)             | 25225  | 12613  | 8408   | 6306   | 5045   | 4204   | 3153   |
|                                |                                |                                       |                                       |                           |                         | f <sub>z</sub> (in)     | 0.0003 | 0.0006 | 0.0010 | 0.0013 | 0.0016 | 0.0019 | 0.0026 |
|                                |                                |                                       |                                       |                           |                         | v <sub>f</sub> (in/min) | 16     | 16     | 16     | 16     | 16     | 16     | 16     |
| M / A / D<br>7c<br>(62-65 HRC) | 0.010                          | 0.010                                 | 360                                   | n (rev/min)               | 25225                   | 12613                   | 8408   | 6306   | 5045   | 4204   | 3153   |        |        |
|                                |                                |                                       |                                       | f <sub>z</sub> (in)       | 0.0003                  | 0.0006                  | 0.0010 | 0.0013 | 0.0016 | 0.0019 | 0.0026 |        |        |
|                                |                                |                                       |                                       | v <sub>f</sub> (in/min)   | 22                      | 22                      | 22     | 22     | 22     | 22     | 22     |        |        |
|                                |                                |                                       |                                       | 300 - 430                 | n (rev/min)             | 15523                   | 7762   | 5174   | 3881   | 3105   | 2587   | 1940   |        |
|                                |                                |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0004                  | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |        |
|                                |                                |                                       |                                       |                           | v <sub>f</sub> (in/min) | 11                      | 11     | 11     | 11     | 11     | 11     | 11     |        |
| M / A / D<br>7d<br>(>65 HRC)   | 0.010                          | 0.010                                 | 260                                   | n (rev/min)               | 79557                   | 39778                   | 26519  | 19889  | 15911  | 13259  | 9945   |        |        |
|                                |                                |                                       |                                       | f <sub>z</sub> (in)       | 0.0004                  | 0.0008                  | 0.0012 | 0.0017 | 0.0021 | 0.0025 | 0.0033 |        |        |
|                                |                                |                                       |                                       | v <sub>f</sub> (in/min)   | 66                      | 66                      | 66     | 66     | 66     | 66     | 66     |        |        |
|                                |                                |                                       |                                       | 230 - 300                 | n (rev/min)             | 64034                   | 32017  | 21345  | 16008  | 12807  | 10672  | 8004   |        |
|                                |                                |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0004                  | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0031 |        |
|                                |                                |                                       |                                       |                           | v <sub>f</sub> (in/min) | 49                      | 49     | 49     | 49     | 49     | 49     | 49     |        |
| K                              | E<br>12 - 13                   | 0.030                                 | 0.020                                 | 1130                      | n (rev/min)             | 109633                  | 54817  | 36544  | 27408  | 21927  | 18272  | 13704  |        |
|                                |                                |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0005                  | 0.0010 | 0.0014 | 0.0019 | 0.0024 | 0.0029 | 0.0038 |        |
|                                |                                |                                       |                                       |                           | v <sub>f</sub> (in/min) | 105                     | 105    | 105    | 105    | 105    | 105    | 105    |        |
|                                |                                |                                       |                                       |                           | 1050 - 1210             | n (rev/min)             | 92170  | 46085  | 30723  | 23042  | 18434  | 15362  | 11521  |
|                                |                                |                                       |                                       |                           |                         | f <sub>z</sub> (in)     | 0.0004 | 0.0009 | 0.0013 | 0.0018 | 0.0022 | 0.0027 | 0.0036 |
|                                |                                |                                       |                                       |                           |                         | v <sub>f</sub> (in/min) | 82     | 82     | 82     | 82     | 82     | 82     | 82     |
| K                              | E<br>14 - 15                   | 0.020                                 | 0.020                                 | 950                       | n (rev/min)             | 109633                  | 54817  | 36544  | 27408  | 21927  | 18272  | 13704  |        |
|                                |                                |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0005                  | 0.0010 | 0.0014 | 0.0019 | 0.0024 | 0.0029 | 0.0038 |        |
|                                |                                |                                       |                                       |                           | v <sub>f</sub> (in/min) | 105                     | 105    | 105    | 105    | 105    | 105    | 105    |        |
|                                |                                |                                       |                                       |                           | 870 - 1030              | n (rev/min)             | 92170  | 46085  | 30723  | 23042  | 18434  | 15362  | 11521  |
|                                |                                |                                       |                                       |                           |                         | f <sub>z</sub> (in)     | 0.0004 | 0.0009 | 0.0013 | 0.0018 | 0.0022 | 0.0027 | 0.0036 |
|                                |                                |                                       |                                       |                           |                         | v <sub>f</sub> (in/min) | 82     | 82     | 82     | 82     | 82     | 82     | 82     |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## MB215 - START VALUES - Inch

| COPY MILLING - ROUGHING |                                |                           |                           |                           |                         |        |            |        |        |        |             |
|-------------------------|--------------------------------|---------------------------|---------------------------|---------------------------|-------------------------|--------|------------|--------|--------|--------|-------------|
| ISO GROUP               | SMG                            | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | 1/16   | 1/8        | 3/16   | 1/4    | 3/8    | 1/2         |
|                         |                                |                           |                           |                           |                         | P      | E<br>5 - 6 | 0.11   | 0.31   | 710    | n (rev/min) |
| f <sub>z</sub> (in)     | 0.0011                         | 0.0023                    | 0.0034                    | 0.0045                    | 0.0068                  |        |            |        |        |        | 0.0090      |
| v <sub>f</sub> (in/min) | 98                             | 98                        | 98                        | 98                        | 98                      |        |            |        |        |        | 98          |
| H                       | M / A / D<br>7a<br>(48-52 HRC) | 0.10                      | 0.30                      | 560                       | n (rev/min)             | 33960  | 17110      | 11380  | 8560   | 5700   | 4280        |
|                         |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0012 | 0.0024     | 0.0036 | 0.0048 | 0.0071 | 0.0095      |
|                         |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 81     | 81         | 81     | 81     | 81     | 81          |

| COPY MILLING - FINISHING |                                |                           |                           |                           |                         |        |            |        |        |        |             |
|--------------------------|--------------------------------|---------------------------|---------------------------|---------------------------|-------------------------|--------|------------|--------|--------|--------|-------------|
| ISO GROUP                | SMG                            | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | 1/16   | 1/8        | 3/16   | 1/4    | 3/8    | 1/2         |
|                          |                                |                           |                           |                           |                         | P      | E<br>5 - 6 | 0.02   | 0.02   | 1070   | n (rev/min) |
| f <sub>z</sub> (in)      | 0.0008                         | 0.0016                    | 0.0024                    | 0.0033                    | 0.0049                  |        |            |        |        |        | 0.0065      |
| v <sub>f</sub> (in/min)  | 106                            | 106                       | 106                       | 106                       | 106                     |        |            |        |        |        | 106         |
| H                        | M / A / D<br>7a<br>(48-52 HRC) | 0.02                      | 0.01                      | 920                       | n (rev/min)             | 55780  | 28120      | 18690  | 14060  | 9370   | 7030        |
|                          |                                |                           |                           |                           | f <sub>z</sub> (in)     | 0.0008 | 0.0016     | 0.0024 | 0.0033 | 0.0049 | 0.0065      |
|                          |                                |                           |                           |                           | v <sub>f</sub> (in/min) | 91     | 91         | 91     | 91     | 91     | 91          |

## MB215M - START VALUES - Inch

| COPY MILLING - ROUGHING |                               |                           |                           |                          |                         |                    |        |        |        |        |        |        |        |        |
|-------------------------|-------------------------------|---------------------------|---------------------------|--------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG                           | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (m / min) |                         | Z <sub>n</sub> = 2 |        |        |        |        |        |        |        |        |
|                         |                               |                           |                           |                          |                         | 1                  | 2      | 3      | 4      | 5      | 6      | 8      | 10     | 12     |
| P                       | E<br>5 - 6                    | 0.10                      | 0.30                      | 710                      | n (rev/min)             | 68885              | 34442  | 22962  | 17221  | 13777  | 11481  | 8611   | 6888   | 5740   |
|                         |                               |                           |                           |                          | f <sub>z</sub> (in)     | 0.0007             | 0.0014 | 0.0021 | 0.0028 | 0.0035 | 0.0043 | 0.0057 | 0.0071 | 0.0085 |
|                         |                               |                           |                           |                          | v <sub>f</sub> (in/min) | 98                 | 98     | 98     | 98     | 98     | 98     | 98     | 98     | 98     |
| H                       | M / A / D<br>7a<br>(48-52HRC) | 0.10                      | 0.30                      | 560                      | n (rev/min)             | 54332              | 27166  | 18111  | 13583  | 10866  | 9055   | 6791   | 5433   | 4528   |
|                         |                               |                           |                           |                          | f <sub>z</sub> (in)     | 0.0007             | 0.0015 | 0.0022 | 0.0030 | 0.0037 | 0.0045 | 0.0060 | 0.0075 | 0.0090 |
|                         |                               |                           |                           |                          | v <sub>f</sub> (in/min) | 81                 | 81     | 81     | 81     | 81     | 81     | 81     | 81     | 81     |

| COPY MILLING - FINISHING |                               |                           |                           |                          |                         |                    |        |        |        |        |        |        |        |        |
|--------------------------|-------------------------------|---------------------------|---------------------------|--------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP                | SMG                           | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (m / min) |                         | Z <sub>n</sub> = 2 |        |        |        |        |        |        |        |        |
|                          |                               |                           |                           |                          |                         | 1                  | 2      | 3      | 4      | 5      | 6      | 8      | 10     | 12     |
| P                        | E<br>5 - 6                    | 0.02                      | 0.02                      | 1070                     | n (rev/min)             | 103812             | 51906  | 34604  | 25953  | 20762  | 17302  | 12977  | 10381  | 8651   |
|                          |                               |                           |                           |                          | f <sub>z</sub> (in)     | 0.0005             | 0.0010 | 0.0015 | 0.0020 | 0.0026 | 0.0031 | 0.0041 | 0.0051 | 0.0061 |
|                          |                               |                           |                           |                          | v <sub>f</sub> (in/min) | 106                | 106    | 106    | 106    | 106    | 106    | 106    | 106    | 106    |
| H                        | M / A / D<br>7a<br>(48-52HRC) | 0.02                      | 0.01                      | 920                      | n (rev/min)             | 89259              | 44629  | 29753  | 22315  | 17852  | 14876  | 11157  | 8926   | 7438   |
|                          |                               |                           |                           |                          | f <sub>z</sub> (in)     | 0.0005             | 0.0010 | 0.0015 | 0.0020 | 0.0026 | 0.0031 | 0.0041 | 0.0051 | 0.0061 |
|                          |                               |                           |                           |                          | v <sub>f</sub> (in/min) | 91                 | 91     | 91     | 91     | 91     | 91     | 91     | 91     | 91     |



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## MBZ215 - START VALUES

| SIDE MILLING - ROUGHING |                               |                                       |                                       |                           |                         |                    |         |         |         |         |         |         |         |         |         |         |         |
|-------------------------|-------------------------------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| ISO GROUP               | SMG                           | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 2 |         |         |         |         |         |         |         |         |         |         |         |
|                         |                               |                                       |                                       |                           |                         | 1/32               | 1/16    | 3/32    | 1/8     | 3/16    | 1/4     | 5/16    | 3/8     | 1/2     | 5/8     | 3/4     | 1       |
| P                       | E<br>5 - 6                    | 0.10                                  | 0.30                                  | 500                       | n (rev/min)             | 61120              | 30560   | 20373   | 15280   | 10187   | 7640    | 6112    | 5093    | 3820    | 3056    | 2547    | 1910    |
|                         |                               |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.00030            | 0.00059 | 0.00089 | 0.00119 | 0.00178 | 0.00238 | 0.00297 | 0.00356 | 0.00475 | 0.00594 | 0.00713 | 0.00950 |
|                         |                               |                                       |                                       |                           | v <sub>f</sub> (in/min) | 36.3               | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    |
| H                       | M / A / D<br>7a<br>(48>52HRc) | 0.05                                  | 0.20                                  | 450                       | n (rev/min)             | 55008              | 27504   | 18336   | 13752   | 9168    | 6876    | 5501    | 4584    | 3438    | 2750    | 2292    | 1719    |
|                         |                               |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.00027            | 0.00054 | 0.00081 | 0.00108 | 0.00161 | 0.00215 | 0.00269 | 0.00323 | 0.00430 | 0.00538 | 0.00645 | 0.00860 |
|                         |                               |                                       |                                       |                           | v <sub>f</sub> (in/min) | 29.6               | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    |
|                         | M / A / D<br>7b<br>(52>62HRc) | 0.03                                  | 0.10                                  | 400                       | n (rev/min)             | 48896              | 24448   | 16299   | 12224   | 8149    | 6112    | 4890    | 4075    | 3056    | 2445    | 2037    | 1528    |
|                         |                               |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.00019            | 0.00038 | 0.00056 | 0.00075 | 0.00113 | 0.00150 | 0.00188 | 0.00225 | 0.00300 | 0.00375 | 0.00450 | 0.00600 |
|                         |                               |                                       |                                       |                           | v <sub>f</sub> (in/min) | 18.3               | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    |

| SIDE MILLING - FINISHING |                               |      |      |     |                         |         |         |         |         |         |         |         |         |         |         |         |         |
|--------------------------|-------------------------------|------|------|-----|-------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| P                        | E<br>5 - 6                    | 0.10 | 0.15 | 500 | n (rev/min)             | 61120   | 30560   | 20373   | 15280   | 10187   | 7640    | 6112    | 5093    | 3820    | 3056    | 2547    | 1910    |
|                          |                               |      |      |     | f <sub>z</sub> (in)     | 0.00030 | 0.00059 | 0.00089 | 0.00119 | 0.00178 | 0.00238 | 0.00297 | 0.00356 | 0.00475 | 0.00594 | 0.00713 | 0.00950 |
|                          |                               |      |      |     | v <sub>f</sub> (in/min) | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    | 36.3    |
| H                        | M / A / D<br>7a<br>(48>52HRc) | 0.05 | 0.10 | 450 | n (rev/min)             | 55008   | 27504   | 18336   | 13752   | 9168    | 6876    | 5501    | 4584    | 3438    | 2750    | 2292    | 1719    |
|                          |                               |      |      |     | f <sub>z</sub> (in)     | 0.00027 | 0.00054 | 0.00081 | 0.00108 | 0.00161 | 0.00215 | 0.00269 | 0.00323 | 0.00430 | 0.00538 | 0.00645 | 0.00860 |
|                          |                               |      |      |     | v <sub>f</sub> (in/min) | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    | 29.6    |
|                          | M / A / D<br>7b<br>(52>62HRc) | 0.03 | 0.05 | 400 | n (rev/min)             | 48896   | 24448   | 16299   | 12224   | 8149    | 6112    | 4890    | 4075    | 3056    | 2445    | 2037    | 1528    |
|                          |                               |      |      |     | f <sub>z</sub> (in)     | 0.00019 | 0.00038 | 0.00056 | 0.00075 | 0.00113 | 0.00150 | 0.00188 | 0.00225 | 0.00300 | 0.00375 | 0.00450 | 0.00600 |
|                          |                               |      |      |     | v <sub>f</sub> (in/min) | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    | 18.3    |

## MZ645 / MZ645R - START VALUES

| SIDE MILLING - ROUGHING |                               |                                       |                                       |                           |                         |                    |         |         |         |         |         |  |  |  |  |  |
|-------------------------|-------------------------------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|---------|---------|---------|---------|---------|--|--|--|--|--|
| ISO GROUP               | SMG                           | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 6 |         |         |         |         |         |  |  |  |  |  |
|                         |                               |                                       |                                       |                           |                         | 1/8                | 3/16    | 1/4     | 5/16    | 3/8     | 1/2     |  |  |  |  |  |
| P                       | E<br>5 - 6                    | 1.50                                  | 0.10                                  | 450                       | n (rev/min)             | 13752              | 9168    | 6876    | 5501    | 4584    | 3438    |  |  |  |  |  |
|                         |                               |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.00075            | 0.00113 | 0.00150 | 0.00188 | 0.00225 | 0.00300 |  |  |  |  |  |
|                         |                               |                                       |                                       |                           | v <sub>f</sub> (in/min) | 61.9               | 61.9    | 61.9    | 61.9    | 61.9    | 61.9    |  |  |  |  |  |
| H                       | M / A / D<br>7a<br>(48>52HRc) | 1.00                                  | 0.05                                  | 450                       | n (rev/min)             | 13752              | 9168    | 6876    | 5501    | 4584    | 3438    |  |  |  |  |  |
|                         |                               |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.00056            | 0.00084 | 0.00113 | 0.00141 | 0.00169 | 0.00225 |  |  |  |  |  |
|                         |                               |                                       |                                       |                           | v <sub>f</sub> (in/min) | 46.4               | 46.4    | 46.4    | 46.4    | 46.4    | 46.4    |  |  |  |  |  |
|                         | M / A / D<br>7b<br>(52>62HRc) | 1.00                                  | 0.02                                  | 400                       | n (rev/min)             | 12224              | 8149    | 6112    | 4890    | 4075    | 3056    |  |  |  |  |  |
|                         |                               |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.00040            | 0.00060 | 0.00080 | 0.00100 | 0.00120 | 0.00160 |  |  |  |  |  |
|                         |                               |                                       |                                       |                           | v <sub>f</sub> (in/min) | 29.3               | 29.3    | 29.3    | 29.3    | 29.3    | 29.3    |  |  |  |  |  |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter

v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.



## DESIGNED FOR GRAPHITE AND CARBON FIBER REINFORCED PLASTICS (CFRP)

# CVD DIAMOND COATING

Niagara Cutter CVD diamond raises the bar in performance and tool life when machining the toughest and most abrasive components made from graphite and CFRP. The unique in-house CVD diamond coating coupled with advanced geometries and the highest quality carbide substrates provide unsurpassed tool life and performance.

Niagara Cutter's graphite machining family of tools includes: DIA230, DIA430, DIA430M, DIACR430, DIAL430, DIAXRR430, DIAB230, DIAB230M, DIAB430, DIALB430, DIAXSB430 and DIAXRB430.

Developed for machining CFRP, the CVD Diamond range provides superior tool life while reducing un-cut fibers. Our offering includes the following products with both coarse and fine tooth configurations: Compression cutters DIACC and router burrs DIAEPB, DIABEB, DIAPPB. Also in this family of products is a new range of nicked routers for trimming and slot milling applications. Two versions are available, DIARTRBE - burr end style and DIARTREM - end mill style.

### PRODUCT OVERVIEW

- In-house CVD diamond coated end mills for a wide range of applications
- Patented geometries yield significant productivity gains
- Continuous in-house R&D
- Premium carbide substrates

### YOUR BENEFITS

- Wide application area, from graphite electrodes to CFRP
- High performance at a competitive price
- Reduced cycle time, higher material removal rates
- Smoother cutting with advanced and patented geometries
- Long and predictable tool life with CVD coatings

### RANGE OVERVIEW

- Inch and metric sizes available
- Wide range of geometries available
- Specials available upon request

#### PREFERRED MATERIAL GROUPS

|             |
|-------------|
| Graphite    |
| Plastic     |
| Thermoplast |
| Thermoset   |

### INDUSTRY TARGETS

- Mold & Die
- Aerospace
- Consumer
- Sports
- Auto

### INDUSTRY APPLICATIONS

**Aerospace:** Well suited for a wide range of materials, a complete CVD diamond family sets Niagara Cutter apart from the competition.

## DIA230



|               |           |                |                |
|---------------|-----------|----------------|----------------|
| SOLID CARBIDE | HELIX<br> | SQUARE END<br> | CENTER CUTTING |
|---------------|-----------|----------------|----------------|



- Cylindrical Shank
- General purpose geometry designed for carbon fiber, composite applications, graphite and green ceramics
- Cutting Data DIA230 - Page 178-179
- Tolerance Specs DIA230 - Page 323

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|---------|
| <b>INCH - DIA230</b>   |                        |           |           |               |                |        |         |
| <a href="#">N77898</a> | DIA230-0.016-F3-S.0-Z2 | 1/64      | 1/8       | 3/64          | 1-1/2          | 2      | CVDDIA  |
| <a href="#">N77901</a> | DIA230-0.031-F3-S.0-Z2 | 1/32      | 1/8       | 3/32          | 1-1/2          | 2      | CVDDIA  |
| <a href="#">N77904</a> | DIA230-0.063-F3-S.0-Z2 | 1/16      | 1/8       | 3/16          | 1-1/2          | 2      | CVDDIA  |
| <a href="#">N77910</a> | DIA230-0.125-D4-S.0-Z2 | 1/8       | 1/8       | 1/2           | 1-1/2          | 2      | CVDDIA  |
| <a href="#">N77913</a> | DIA230-0.188-D3-S.0-Z2 | 3/16      | 3/16      | 5/8           | 2              | 2      | CVDDIA  |
| <a href="#">N77916</a> | DIA230-0.250-D3-S.0-Z2 | 1/4       | 1/4       | 3/4           | 2-1/2          | 2      | CVDDIA  |
| <a href="#">N77928</a> | DIA230-0.500-D2-S.0-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | CVDDIA  |

# DIAB230 & DIAB230M

|               |  |   |                |
|---------------|--|---|----------------|
| SOLID CARBIDE | HELIX<br> | BALL END<br> | CENTER CUTTING |
|---------------|--|---|----------------|



- Cylindrical Shank
- General purpose geometry designed for carbon fiber, composite applications, graphite and green ceramics

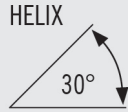
- Cutting Data DIAB230 - Page 178-179
- Tolerance Specs DIAB230 - Page 323
- Cutting Data DIAB230M - Page 179-181
- Tolerance Specs DIAB230M - Page 323

| PRODUCT NUMBER           | DESCRIPTION             | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING |
|--------------------------|-------------------------|-----------|-----------|---------------|----------------|--------|---------|
| <b>INCH - DIAB230</b>    |                         |           |           |               |                |        |         |
| <a href="#">N77931</a>   | DIAB230-0.016-F3-B.0-Z2 | 1/64      | 1/8       | 3/64          | 1-1/2          | 2      | CVDDIA  |
| <a href="#">N77934</a>   | DIAB230-0.031-F3-B.0-Z2 | 1/32      | 1/8       | 3/32          | 1-1/2          | 2      | CVDDIA  |
| <a href="#">N77174</a>   | DIAB230-0.047-F3-B.0-Z2 | 3/64      | 1/8       | 1/8           | 1-1/2          | 2      | CVDDIA  |
| <a href="#">N77937</a>   | DIAB230-0.063-F3-B.0-Z2 | 1/16      | 1/8       | 3/16          | 1-1/2          | 2      | CVDDIA  |
| <a href="#">N77943</a>   | DIAB230-0.125-D4-B.0-Z2 | 1/8       | 1/8       | 1/2           | 1-1/2          | 2      | CVDDIA  |
| <a href="#">N77946</a>   | DIAB230-0.188-D3-B.0-Z2 | 3/16      | 3/16      | 5/8           | 2              | 2      | CVDDIA  |
| <a href="#">N77949</a>   | DIAB230-0.250-D3-B.0-Z2 | 1/4       | 1/4       | 3/4           | 2-1/2          | 2      | CVDDIA  |
| <a href="#">N77961</a>   | DIAB230-0.500-D2-B.0-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | CVDDIA  |
| <b>METRIC - DIAB230M</b> |                         |           |           |               |                |        |         |
| <a href="#">N77267</a>   | DIAB230M-010-F4-B.0-Z2  | 1mm       | 3mm       | 4mm           | 45mm           | 2      | CVDDIA  |
| <a href="#">N77268</a>   | DIAB230M-020-F5-B.0-Z2  | 2mm       | 3mm       | 10mm          | 45mm           | 2      | CVDDIA  |
| <a href="#">N77269</a>   | DIAB230M-030-D5-B.0-Z2  | 3mm       | 3mm       | 15mm          | 45mm           | 2      | CVDDIA  |
| <a href="#">N77270</a>   | DIAB230M-040-D4-B.0-Z2  | 4mm       | 4mm       | 15mm          | 55mm           | 2      | CVDDIA  |
| <a href="#">N77271</a>   | DIAB230M-060-D3-B.0-Z2  | 6mm       | 6mm       | 20mm          | 64mm           | 2      | CVDDIA  |



## DIA430 & DIA430M

SOLID  
CARBIDE



CENTER  
CUTTING

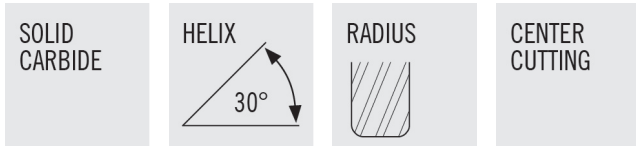


- Cylindrical Shank
- General purpose geometry designed for carbon fiber, composite applications, graphite and green ceramics

- Cutting Data DIA430 - Page 182-183
- Tolerance Specs DIA430 - Page 323
- Cutting Data DIA430M - Page 186-187
- Tolerance Specs DIA430M - Page 323

| PRODUCT NUMBER          | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING |
|-------------------------|------------------------|-----------|-----------|---------------|----------------|--------|---------|
| <b>INCH - DIA430</b>    |                        |           |           |               |                |        |         |
| <a href="#">N77790</a>  | DIA430-0.016-F3-S.0-Z4 | 1/64      | 1/8       | 3/64          | 1-1/2          | 4      | CVDDIA  |
| <a href="#">N77793</a>  | DIA430-0.031-F3-S.0-Z4 | 1/32      | 1/8       | 3/32          | 1-1/2          | 4      | CVDDIA  |
| <a href="#">N77796</a>  | DIA430-0.063-F3-S.0-Z4 | 1/16      | 1/8       | 3/16          | 1-1/2          | 4      | CVDDIA  |
| <a href="#">N77799</a>  | DIA430-0.094-F4-S.0-Z4 | 3/32      | 1/8       | 3/8           | 1-1/2          | 4      | CVDDIA  |
| <a href="#">N77802</a>  | DIA430-0.125-D4-S.0-Z4 | 1/8       | 1/8       | 1/2           | 1-1/2          | 4      | CVDDIA  |
| <a href="#">N77805</a>  | DIA430-0.188-D3-S.0-Z4 | 3/16      | 3/16      | 5/8           | 2              | 4      | CVDDIA  |
| <a href="#">N77808</a>  | DIA430-0.250-D3-S.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | CVDDIA  |
| <a href="#">N77814</a>  | DIA430-0.375-D2-S.0-Z4 | 3/8       | 3/8       | 7/8           | 2-1/2          | 4      | CVDDIA  |
| <a href="#">N77820</a>  | DIA430-0.500-D2-S.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | CVDDIA  |
| <b>METRIC - DIA430M</b> |                        |           |           |               |                |        |         |
| <a href="#">N77276</a>  | DIA430M-020-F5-S.0-Z4  | 2mm       | 3mm       | 10mm          | 45mm           | 4      | CVDDIA  |
| <a href="#">N77277</a>  | DIA430M-030-D5-S.0-Z4  | 3mm       | 3mm       | 15mm          | 45mm           | 4      | CVDDIA  |
| <a href="#">N77278</a>  | DIA430M-040-D4-S.0-Z4  | 4mm       | 4mm       | 15mm          | 55mm           | 4      | CVDDIA  |
| <a href="#">N77279</a>  | DIA430M-060-D3-S.0-Z4  | 6mm       | 6mm       | 20mm          | 64mm           | 4      | CVDDIA  |
| <a href="#">N77280</a>  | DIA430M-080-D2-S.0-Z4  | 8mm       | 8mm       | 20mm          | 64mm           | 4      | CVDDIA  |

## DIACR430

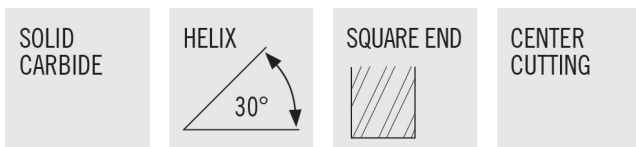


- Cylindrical Shank
- General purpose geometry designed for carbon fiber, composite applications, graphite and green ceramics

- Cutting Data - Page 182-183
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION                 | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS |
|------------------------|-----------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|
| <a href="#">N18415</a> | DIACR430-0.063-F3-R010.0-Z4 | 1/16      | 1/8       | 3/16          | 1-1/2          | 4      | CVDDIA  | 0.010  |
| <a href="#">N18416</a> | DIACR430-0.063-F3-R015.0-Z4 | 1/16      | 1/8       | 3/16          | 1-1/2          | 4      | CVDDIA  | 0.015  |
| <a href="#">N18417</a> | DIACR430-0.125-D4-R015.0-Z4 | 1/8       | 1/8       | 1/2           | 1-1/2          | 4      | CVDDIA  | 0.015  |
| <a href="#">N18418</a> | DIACR430-0.125-D4-R020.0-Z4 | 1/8       | 1/8       | 1/2           | 1-1/2          | 4      | CVDDIA  | 0.020  |
| <a href="#">N18419</a> | DIACR430-0.188-D3-R020.0-Z4 | 3/16      | 3/16      | 5/8           | 2              | 4      | CVDDIA  | 0.020  |
| <a href="#">N18421</a> | DIACR430-0.250-D3-R020.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | CVDDIA  | 0.020  |
| <a href="#">N18422</a> | DIACR430-0.250-D3-R030.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | CVDDIA  | 0.030  |
| <a href="#">N77191</a> | DIACR430-0.250-D6-R030.0-Z4 | 1/4       | 1/4       | 1-3/8         | 4              | 4      | CVDDIA  | 0.030  |
| <a href="#">N18423</a> | DIACR430-0.375-D2-R020.0-Z4 | 3/8       | 3/8       | 7/8           | 2-1/2          | 4      | CVDDIA  | 0.020  |
| <a href="#">N18424</a> | DIACR430-0.375-D2-R030.0-Z4 | 3/8       | 3/8       | 7/8           | 2-1/2          | 4      | CVDDIA  | 0.030  |
| <a href="#">N18425</a> | DIACR430-0.500-D2-R030.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | CVDDIA  | 0.030  |
| <a href="#">N18426</a> | DIACR430-0.500-D2-R060.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | CVDDIA  | 0.060  |
| <a href="#">N77194</a> | DIACR430-0.500-D3-R030.0-Z4 | 1/2       | 1/2       | 1-3/8         | 4              | 4      | CVDDIA  | 0.030  |

## DIAL430



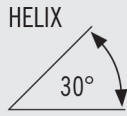
- Cylindrical Shank
- General purpose geometry designed for carbon fiber, composite applications, graphite and green ceramics

- Cutting Data - Page 184-185
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION             | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING |
|------------------------|-------------------------|-----------|-----------|---------------|----------------|--------|---------|
| <a href="#">N77856</a> | DIAL430-0.125-D8-S.0-Z4 | 1/8       | 1/8       | 1             | 3              | 4      | CVDDIA  |
| <a href="#">N77859</a> | DIAL430-0.188-D5-S.0-Z4 | 3/16      | 3/16      | 1             | 4              | 4      | CVDDIA  |
| <a href="#">N72693</a> | DIAL430-0.188-D6-S.0-Z4 | 3/16      | 3/16      | 1-1/8         | 3              | 4      | CVDDIA  |
| <a href="#">N77862</a> | DIAL430-0.250-D5-S.0-Z4 | 1/4       | 1/4       | 1-1/4         | 3              | 4      | CVDDIA  |
| <a href="#">N72699</a> | DIAL430-0.250-D6-S.0-Z4 | 1/4       | 1/4       | 1-3/8         | 4              | 4      | CVDDIA  |
| <a href="#">N77868</a> | DIAL430-0.375-D4-S.0-Z4 | 3/8       | 3/8       | 1-3/8         | 3-1/4          | 4      | CVDDIA  |
| <a href="#">N72717</a> | DIAL430-0.375-D5-S.0-Z4 | 3/8       | 3/8       | 1-3/8         | 4              | 4      | CVDDIA  |
| <a href="#">N18695</a> | DIAL430-0.500-D3-S.0-Z4 | 1/2       | 1/2       | 1-3/8         | 4              | 4      | CVDDIA  |
| <a href="#">N77874</a> | DIAL430-0.500-D5-S.0-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | CVDDIA  |
| <a href="#">N72729</a> | DIAL430-0.500-D6-S.0-Z4 | 1/2       | 1/2       | 3             | 6              | 4      | CVDDIA  |

## DIAB430

SOLID CARBIDE



BALL END



CENTER CUTTING



- Cylindrical Shank
- General purpose geometry designed for carbon fiber, composite applications, graphite and green ceramics

- Cutting Data - Page 182-183
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION             | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING |
|------------------------|-------------------------|-----------|-----------|---------------|----------------|--------|---------|
| <a href="#">N77823</a> | DIAB430-0.016-F3-B.0-Z4 | 1/64      | 1/8       | 3/64          | 1-1/2          | 4      | CVDDIA  |
| <a href="#">N77826</a> | DIAB430-0.031-F3-B.0-Z4 | 1/32      | 1/8       | 3/32          | 1-1/2          | 4      | CVDDIA  |
| <a href="#">N77829</a> | DIAB430-0.063-F3-B.0-Z4 | 1/16      | 1/8       | 3/16          | 1-1/2          | 4      | CVDDIA  |
| <a href="#">N77183</a> | DIAB430-0.078-F3-B.0-Z4 | 5/64      | 1/8       | 1/4           | 1-1/2          | 4      | CVDDIA  |
| <a href="#">N77832</a> | DIAB430-0.094-F4-B.0-Z4 | 3/32      | 1/8       | 3/8           | 1-1/2          | 4      | CVDDIA  |
| <a href="#">N77835</a> | DIAB430-0.125-D4-B.0-Z4 | 1/8       | 1/8       | 1/2           | 1-1/2          | 4      | CVDDIA  |
| <a href="#">N77838</a> | DIAB430-0.188-D3-B.0-Z4 | 3/16      | 3/16      | 5/8           | 2              | 4      | CVDDIA  |
| <a href="#">N77841</a> | DIAB430-0.250-D3-B.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | CVDDIA  |
| <a href="#">N77847</a> | DIAB430-0.375-D2-B.0-Z4 | 3/8       | 3/8       | 7/8           | 2-1/2          | 4      | CVDDIA  |
| <a href="#">N77853</a> | DIAB430-0.500-D2-B.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | CVDDIA  |

## DIALB430

SOLID CARBIDE



BALL END



CENTER CUTTING

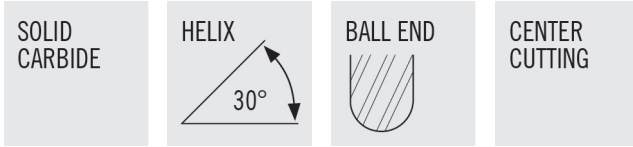


- Cylindrical Shank
- General purpose geometry designed for carbon fiber, composite applications, graphite and green Ceramics

- Cutting Data - Page 184-185
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|
| <a href="#">N77877</a> | DIALB430-0.125-D8-B.0-Z4 | 1/8       | 1/8       | 1             | 3              | 4      | CVDDIA  |
| <a href="#">N77880</a> | DIALB430-0.188-D5-B.0-Z4 | 3/16      | 3/16      | 1             | 4              | 4      | CVDDIA  |
| <a href="#">N72696</a> | DIALB430-0.188-D6-B.0-Z4 | 3/16      | 3/16      | 1-1/8         | 3              | 4      | CVDDIA  |
| <a href="#">N77883</a> | DIALB430-0.250-D5-B.0-Z4 | 1/4       | 1/4       | 1-1/4         | 3              | 4      | CVDDIA  |
| <a href="#">N72702</a> | DIALB430-0.250-D6-B.0-Z4 | 1/4       | 1/4       | 1-3/8         | 4              | 4      | CVDDIA  |
| <a href="#">N72708</a> | DIALB430-0.250-D7-B.0-Z4 | 1/4       | 1/4       | 1-3/8         | 6              | 4      | CVDDIA  |
| <a href="#">N72720</a> | DIALB430-0.375-D5-B.0-Z4 | 3/8       | 3/8       | 1-3/8         | 4              | 4      | CVDDIA  |
| <a href="#">N72726</a> | DIALB430-0.375-D6-B.0-Z4 | 3/8       | 3/8       | 1-3/8         | 6              | 4      | CVDDIA  |
| <a href="#">N18697</a> | DIALB430-0.500-D3-B.0-Z4 | 1/2       | 1/2       | 1-3/8         | 4              | 4      | CVDDIA  |
| <a href="#">N77895</a> | DIALB430-0.500-D5-B.0-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | CVDDIA  |
| <a href="#">N18698</a> | DIALB430-0.500-D4-B.0-Z4 | 1/2       | 1/2       | 1-3/8         | 6              | 4      | CVDDIA  |
| <a href="#">N72732</a> | DIALB430-0.500-D6-B.0-Z4 | 1/2       | 1/2       | 3             | 6              | 4      | CVDDIA  |

## DIAXRB430 & DIAXS430

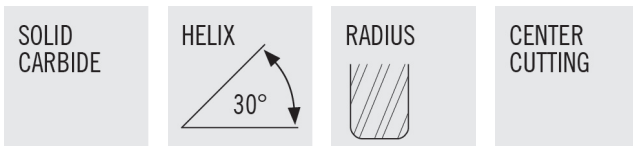


- Cylindrical Shank
- General purpose geometry designed for carbon fiber, composite applications, graphite and green ceramics

- Cutting Data - Page 184-185
- Tolerance Specs - Page 323

| PRODUCT NUMBER                    | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING |
|-----------------------------------|---------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|
| <b>REGULAR LENGTH - DIAXRB430</b> |                           |           |           |               |                |          |       |        |         |
| <a href="#">N18681</a>            | DIAXRB430-0.031-G4-B.0-Z4 | 1/32      | 1/8       | 3/32          | 3              | 0.028    | 3/8   | 4      | CVDDIA  |
| <a href="#">N18686</a>            | DIAXRB430-0.031-G5-B.0-Z4 | 1/32      | 1/8       | 3/32          | 3              | 0.028    | 1/2   | 4      | CVDDIA  |
| <a href="#">N18682</a>            | DIAXRB430-0.047-G3-B.0-Z4 | 3/64      | 1/8       | 9/64          | 3              | 0.043    | 9/16  | 4      | CVDDIA  |
| <a href="#">N18687</a>            | DIAXRB430-0.047-G4-B.0-Z4 | 3/64      | 1/8       | 9/64          | 3              | 0.043    | 3/4   | 4      | CVDDIA  |
| <a href="#">N18683</a>            | DIAXRB430-0.063-G4-B.0-Z4 | 1/16      | 1/8       | 3/16          | 3              | 0.057    | 3/4   | 4      | CVDDIA  |
| <a href="#">N18688</a>            | DIAXRB430-0.063-G5-B.0-Z4 | 1/16      | 1/8       | 3/16          | 3              | 0.057    | 1     | 4      | CVDDIA  |
| <a href="#">N18684</a>            | DIAXRB430-0.094-G3-B.0-Z4 | 3/32      | 1/8       | 9/32          | 3              | 0.086    | 1     | 4      | CVDDIA  |
| <a href="#">N18689</a>            | DIAXRB430-0.094-G4-B.0-Z4 | 3/32      | 1/8       | 9/32          | 3              | 0.086    | 1-1/2 | 4      | CVDDIA  |
| <a href="#">N18685</a>            | DIAXRB430-0.125-E3-B.0-Z4 | 1/8       | 1/8       | 3/8           | 3              | 0.115    | 1-1/2 | 4      | CVDDIA  |
| <a href="#">N18690</a>            | DIAXRB430-0.125-E4-B.0-Z4 | 1/8       | 1/8       | 3/8           | 3              | 0.115    | 2     | 4      | CVDDIA  |
| <b>STUB LENGTH - DIAXS430</b>     |                           |           |           |               |                |          |       |        |         |
| <a href="#">N77214</a>            | DIAXS430-0.063-G1-B.0-Z4  | 1/16      | 1/8       | 1/16          | 3              | 0.057    | 5/16  | 4      | CVDDIA  |
| <a href="#">N77216</a>            | DIAXS430-0.125-E1-B.0-Z4  | 1/8       | 1/8       | 1/8           | 3              | 0.115    | 5/8   | 4      | CVDDIA  |
| <a href="#">N77218</a>            | DIAXS430-0.250-E1-B.0-Z4  | 1/4       | 1/4       | 1/4           | 4              | 0.240    | 3/4   | 4      | CVDDIA  |

## DIAXRR430



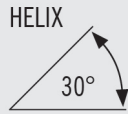
- Cylindrical Shank
- General purpose geometry designed for carbon fiber, composite applications, graphite and green ceramics

- Cutting Data - Page 184-185
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION                  | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING | RADIUS |
|------------------------|------------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|---------|--------|
| <a href="#">N18671</a> | DIAXRR430-0.031-G3-R005.0-Z4 | 1/32      | 1/8       | 3/32          | 3              | 0.028    | 3/8   | 4      | CVDDIA  | 0.005  |
| <a href="#">N18676</a> | DIAXRR430-0.031-G4-R005.0-Z4 | 1/32      | 1/8       | 3/32          | 3              | 0.028    | 1/2   | 4      | CVDDIA  | 0.005  |
| <a href="#">N18672</a> | DIAXRR430-0.047-G3-R010.0-Z4 | 3/64      | 1/8       | 9/64          | 3              | 0.043    | 9/16  | 4      | CVDDIA  | 0.010  |
| <a href="#">N18677</a> | DIAXRR430-0.047-G4-R010.0-Z4 | 3/64      | 1/8       | 9/64          | 3              | 0.043    | 3/4   | 4      | CVDDIA  | 0.010  |
| <a href="#">N18673</a> | DIAXRR430-0.063-G4-R010.0-Z4 | 1/16      | 1/8       | 3/16          | 3              | 0.057    | 3/4   | 4      | CVDDIA  | 0.010  |
| <a href="#">N18678</a> | DIAXRR430-0.063-G5-R010.0-Z4 | 1/16      | 1/8       | 3/16          | 3              | 0.057    | 1     | 4      | CVDDIA  | 0.010  |
| <a href="#">N18674</a> | DIAXRR430-0.094-G3-R010.0-Z4 | 3/32      | 1/8       | 9/32          | 3              | 0.086    | 1     | 4      | CVDDIA  | 0.010  |
| <a href="#">N18679</a> | DIAXRR430-0.094-G4-R010.0-Z4 | 3/32      | 1/8       | 9/32          | 3              | 0.086    | 1-1/2 | 4      | CVDDIA  | 0.010  |
| <a href="#">N18675</a> | DIAXRR430-0.125-E3-R010.0-Z4 | 1/8       | 1/8       | 3/8           | 3              | 0.115    | 1-1/2 | 4      | CVDDIA  | 0.010  |
| <a href="#">N77253</a> | DIAXRR430-0.125-E6-R030.0-Z4 | 1/8       | 1/8       | 3/4           | 3              | 0.115    | 1-1/2 | 4      | CVDDIA  | 0.030  |

## DIACC

SOLID  
CARBIDE



CENTER  
CUTTING



- Compression Cutter
- Cylindrical Shank
- Chip breaking notches
- Open flute design
- "X" DIM equals the length to helix transition from end teeth
- Designed to avoid delamination
- Designed for carbon fiber, composite applications, graphite, and green ceramics

- Cutting Data - Page 188-189
- Tolerance Specs - Page 323

## COARSE PITCH

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | "X" DIM |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|---------|---------|
| <a href="#">N77311</a> | DIACC-0.250-D3-S.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | CVDDIA  | 0.150   |
| <a href="#">N77312</a> | DIACC-0.375-D3-S.0-Z3 | 3/8       | 3/8       | 1             | 3              | 3      | CVDDIA  | 0.213   |
| <a href="#">N77313</a> | DIACC-0.500-D3-S.0-Z5 | 1/2       | 1/2       | 1-1/4         | 3              | 5      | CVDDIA  | 0.275   |

## FINE PITCH

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | "X" DIM |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|---------|---------|
| <a href="#">N68196</a> | DIACC-0.250-D3-S.0-Z5 | 1/4       | 1/4       | 3/4           | 2-1/2          | 5      | CVDDIA  | 0.150   |
| <a href="#">N68197</a> | DIACC-0.375-D3-S.0-Z5 | 3/8       | 3/8       | 1             | 3              | 5      | CVDDIA  | 0.213   |
| <a href="#">N68198</a> | DIACC-0.500-D3-S.0-Z7 | 1/2       | 1/2       | 1-1/4         | 3              | 7      | CVDDIA  | 0.275   |



# PUSH YOUR CFRP MACHINING OPERATIONS DIAMOND ROUTER

Overcome the challenges of machining CFRP (carbon fiber reinforced plastic) materials with Niagara Cutter's new DIARTRBE and DIARTREM end mills. Designed to push rather than pull when slot and side milling (routing) large, thick panel forms, the cutter directs cutting forces downward into the workpiece preventing parts from being pulled loose from their fixturing, while also minimizing chatter and material delamination.

Achieve the highest possible CFRP material machining process reliability – even when using gantry machines and vacuum clamping – thanks to the innovative designs of the DIARTRBE and DIARTREM end mills.

In addition to their left-hand helix/right-hand cut geometry that directs cutting forces downward, the cutters feature edge serrations, an optimized coating and a compact design that minimizes overall tool length. This combination of features minimizes tool overhang and maximizes stability to ensure quality surface finishes and long tool life.

## YOUR BENEFITS

- Fast and efficient cutting
- Prevention of delamination and part distortion
- Reduced part costs through longer tool life
- High process predictability and reliability
- Reduced chatter
- Maximum stability
- High quality surface finishes
- Less scrap

## RANGE OVERVIEW

### DIARTREM END MILL STYLE, 2-FLUTES

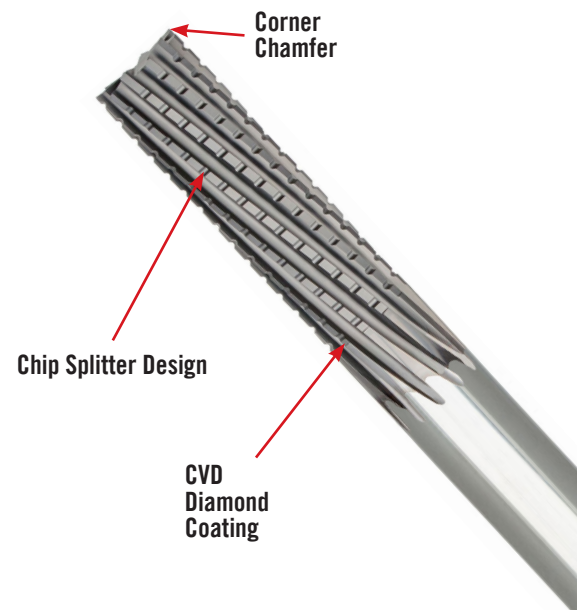
### DIARTRBE BURR END STYLE, 3- TO 7-FLUTES

- Inch (1/8" - 1/2") diameters
- 10° Left-hand helix
- Right hand cut
- Chip splitters
- CVD Diamond coated

| MATERIAL GROUPS                             |
|---|
| Thermoset Carbon & Glass Fiber (CFRP/CRP)   |
| Thermoplast Carbon & Glass Fiber (CFRP/CRP) |

## INDUSTRY APPLICATIONS

- **Aerospace:** Many components such as panels, nose cones and internal structural pieces are now made from composite materials. These new materials push the limits of manufacturing. Combat this with the DIARTR range of routers, eliminating un-cut fibers with ease, and providing unsurpassed tool life in trimming and slot milling.



# DIARTREM

SOLID  
CARBIDE



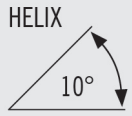
- Left hand helix directs cutting forces into workholding
- Right hand cut for normal spindle rotation direction
- Unique left hand flute shape reduces fluted length
- CVD diamond coating for maximum tool life
- Designed for carbon fiber, composite applications, and honeycomb materials
- For slotting and side milling
- End mill style end teeth
- Cutting Data - Page 190
- Tolerance Specs - Page 323

| PRODUCT NUMBER           | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING |
|--------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|---------|
| <a href="#">03134674</a> | DIARTREM-0.125-D3-S.0-Z6  | 1/8       | 1/8       | 3/8           | 1-1/2          | 6      | CVDDIA  |
| <a href="#">03134675</a> | DIARTREM-0.125-D4-S.0-Z8  | 1/8       | 1/8       | 1/2           | 1-1/2          | 8      | CVDDIA  |
| <a href="#">03134677</a> | DIARTREM-0.188-D3-S.0-Z6  | 3/16      | 3/16      | 9/16          | 2              | 6      | CVDDIA  |
| <a href="#">03134678</a> | DIARTREM-0.188-D4-S.0-Z8  | 3/16      | 3/16      | 3/4           | 2              | 8      | CVDDIA  |
| <a href="#">03134682</a> | DIARTREM-0.250-D3-S.0-Z10 | 1/4       | 1/4       | 3/4           | 2-1/2          | 10     | CVDDIA  |
| <a href="#">03134685</a> | DIARTREM-0.250-D4-S.0-Z10 | 1/4       | 1/4       | 1             | 3              | 10     | CVDDIA  |
| <a href="#">03134688</a> | DIARTREM-0.375-D3-S.0-Z12 | 3/8       | 3/8       | 1-1/8         | 3              | 12     | CVDDIA  |
| <a href="#">03134690</a> | DIARTREM-0.375-D4-S.0-Z12 | 3/8       | 3/8       | 1-1/2         | 4              | 12     | CVDDIA  |
| <a href="#">03134692</a> | DIARTREM-0.500-D2-S.0-Z14 | 1/2       | 1/2       | 1             | 3              | 14     | CVDDIA  |

DISCOUNT CODE D43

## DIARTRBE

SOLID  
CARBIDE



- Left hand helix directs cutting forces into workholding
- Right hand cut for normal spindle rotation direction
- Unique left hand flute shape reduces fluted length
- CVD diamond coating for maximum tool life
- Designed for carbon fiber, composite applications, and honeycomb materials
- For slotting and side milling
- Burr end style end teeth
- Cutting Data - Page 190
- Tolerance Specs - Page 323

| PRODUCT NUMBER           | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING |
|--------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|---------|
| <a href="#">03134673</a> | DIARTRBE-0.125-D2-S.0-Z6  | 1/8       | 1/8       | 1/4           | 1-1/2          | 6      | CVDDIA  |
| <a href="#">03134676</a> | DIARTRBE-0.188-D2-S.0-Z6  | 3/16      | 3/16      | 3/8           | 2              | 6      | CVDDIA  |
| <a href="#">03134679</a> | DIARTRBE-0.250-D2-S.0-Z8  | 1/4       | 1/4       | 1/2           | 2-1/2          | 8      | CVDDIA  |
| <a href="#">03134680</a> | DIARTRBE-0.250-D3-S.0-Z8  | 1/4       | 1/4       | 3/4           | 2-1/2          | 8      | CVDDIA  |
| <a href="#">03134681</a> | DIARTRBE-0.250-D3-S.0-Z10 | 1/4       | 1/4       | 3/4           | 2-1/2          | 10     | CVDDIA  |
| <a href="#">03134683</a> | DIARTRBE-0.250-D4-S.0-Z8  | 1/4       | 1/4       | 1             | 3              | 8      | CVDDIA  |
| <a href="#">03134684</a> | DIARTRBE-0.250-D4-S.0-Z10 | 1/4       | 1/4       | 1             | 3              | 10     | CVDDIA  |
| <a href="#">03134686</a> | DIARTRBE-0.375-D2-S.0-Z12 | 3/8       | 3/8       | 3/4           | 2-1/2          | 12     | CVDDIA  |
| <a href="#">03134687</a> | DIARTRBE-0.375-D3-S.0-Z12 | 3/8       | 3/8       | 1-1/8         | 3              | 12     | CVDDIA  |
| <a href="#">03134689</a> | DIARTRBE-0.375-D4-S.0-Z12 | 3/8       | 3/8       | 1-1/2         | 4              | 12     | CVDDIA  |
| <a href="#">03134691</a> | DIARTRBE-0.500-D2-S.0-Z14 | 1/2       | 1/2       | 1             | 3              | 14     | CVDDIA  |



## DIAEPB

SOLID  
CARBIDE

- End mill point burr
- Cylindrical Shank
- Positive end cutting geometry
- Low cutting forces
- End mill style end teeth geometry
- High shearing capabilities to reduce material delamination
- Designed for carbon fiber, composite applications, graphite and green ceramics
- Cutting Data - Page 191-193
- Tolerance Specs - Page 323

### COARSE PITCH

- Can be utilized up to 100% radial engagement



| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | COATING |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|---------|
| <a href="#">N68077</a> | DIAEPB-0.125-D1-S.0-Z | 1/8       | 1/8       | 1/2           | 1-1/2          | CVDDIA  |
| <a href="#">N68078</a> | DIAEPB-0.250-D2-S.0-Z | 1/4       | 1/4       | 3/4           | 2-1/2          | CVDDIA  |
| <a href="#">N68079</a> | DIAEPB-0.250-D4-S.0-Z | 1/4       | 1/4       | 1-3/8         | 3              | CVDDIA  |
| <a href="#">N68081</a> | DIAEPB-0.375-D1-S.0-Z | 3/8       | 3/8       | 1-3/8         | 3-1/4          | CVDDIA  |
| <a href="#">N68083</a> | DIAEPB-0.500-D1-S.0-Z | 1/2       | 1/2       | 1             | 3              | CVDDIA  |
| <a href="#">N68084</a> | DIAEPB-0.500-D3-S.0-Z | 1/2       | 1/2       | 2             | 4              | CVDDIA  |

### FINE PITCH

- Improved surface finish as compared to coarse pitch
- Up to 50% radial engagement



| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | COATING |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|---------|
| <a href="#">N68172</a> | DIAEPB-0.125-D2-S.0-Z | 1/8       | 1/8       | 1/2           | 1-1/2          | CVDDIA  |
| <a href="#">N68173</a> | DIAEPB-0.250-D1-S.0-Z | 1/4       | 1/4       | 3/4           | 2-1/2          | CVDDIA  |
| <a href="#">N68176</a> | DIAEPB-0.375-D4-S.0-Z | 3/8       | 3/8       | 1-3/8         | 3-1/4          | CVDDIA  |
| <a href="#">N68178</a> | DIAEPB-0.500-D2-S.0-Z | 1/2       | 1/2       | 1             | 3              | CVDDIA  |
| <a href="#">N68179</a> | DIAEPB-0.500-D4-S.0-Z | 1/2       | 1/2       | 2             | 4              | CVDDIA  |

## DIABEB

SOLID  
CARBIDE

- Burr end burr
- Positive cutting geometry
- Lower cutting forces
- High shear capabilities to reduce material delamination
- Burr style end teeth geometry
- Designed for carbon fiber, composite applications, graphite and green ceramics
- Cutting Data - Page 191-193
- Tolerance Specs - Page 323

### COARSE PITCH

- Can be utilized up to 100% radial engagement



| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | COATING |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|---------|
| <a href="#">N68093</a> | DIABEB-0.125-D1-S.0-Z | 1/8       | 1/8       | 1/2           | 1-1/2          | CVDDIA  |
| <a href="#">N68094</a> | DIABEB-0.250-D1-S.0-Z | 1/4       | 1/4       | 3/4           | 2-1/2          | CVDDIA  |
| <a href="#">N68097</a> | DIABEB-0.375-D1-S.0-Z | 3/8       | 3/8       | 1-3/8         | 3-1/4          | CVDDIA  |
| <a href="#">N68098</a> | DIABEB-0.375-D7-S.0-Z | 3/8       | 3/8       | 2-1/8         | 4              | CVDDIA  |
| <a href="#">N68099</a> | DIABEB-0.500-D1-S.0-Z | 1/2       | 1/2       | 1             | 3              | CVDDIA  |
| <a href="#">N68100</a> | DIABEB-0.500-D3-S.0-Z | 1/2       | 1/2       | 2             | 4              | CVDDIA  |

### FINE PITCH

- Improved surface finish as compared to coarse pitch
- Up to 50% radial engagement



| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | COATING |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|---------|
| <a href="#">N68188</a> | DIABEB-0.125-D2-S.0-Z | 1/8       | 1/8       | 1/2           | 1-1/2          | CVDDIA  |
| <a href="#">N68189</a> | DIABEB-0.250-D2-S.0-Z | 1/4       | 1/4       | 3/4           | 2-1/2          | CVDDIA  |
| <a href="#">N68192</a> | DIABEB-0.375-D2-S.0-Z | 3/8       | 3/8       | 1-3/8         | 3-1/4          | CVDDIA  |
| <a href="#">N68193</a> | DIABEB-0.375-D8-S.0-Z | 3/8       | 3/8       | 2-1/8         | 4              | CVDDIA  |
| <a href="#">N68194</a> | DIABEB-0.500-D2-S.0-Z | 1/2       | 1/2       | 1             | 3              | CVDDIA  |
| <a href="#">N68195</a> | DIABEB-0.500-D4-S.0-Z | 1/2       | 1/2       | 2             | 4              | CVDDIA  |

## DIAPPB

SOLID CARBIDE

- Plunge point burr
- Cylindrical Shank
- Drill point design
- Positive end cutting geometry
- Low cutting forces
- High shearing capabilities to reduce material delamination
- Designed for carbon fiber, composite applications, graphite and green ceramics
- Cutting Data - Page 191-193
- Tolerance Specs - Page 323

### COARSE PITCH



| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | COATING |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|---------|
| <a href="#">N68085</a> | DIAPPB-0.125-D1-C.0-Z | 1/8       | 1/8       | 1/2           | 1-1/2          | CVDDIA  |
| <a href="#">N68086</a> | DIAPPB-0.250-D1-C.0-Z | 1/4       | 1/4       | 3/4           | 2-1/2          | CVDDIA  |
| <a href="#">N68087</a> | DIAPPB-0.250-D3-C.0-Z | 1/4       | 1/4       | 1-3/8         | 3              | CVDDIA  |
| <a href="#">N68088</a> | DIAPPB-0.250-D5-C.0-Z | 1/4       | 1/4       | 2             | 4              | CVDDIA  |

### FINE PITCH

- Improved surface finish as compared to coarse pitch



| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | COATING |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|---------|
| <a href="#">N68180</a> | DIAPPB-0.125-D2-C.0-Z | 1/8       | 1/8       | 1/2           | 1-1/2          | CVDDIA  |
| <a href="#">N68181</a> | DIAPPB-0.250-D2-C.0-Z | 1/4       | 1/4       | 3/4           | 2-1/2          | CVDDIA  |
| <a href="#">N68182</a> | DIAPPB-0.250-D4-C.0-Z | 1/4       | 1/4       | 1-3/8         | 3              | CVDDIA  |
| <a href="#">N68183</a> | DIAPPB-0.250-D6-C.0-Z | 1/4       | 1/4       | 2             | 4              | CVDDIA  |

## DIA230 / DIAB230 - START VALUES

| SLOTTING            |  |  |                              |                     |                     |                         |                         |             |        |        |        |        |        |       |
|---------------------|--|--|------------------------------|---------------------|---------------------|-------------------------|-------------------------|-------------|--------|--------|--------|--------|--------|-------|
| SMG                 | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |                     | Z <sub>n</sub> = 2  |                         |                         |             |        |        |        |        |        |       |
|                     |  |  |                              |                     | 1/8                 | 3/16                    | 1/4                     | 5/16        | 3/8    | 1/2    | 5/8    | 3/4    |        |       |
| GRAPHITE            | 1.00                                     | 1.00                                     | 1425                         | n (rev/min)         | 43548               | 29032                   | 21774                   | 17419       | 14516  | 10887  | 8710   | 7258   |        |       |
|                     |  |  |                              | f <sub>z</sub> (in) | 0.0005              | 0.0007                  | 0.0009                  | 0.0011      | 0.0014 | 0.0018 | 0.0023 | 0.0027 |        |       |
|                     |  |  | 1125                         | -                   | 1725                | v <sub>f</sub> (in/min) | 39.5                    | 39.5        | 39.5   | 39.5   | 39.5   | 39.5   | 39.5   | 39.5  |
|                     |  |  | PLASTIC (SOFT)               | 1.00                | 1.00                | 1425                    | n (rev/min)             | 43548       | 29032  | 21774  | 17419  | 14516  | 10887  | 8710  |
| f <sub>z</sub> (in) | 0.0005                                   | 0.0007                                   |                              |                     |                     |                         | 0.0009                  | 0.0011      | 0.0014 | 0.0018 | 0.0023 | 0.0027 |        |       |
| 1125                | -  | 1725                                     |                              |                     |                     | v <sub>f</sub> (in/min) | 39.5                    | 39.5        | 39.5   | 39.5   | 39.5   | 39.5   | 39.5   | 39.5  |
| PLASTIC (HARD)      | 1.00                                     | 1.00                                     |                              |                     |                     | 1425                    | n (rev/min)             | 43548       | 29032  | 21774  | 17419  | 14516  | 10887  | 8710  |
|                     |  |  | f <sub>z</sub> (in)          | 0.0005              | 0.0007              |                         | 0.0009                  | 0.0011      | 0.0014 | 0.0018 | 0.0023 | 0.0027 |        |       |
|                     |  |  | 1125                         | -                   | 1725                | v <sub>f</sub> (in/min) | 39.5                    | 39.5        | 39.5   | 39.5   | 39.5   | 39.5   | 39.5   | 39.5  |
|                     |  |  | THERMOPLAST                  | CFRP                | 1.00                | 1.00                    | 1313                    | n (rev/min) | 40110  | 26740  | 20055  | 16044  | 13370  | 10028 |
| f <sub>z</sub> (in) | 0.0005                                   | 0.0007                                   |                              |                     |                     |                         |                         | 0.0010      | 0.0012 | 0.0015 | 0.0020 | 0.0025 | 0.0030 |       |
| 1163                | -  | 1463                                     |                              |                     |                     |                         | v <sub>f</sub> (in/min) | 39.7        | 39.7   | 39.7   | 39.7   | 39.7   | 39.7   | 39.7  |
| GRP                 | 0.80                                     | 1.00                                     |                              | 1425                | n (rev/min)         | 43548                   | 29032                   | 21774       | 17419  | 14516  | 10887  | 8710   | 7258   |       |
|                     |  |  |                              |                     | f <sub>z</sub> (in) | 0.0010                  | 0.0015                  | 0.0020      | 0.0025 | 0.0030 | 0.0040 | 0.0050 | 0.0059 |       |
|                     |  |  |                              | 1335                | -                   | 1515                    | v <sub>f</sub> (in/min) | 86.2        | 86.2   | 86.2   | 86.2   | 86.2   | 86.2   | 86.2  |
| THERMOSET           | CFRP                                     | 1.00                                     | 1.00                         | 1313                | n (rev/min)         | 40110                   | 26740                   | 20055       | 16044  | 13370  | 10028  | 8022   | 6685   |       |
|                     |  |  |                              |                     | f <sub>z</sub> (in) | 0.0005                  | 0.0007                  | 0.0010      | 0.0012 | 0.0015 | 0.0020 | 0.0025 | 0.0030 |       |
|                     |  |  |                              | 1162.5              | -                   | 1462.5                  | v <sub>f</sub> (in/min) | 39.7        | 39.7   | 39.7   | 39.7   | 39.7   | 39.7   | 39.7  |
|                     | GRP                                      | 0.80                                     | 1.00                         | 1425                | n (rev/min)         | 43548                   | 29032                   | 21774       | 17419  | 14516  | 10887  | 8710   | 7258   |       |
|                     |  |  |                              |                     | f <sub>z</sub> (in) | 0.0010                  | 0.0015                  | 0.0020      | 0.0025 | 0.0030 | 0.0040 | 0.0050 | 0.0059 |       |
|                     |  |  |                              | 1335                | -                   | 1515                    | v <sub>f</sub> (in/min) | 86.2        | 86.2   | 86.2   | 86.2   | 86.2   | 86.2   | 86.2  |



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SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## DIA230 / DIAB230 - START VALUES

| SIDE MILLING - ROUGHING |  |  |                              |   |      |                         |        |        |        |        |        |        |        |        |       |
|-------------------------|--|--|------------------------------|---|------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| SMG                     | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |   |      | Zn = 2                  |        |        |        |        |        |        |        |        |       |
|                         |  |  |                              |   |      | 1/8                     | 3/16   | 1/4    | 5/16   | 3/8    | 1/2    | 5/8    | 3/4    |        |       |
| GRAPHITE                | 1.00                                     | 0.40                                     | 1900                         | - | 2200 | n (rev/min)             | 58064  | 38709  | 29032  | 23226  | 19355  | 14516  | 11613  | 9677   |       |
|                         |  |  |                              |   |      | f <sub>z</sub> (in)     | 0.0007 | 0.0010 | 0.0014 | 0.0017 | 0.0021 | 0.0028 | 0.0034 | 0.0041 |       |
|                         |  |  | 1600                         | - | 2200 | v <sub>f</sub> (in/min) | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8  |
|                         |  |  |                              |   |      | n (rev/min)             | 58064  | 38709  | 29032  | 23226  | 19355  | 14516  | 11613  | 9677   |       |
| PLASTIC<br>(SOFT)       | 1.00                                     | 0.40                                     | 1900                         | - | 2200 | n (rev/min)             | 58064  | 38709  | 29032  | 23226  | 19355  | 14516  | 11613  | 9677   |       |
|                         |  |  |                              |   |      | f <sub>z</sub> (in)     | 0.0007 | 0.0010 | 0.0014 | 0.0017 | 0.0021 | 0.0028 | 0.0034 | 0.0041 |       |
|                         |  |  | 1600                         | - | 2200 | v <sub>f</sub> (in/min) | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8  |
|                         |  |  |                              |   |      | n (rev/min)             | 58064  | 38709  | 29032  | 23226  | 19355  | 14516  | 11613  | 9677   |       |
| PLASTIC<br>(HARD)       | 1.00                                     | 0.40                                     | 1900                         | - | 2200 | n (rev/min)             | 58064  | 38709  | 29032  | 23226  | 19355  | 14516  | 11613  | 9677   |       |
|                         |  |  |                              |   |      | f <sub>z</sub> (in)     | 0.0007 | 0.0010 | 0.0014 | 0.0017 | 0.0021 | 0.0028 | 0.0034 | 0.0041 |       |
|                         |  |  | 1600                         | - | 2200 | v <sub>f</sub> (in/min) | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8  |
|                         |  |  |                              |   |      | n (rev/min)             | 58064  | 38709  | 29032  | 23226  | 19355  | 14516  | 11613  | 9677   |       |
| THERMOPLAST             | 1.00                                     | 0.40                                     | 1750                         | - | 1900 | n (rev/min)             | 53480  | 35653  | 26740  | 21392  | 17827  | 13370  | 10696  | 8913   |       |
|                         |  |  |                              |   |      | f <sub>z</sub> (in)     | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 | 0.0038 | 0.0045 |       |
|                         |  |  | 1600                         | - | 1900 | v <sub>f</sub> (in/min) | 80.2   | 80.2   | 80.2   | 80.2   | 80.2   | 80.2   | 80.2   | 80.2   | 80.2  |
|                         |  |  |                              |   |      | n (rev/min)             | 58064  | 38709  | 29032  | 23226  | 19355  | 14516  | 11613  | 9677   |       |
|                         |  |  | 1810                         | - | 1990 | v <sub>f</sub> (in/min) | 174.2  | 174.2  | 174.2  | 174.2  | 174.2  | 174.2  | 174.2  | 174.2  | 174.2 |
|                         |  |  |                              |   |      | f <sub>z</sub> (in)     | 0.0015 | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 |       |
| THERMOSET               | 1.00                                     | 0.40                                     | 1750                         | - | 1900 | n (rev/min)             | 53480  | 35653  | 26740  | 21392  | 17827  | 13370  | 10696  | 8913   |       |
|                         |  |  |                              |   |      | f <sub>z</sub> (in)     | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 | 0.0038 | 0.0045 |       |
|                         |  |  | 1600                         | - | 1900 | v <sub>f</sub> (in/min) | 80.2   | 80.2   | 80.2   | 80.2   | 80.2   | 80.2   | 80.2   | 80.2   | 80.2  |
|                         |  |  |                              |   |      | n (rev/min)             | 58064  | 38709  | 29032  | 23226  | 19355  | 14516  | 11613  | 9677   |       |
|                         |  |  | 1810                         | - | 1990 | v <sub>f</sub> (in/min) | 174.2  | 174.2  | 174.2  | 174.2  | 174.2  | 174.2  | 174.2  | 174.2  | 174.2 |
|                         |  |  |                              |   |      | f <sub>z</sub> (in)     | 0.0015 | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 |       |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## DIAB230M - START VALUES

| SLOTTING       |                  |                  |                  |             |             |        |        |        |        |        |        |        |        |
|----------------|------------------|------------------|------------------|-------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
| SMG            | ap x Dc<br>(max) | ae x Dc<br>(max) | Vc<br>(sf / min) |             | Zn = 2      |        |        |        |        |        |        |        |        |
|                |                  |                  |                  |             | 1           | 2      | 3      | 4      | 6      | 8      | 10     | 12     |        |
| GRAPHITE       | 1.00             | 1.00             | 1425             | n (min-1)   | 138265      | 69132  | 46088  | 34566  | 23044  | 17283  | 13826  | 11522  |        |
|                |                  |                  |                  | fz (in)     | 0.0001      | 0.0003 | 0.0004 | 0.0006 | 0.0009 | 0.0011 | 0.0014 | 0.0017 |        |
|                |                  |                  | 1125 - 1725      | vf (in/min) | 39.2        | 39.2   | 39.2   | 39.2   | 39.2   | 39.2   | 39.2   | 39.2   | 39.2   |
| PLASTIC (SOFT) | 1.00             | 1.00             | 1425             | n (min-1)   | 138265      | 69132  | 46088  | 34566  | 23044  | 17283  | 13826  | 11522  |        |
|                |                  |                  |                  | fz (in)     | 0.0001      | 0.0003 | 0.0004 | 0.0006 | 0.0009 | 0.0011 | 0.0014 | 0.0017 |        |
|                |                  |                  | 1125 - 1725      | vf (in/min) | 39.2        | 39.2   | 39.2   | 39.2   | 39.2   | 39.2   | 39.2   | 39.2   | 39.2   |
| PLASTIC (HARD) | 1.00             | 1.00             | 1425             | n (min-1)   | 138265      | 69132  | 46088  | 34566  | 23044  | 17283  | 13826  | 11522  |        |
|                |                  |                  |                  | fz (in)     | 0.0001      | 0.0003 | 0.0004 | 0.0006 | 0.0009 | 0.0011 | 0.0014 | 0.0017 |        |
|                |                  |                  | 1125 - 1725      | vf (in/min) | 39.2        | 39.2   | 39.2   | 39.2   | 39.2   | 39.2   | 39.2   | 39.2   | 39.2   |
| THERMOPLAST    | CFRP             | 1.00             | 1.00             | 1310        | n (min-1)   | 127107 | 63553  | 42369  | 31777  | 21184  | 15888  | 12711  | 10592  |
|                |                  |                  |                  |             | fz (in)     | 0.0002 | 0.0003 | 0.0005 | 0.0006 | 0.0009 | 0.0013 | 0.0016 | 0.0019 |
|                |                  |                  |                  | 1160 - 1465 | vf (in/min) | 40.0   | 40.0   | 40.0   | 40.0   | 40.0   | 40.0   | 40.0   | 40.0   |
|                | GRP              | 0.80             | 1.00             | 1425        | n (min-1)   | 138265 | 69132  | 46088  | 34566  | 23044  | 17283  | 13826  | 11522  |
|                |                  |                  |                  |             | fz (in)     | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0019 | 0.0025 | 0.0031 | 0.0037 |
|                |                  |                  |                  | 1335 - 1515 | vf (in/min) | 86.0   | 86.0   | 86.0   | 86.0   | 86.0   | 86.0   | 86.0   | 86.0   |
| THERMOSET      | CFRP             | 1.00             | 1.00             | 1310        | n (min-1)   | 127107 | 63553  | 42369  | 31777  | 21184  | 15888  | 12711  | 10592  |
|                |                  |                  |                  |             | fz (in)     | 0.0002 | 0.0003 | 0.0005 | 0.0006 | 0.0009 | 0.0013 | 0.0016 | 0.0019 |
|                |                  |                  |                  | 1160 - 1465 | vf (in/min) | 40.0   | 40.0   | 40.0   | 40.0   | 40.0   | 40.0   | 40.0   | 40.0   |
|                | GRP              | 0.80             | 1.00             | 1425        | n (min-1)   | 138265 | 69132  | 46088  | 34566  | 23044  | 17283  | 13826  | 11522  |
|                |                  |                  |                  |             | fz (in)     | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0019 | 0.0025 | 0.0031 | 0.0037 |
|                |                  |                  |                  | 1335 - 1515 | vf (in/min) | 86.0   | 86.0   | 86.0   | 86.0   | 86.0   | 86.0   | 86.0   | 86.0   |



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SMG = Seco Material Group  
n [min-1] = RPM  
Vc (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
ap/Dc = % of diameter  
vf [in/min] = Feed rate  
ae/Dc = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

## DIAB230M - START VALUES

| SIDE MILLING - ROUGHING |  |  |                              |      |      |             |             |        |        |        |        |        |        |        |        |
|-------------------------|--|--|------------------------------|------|------|-------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
| SMG                     | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |      |      | Zn = 2      |             |        |        |        |        |        |        |        |        |
|                         |  |  |                              |      |      | 1           | 2           | 3      | 4      | 6      | 8      | 10     | 12     |        |        |
| GRAPHITE                | 1.00                                     | 0.40                                     | 1600                         | -    | 2200 | n (min-1)   | 184353      | 92177  | 61451  | 46088  | 30726  | 23044  | 18435  | 15363  |        |
|                         |  |  |                              |      |      | fz (in)     | 0.0002      | 0.0004 | 0.0006 | 0.0009 | 0.0013 | 0.0017 | 0.0022 | 0.0026 |        |
|                         |  |  |                              |      |      | vf (in/min) | 79.8        | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   | 79.8   |        |
| PLASTIC (SOFT)          | 1.00                                     | 0.40                                     | 1600                         | -    | 2200 | n (min-1)   | 184353      | 92177  | 61451  | 46088  | 30726  | 23044  | 18435  | 15363  |        |
|                         |  |  |                              |      |      | fz (in)     | 0.0001      | 0.0003 | 0.0004 | 0.0006 | 0.0009 | 0.0011 | 0.0014 | 0.0017 |        |
|                         |  |  |                              |      |      | vf (in/min) | 52.3        | 52.3   | 52.3   | 52.3   | 52.3   | 52.3   | 52.3   | 52.3   |        |
| PLASTIC (HARD)          | 1.00                                     | 0.40                                     | 1600                         | -    | 2200 | n (min-1)   | 184353      | 92177  | 61451  | 46088  | 30726  | 23044  | 18435  | 15363  |        |
|                         |  |  |                              |      |      | fz (in)     | 0.0001      | 0.0003 | 0.0004 | 0.0006 | 0.0009 | 0.0011 | 0.0014 | 0.0017 |        |
|                         |  |  |                              |      |      | vf (in/min) | 52.3        | 52.3   | 52.3   | 52.3   | 52.3   | 52.3   | 52.3   | 52.3   |        |
| THERMOPLAST             | CFRP                                     | 1.00                                     | 1600                         | -    | 1900 | n (min-1)   | 169799      | 84900  | 56600  | 42450  | 28300  | 21225  | 16980  | 14150  |        |
|                         |  |  |                              |      |      | fz (in)     | 0.0002      | 0.0003 | 0.0005 | 0.0006 | 0.0009 | 0.0013 | 0.0016 | 0.0019 |        |
|                         |  |  |                              |      |      | vf (in/min) | 53.5        | 53.5   | 53.5   | 53.5   | 53.5   | 53.5   | 53.5   | 53.5   |        |
|                         | GRP                                      | 1.00                                     | 0.40                         | 1810 | -    | 1990        | n (min-1)   | 184353 | 92177  | 61451  | 46088  | 30726  | 23044  | 18435  | 15363  |
|                         |  |  |                              |      |      |             | fz (in)     | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0019 | 0.0025 | 0.0031 | 0.0037 |
|                         |  |  |                              |      |      |             | vf (in/min) | 114.7  | 114.7  | 114.7  | 114.7  | 114.7  | 114.7  | 114.7  | 114.7  |
| THERMOSET               | CFRP                                     | 1.00                                     | 1600                         | -    | 1900 | n (min-1)   | 169799      | 84900  | 56600  | 42450  | 28300  | 21225  | 16980  | 14150  |        |
|                         |  |  |                              |      |      | fz (in)     | 0.0002      | 0.0003 | 0.0005 | 0.0006 | 0.0009 | 0.0013 | 0.0016 | 0.0019 |        |
|                         |  |  |                              |      |      | vf (in/min) | 53.5        | 53.5   | 53.5   | 53.5   | 53.5   | 53.5   | 53.5   | 53.5   |        |
|                         | GRP                                      | 1.00                                     | 0.40                         | 1810 | -    | 1990        | n (min-1)   | 184353 | 92177  | 61451  | 46088  | 30726  | 23044  | 18435  | 15363  |
|                         |  |  |                              |      |      |             | fz (in)     | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0019 | 0.0025 | 0.0031 | 0.0037 |
|                         |  |  |                              |      |      |             | vf (in/min) | 114.7  | 114.7  | 114.7  | 114.7  | 114.7  | 114.7  | 114.7  | 114.7  |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## DIA430 / DIACR430 / DIAB430 - START VALUES

| SLOTTING       |  |  |                              |                         |                    |                     |                         |                         |        |        |        |        |        |        |        |
|----------------|--|--|------------------------------|-------------------------|--------------------|---------------------|-------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|
| SMG            | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |                         | Z <sub>n</sub> = 4 |                     |                         |                         |        |        |        |        |        |        |        |
|                |  |  |                              |                         |                    | 1/8                 | 3/16                    | 1/4                     | 5/16   | 3/8    | 1/2    | 5/8    | 3/4    |        |        |
| GRAPHITE       | 1.00                                     | 1.00                                     | 1425                         | -                       | 1725               | n (rev/min)         | 43548                   | 29032                   | 21774  | 17419  | 14516  | 10887  | 8710   | 7258   |        |
|                |  |  |                              |                         |                    | f <sub>z</sub> (in) | 0.0005                  | 0.0007                  | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0023 | 0.0027 |        |
|                |  |  | v <sub>f</sub> (in/min)      | 79.0                    | 79.0               | 79.0                | 79.0                    | 79.0                    | 79.0   | 79.0   | 79.0   | 79.0   | 79.0   |        |        |
| PLASTIC (SOFT) | 1.00                                     | 1.00                                     | 1425                         | -                       | 1725               | n (rev/min)         | 43548                   | 29032                   | 21774  | 17419  | 14516  | 10887  | 8710   | 7258   |        |
|                |  |  |                              |                         |                    | f <sub>z</sub> (in) | 0.0005                  | 0.0007                  | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0023 | 0.0027 |        |
|                |  |  | v <sub>f</sub> (in/min)      | 79.0                    | 79.0               | 79.0                | 79.0                    | 79.0                    | 79.0   | 79.0   | 79.0   | 79.0   | 79.0   |        |        |
| PLASTIC (HARD) | 1.00                                     | 1.00                                     | 1425                         | -                       | 1725               | n (rev/min)         | 43548                   | 29032                   | 21774  | 17419  | 14516  | 10887  | 8710   | 7258   |        |
|                |  |  |                              |                         |                    | f <sub>z</sub> (in) | 0.0005                  | 0.0007                  | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0023 | 0.0027 |        |
|                |  |  | v <sub>f</sub> (in/min)      | 79.0                    | 79.0               | 79.0                | 79.0                    | 79.0                    | 79.0   | 79.0   | 79.0   | 79.0   | 79.0   |        |        |
| THERMOPLAST    | CFRP                                     | 1.00                                     | 1.00                         | 1313                    | -                  | 1463                | f <sub>z</sub> (in)     | 40110                   | 26740  | 20055  | 16044  | 13370  | 10028  | 8022   | 6685   |
|                |  |  |                              |                         |                    |                     | v <sub>f</sub> (in/min) | 0.0005                  | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0020 | 0.0025 | 0.0030 |
|                |  |  |                              | v <sub>f</sub> (in/min) | 1163               | -                   | 1463                    | f <sub>z</sub> (in)     | 79.4   | 79.4   | 79.4   | 79.4   | 79.4   | 79.4   | 79.4   |
|                | GRP                                      | 0.80                                     | 1.00                         | 1425                    | -                  | 1515                | v <sub>f</sub> (in/min) | 43548                   | 29032  | 21774  | 17419  | 14516  | 10887  | 8710   | 7258   |
|                |  |  |                              |                         |                    |                     | f <sub>z</sub> (in)     | 0.0010                  | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 | 0.0050 | 0.0059 |
|                |  |  |                              | v <sub>f</sub> (in/min) | 1335               | -                   | 1515                    | v <sub>f</sub> (in/min) | 172.5  | 172.5  | 172.5  | 172.4  | 172.5  | 172.5  | 172.5  |
| THERMOSET      | CFRP                                     | 1.00                                     | 1.00                         | 1313                    | -                  | 1462.5              | f <sub>z</sub> (in)     | 40110                   | 26740  | 20055  | 16044  | 13370  | 10028  | 8022   | 6685   |
|                |  |  |                              |                         |                    |                     | v <sub>f</sub> (in/min) | 0.0005                  | 0.0007 | 0.0010 | 0.0012 | 0.0015 | 0.0020 | 0.0025 | 0.0030 |
|                |  |  |                              | v <sub>f</sub> (in/min) | 1162.5             | -                   | 1462.5                  | f <sub>z</sub> (in)     | 79.4   | 79.4   | 79.4   | 79.4   | 79.4   | 79.4   | 79.4   |
|                | GRP                                      | 0.80                                     | 1.00                         | 1425                    | -                  | 1515                | v <sub>f</sub> (in/min) | 43548                   | 29032  | 21774  | 17419  | 14516  | 10887  | 8710   | 7258   |
|                |  |  |                              |                         |                    |                     | f <sub>z</sub> (in)     | 0.0010                  | 0.0015 | 0.0020 | 0.0025 | 0.0030 | 0.0040 | 0.0050 | 0.0059 |
|                |  |  |                              | v <sub>f</sub> (in/min) | 1335               | -                   | 1515                    | v <sub>f</sub> (in/min) | 172.5  | 172.5  | 172.5  | 172.4  | 172.5  | 172.5  | 172.5  |



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SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
v<sub>f</sub> [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.



## DIA430 / DIACR430 / DIAB430 - START VALUES

| SIDE MILLING - ROUGHING |  |  |                              |                         |                    |        |                         |        |        |        |        |        |        |        |        |
|-------------------------|--|--|------------------------------|-------------------------|--------------------|--------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| SMG                     | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |                         | Z <sub>n</sub> = 4 |        |                         |        |        |        |        |        |        |        |        |
|                         |  |  |                              |                         | 1/8                | 3/16   | 1/4                     | 5/16   | 3/8    | 1/2    | 5/8    | 3/4    |        |        |        |
| GRAPHITE                | 1.00                                     | 0.40                                     | 1900                         | n (rev/min)             | 58064              | 38709  | 29032                   | 23226  | 19355  | 14516  | 11613  | 9677   |        |        |        |
|                         |  |  |                              | f <sub>z</sub> (in)     | 0.0007             | 0.0010 | 0.0014                  | 0.0017 | 0.0021 | 0.0028 | 0.0034 | 0.0041 |        |        |        |
|                         |  |  | 1600 - 2200                  | v <sub>f</sub> (in/min) | 159.7              | 159.7  | 159.7                   | 159.7  | 159.7  | 159.7  | 159.7  | 159.7  | 159.7  |        |        |
|                         |  |  |                              | n (rev/min)             | 58064              | 38709  | 29032                   | 23226  | 19355  | 14516  | 11613  | 9677   |        |        |        |
|                         |  |  | PLASTIC (SOFT)               | 1.00                    | 0.40               | 1900   | f <sub>z</sub> (in)     | 0.0007 | 0.0010 | 0.0014 | 0.0017 | 0.0021 | 0.0028 | 0.0034 | 0.0041 |
|                         |  |  |                              |                         |                    |        | v <sub>f</sub> (in/min) | 159.7  | 159.7  | 159.7  | 159.7  | 159.7  | 159.7  | 159.7  | 159.7  |
| PLASTIC (HARD)          | 1.00                                     | 0.40                                     | 1900                         | n (rev/min)             | 58064              | 38709  | 29032                   | 23226  | 19355  | 14516  | 11613  | 9677   |        |        |        |
|                         |  |  |                              | f <sub>z</sub> (in)     | 0.0007             | 0.0010 | 0.0014                  | 0.0017 | 0.0021 | 0.0028 | 0.0034 | 0.0041 |        |        |        |
|                         |  |  | 1600 - 2200                  | v <sub>f</sub> (in/min) | 159.7              | 159.7  | 159.7                   | 159.7  | 159.7  | 159.7  | 159.7  | 159.7  |        |        |        |
|                         |  |  |                              | n (rev/min)             | 58064              | 38709  | 29032                   | 23226  | 19355  | 14516  | 11613  | 9677   |        |        |        |
|                         |  |  | THERMOPLAST                  | 1.00                    | 0.40               | 1750   | n (rev/min)             | 53480  | 35653  | 26740  | 21392  | 17827  | 13370  | 10696  | 8913   |
|                         |  |  |                              |                         |                    |        | f <sub>z</sub> (in)     | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 | 0.0038 | 0.0045 |
| 1600 - 1900             | v <sub>f</sub> (in/min)                  | 160.4                                    |                              |                         |                    | 160.4  | 160.4                   | 160.4  | 160.4  | 160.4  | 160.4  | 160.4  |        |        |        |
|                         | n (rev/min)                              | 58064                                    |                              |                         |                    | 38709  | 29032                   | 23226  | 19355  | 14516  | 11613  | 9677   |        |        |        |
| GRP                     | 1.00                                     | 0.40                                     |                              |                         |                    | 1900   | f <sub>z</sub> (in)     | 0.0015 | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 |
|                         |  |  |                              |                         |                    |        | v <sub>f</sub> (in/min) | 348.4  | 348.4  | 348.4  | 348.4  | 348.4  | 348.4  | 348.4  | 348.4  |
| THERMOSET               | 1.00                                     | 0.40                                     | 1750                         | n (rev/min)             | 53480              | 35653  | 26740                   | 21392  | 17827  | 13370  | 10696  | 8913   |        |        |        |
|                         |  |  |                              | f <sub>z</sub> (in)     | 0.0008             | 0.0011 | 0.0015                  | 0.0019 | 0.0023 | 0.0030 | 0.0038 | 0.0045 |        |        |        |
|                         |  |  | 1600 - 1900                  | v <sub>f</sub> (in/min) | 160.4              | 160.4  | 160.4                   | 160.4  | 160.4  | 160.4  | 160.4  | 160.4  |        |        |        |
|                         |  |  |                              | n (rev/min)             | 58064              | 38709  | 29032                   | 23226  | 19355  | 14516  | 11613  | 9677   |        |        |        |
|                         |  |  | GRP                          | 1.00                    | 0.40               | 1900   | f <sub>z</sub> (in)     | 0.0015 | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0060 | 0.0075 | 0.0090 |
|                         |  |  |                              |                         |                    |        | v <sub>f</sub> (in/min) | 348.4  | 348.4  | 348.4  | 348.4  | 348.4  | 348.4  | 348.4  | 348.4  |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## DIAXSB430 / DIAL430 / DIALB430 / DIAARR430 / DIAARB430 - START VALUES

| SLOTTING       |  |  |                              |      |      |      |                         |        |        |                         |        |        |        |        |        |        |        |        |
|----------------|--|--|------------------------------|------|------|------|-------------------------|--------|--------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| SMG            | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |      |      |      | Z <sub>n</sub> = 4      |        |        |                         |        |        |        |        |        |        |        |        |
|                |  |  |                              |      |      |      | 1/8                     | 3/16   | 1/4    | 5/16                    | 3/8    | 1/2    | 5/8    | 3/4    |        |        |        |        |
| GRAPHITE       | 1.00                                     | 1.00                                     | 1140                         | 840  | -    | 1440 | n (rev/min)             | 34838  | 23226  | 17419                   | 13935  | 11613  | 8710   | 6968   | 5806   |        |        |        |
|                |  |  |                              |      |      |      | f <sub>z</sub> (in)     | 0.0003 | 0.0005 | 0.0007                  | 0.0009 | 0.0010 | 0.0014 | 0.0017 | 0.0020 |        |        |        |
|                |  |  |                              |      |      |      | v <sub>f</sub> (in/min) | 47.4   | 47.4   | 47.4                    | 47.4   | 47.4   | 47.4   | 47.4   | 47.4   | 47.4   |        |        |
|                |  |  | PLASTIC (SOFT)               | 1.00 | 1.00 | 1140 | 840                     | -      | 1440   | n (rev/min)             | 34838  | 23226  | 17419  | 13935  | 11613  | 8710   | 6968   | 5806   |
|                |  |  |                              |      |      |      |                         |        |        | f <sub>z</sub> (in)     | 0.0003 | 0.0005 | 0.0007 | 0.0009 | 0.0010 | 0.0014 | 0.0017 | 0.0020 |
|                |  |  |                              |      |      |      |                         |        |        | v <sub>f</sub> (in/min) | 47.4   | 47.4   | 47.4   | 47.4   | 47.4   | 47.4   | 47.4   | 47.4   |
| PLASTIC (HARD) | 1.00                                     | 1.00                                     | 1140                         | 840  | -    | 1440 | n (rev/min)             | 34838  | 23226  | 17419                   | 13935  | 11613  | 8710   | 6968   | 5806   |        |        |        |
|                |  |  |                              |      |      |      | f <sub>z</sub> (in)     | 0.0003 | 0.0005 | 0.0007                  | 0.0009 | 0.0010 | 0.0014 | 0.0017 | 0.0020 |        |        |        |
|                |  |  |                              |      |      |      | v <sub>f</sub> (in/min) | 47.4   | 47.4   | 47.4                    | 47.4   | 47.4   | 47.4   | 47.4   | 47.4   | 47.4   |        |        |
| THERMOPLAST    | 1.00                                     | 1.00                                     | 1050                         | 900  | -    | 1200 | n (rev/min)             | 32088  | 21392  | 16044                   | 12835  | 10696  | 8022   | 6418   | 5348   |        |        |        |
|                |  |  |                              |      |      |      | f <sub>z</sub> (in)     | 0.0004 | 0.0006 | 0.0007                  | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0022 |        |        |        |
|                |  |  |                              |      |      |      | v <sub>f</sub> (in/min) | 47.7   | 47.7   | 47.7                    | 47.6   | 47.7   | 47.7   | 47.7   | 47.7   | 47.7   |        |        |
|                |  |  | GRP                          | 0.80 | 1.00 | 1140 | 1050                    | -      | 1230   | n (rev/min)             | 34838  | 23226  | 17419  | 13935  | 11613  | 8710   | 6968   | 5806   |
|                |  |  |                              |      |      |      |                         |        |        | f <sub>z</sub> (in)     | 0.0007 | 0.0011 | 0.0015 | 0.0019 | 0.0022 | 0.0030 | 0.0037 | 0.0045 |
|                |  |  |                              |      |      |      |                         |        |        | v <sub>f</sub> (in/min) | 103.5  | 103.5  | 103.5  | 103.5  | 103.5  | 103.5  | 103.5  | 103.5  |
| THERMOSET      | 1.00                                     | 1.00                                     | 1050                         | 900  | -    | 1200 | n (rev/min)             | 32088  | 21392  | 16044                   | 12835  | 10696  | 8022   | 6418   | 5348   |        |        |        |
|                |  |  |                              |      |      |      | f <sub>z</sub> (in)     | 0.0004 | 0.0006 | 0.0007                  | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0022 |        |        |        |
|                |  |  |                              |      |      |      | v <sub>f</sub> (in/min) | 47.7   | 47.7   | 47.7                    | 47.6   | 47.7   | 47.7   | 47.7   | 47.7   | 47.7   |        |        |
|                |  |  | GRP                          | 0.80 | 1.00 | 1140 | 1050                    | -      | 1230   | n (rev/min)             | 34838  | 23226  | 17419  | 13935  | 11613  | 8710   | 6968   | 5806   |
|                |  |  |                              |      |      |      |                         |        |        | f <sub>z</sub> (in)     | 0.0007 | 0.0011 | 0.0015 | 0.0019 | 0.0022 | 0.0030 | 0.0037 | 0.0045 |
|                |  |  |                              |      |      |      |                         |        |        | v <sub>f</sub> (in/min) | 103.5  | 103.5  | 103.5  | 103.5  | 103.5  | 103.5  | 103.5  | 103.5  |



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SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
v<sub>f</sub> [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

## DIAXSB430 / DIAL430 / DIALB430 / DIAXRR430 / DIAXRB430 - START VALUES

### SIDE MILLING - ROUGHING

| SMG            | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |                         | Z <sub>n</sub> = 4      |        |        |        |        |        |        |        |        |
|----------------|--|--|------------------------------|-------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
|                |  |  |                              |                         | 1/8                     | 3/16   | 1/4    | 5/16   | 3/8    | 1/2    | 5/8    | 3/4    |        |
| GRAPHITE       | 1.00                                     | 0.40                                     | 1520                         | n (rev/min)             | 46451                   | 30967  | 23226  | 18580  | 15484  | 11613  | 9290   | 7742   |        |
|                |  |  |                              | f <sub>z</sub> (in)     | 0.0005                  | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0021 | 0.0026 | 0.0031 |        |
|                |  |  | 1220 - 1820                  | v <sub>f</sub> (in/min) | 95.8                    | 95.8   | 95.8   | 95.8   | 95.8   | 95.8   | 95.8   | 95.8   | 95.8   |
| PLASTIC (SOFT) | 1.00                                     | 0.40                                     | 1520                         | n (rev/min)             | 46451                   | 30967  | 23226  | 18580  | 15484  | 11613  | 9290   | 7742   |        |
|                |  |  |                              | f <sub>z</sub> (in)     | 0.0005                  | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0021 | 0.0026 | 0.0031 |        |
|                |  |  | 1220 - 1820                  | v <sub>f</sub> (in/min) | 95.8                    | 95.8   | 95.8   | 95.8   | 95.8   | 95.8   | 95.8   | 95.8   | 95.8   |
| PLASTIC (HARD) | 1.00                                     | 0.40                                     | 1520                         | n (rev/min)             | 46451                   | 30967  | 23226  | 18580  | 15484  | 11613  | 9290   | 7742   |        |
|                |  |  |                              | f <sub>z</sub> (in)     | 0.0005                  | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0021 | 0.0026 | 0.0031 |        |
|                |  |  | 1220 - 1820                  | v <sub>f</sub> (in/min) | 95.8                    | 95.8   | 95.8   | 95.8   | 95.8   | 95.8   | 95.8   | 95.8   | 95.8   |
| THERMOPLAST    | CFRP                                     | 1.00                                     | 0.40                         | 1400                    | n (rev/min)             | 42784  | 28523  | 21392  | 17114  | 14261  | 10696  | 8557   | 7131   |
|                |  |  |                              |                         | f <sub>z</sub> (in)     | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0023 | 0.0028 | 0.0034 |
|                |  |  |                              | 1250 - 1550             | v <sub>f</sub> (in/min) | 96.3   | 96.3   | 96.3   | 96.3   | 96.3   | 96.3   | 96.3   | 96.3   |
|                | GRP                                      | 1.00                                     | 0.40                         | 1520                    | n (rev/min)             | 46451  | 30967  | 23226  | 18580  | 15484  | 11613  | 9290   | 7742   |
|                |  |  |                              |                         | f <sub>z</sub> (in)     | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 | 0.0056 | 0.0068 |
|                |  |  |                              | 1430 - 1610             | v <sub>f</sub> (in/min) | 209.0  | 209.0  | 209.0  | 209.0  | 209.0  | 209.0  | 209.0  | 209.0  |
| THERMOSET      | CFRP                                     | 1.00                                     | 0.40                         | 1400                    | n (rev/min)             | 42784  | 28523  | 21392  | 17114  | 14261  | 10696  | 8557   | 7131   |
|                |  |  |                              |                         | f <sub>z</sub> (in)     | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0023 | 0.0028 | 0.0034 |
|                |  |  |                              | 1250 - 1550             | v <sub>f</sub> (in/min) | 96.3   | 96.3   | 96.3   | 96.3   | 96.3   | 96.3   | 96.3   | 96.3   |
|                | GRP                                      | 1.00                                     | 0.40                         | 1520                    | n (rev/min)             | 46451  | 30967  | 23226  | 18580  | 15484  | 11613  | 9290   | 7742   |
|                |  |  |                              |                         | f <sub>z</sub> (in)     | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 | 0.0056 | 0.0068 |
|                |  |  |                              | 1430 - 1610             | v <sub>f</sub> (in/min) | 209.0  | 209.0  | 209.0  | 209.0  | 209.0  | 209.0  | 209.0  | 209.0  |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## DIA430M - START VALUES

| SLOTTING       |  |  |                              |             |       |                    |           |        |        |        |        |        |
|----------------|--|--|------------------------------|-------------|-------|--------------------|-----------|--------|--------|--------|--------|--------|
| SMG            | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |             |       | Z <sub>n</sub> = 4 |           |        |        |        |        |        |
|                |  |  |                              |             |       | 2                  | 3         | 4      | 6      | 8      |        |        |
| GRAPHITE       | 1.00                                     | 1.00                                     | 1425                         | -           | 1725  | n (min-1)          | 69132     | 46088  | 34566  | 23044  | 17283  |        |
|                |  |  |                              |             |       | fz (in)            | 0.0003    | 0.0004 | 0.0006 | 0.0009 | 0.0011 |        |
|                |  |  | vf (in/min)                  | 78.4        | 78.4  | 78.4               | 78.4      | 78.4   |        |        |        |        |
| PLASTIC (SOFT) | 1.00                                     | 1.00                                     | 1425                         | -           | 1725  | n (min-1)          | 69132     | 46088  | 34566  | 23044  | 17283  |        |
|                |  |  |                              |             |       | fz (in)            | 0.0003    | 0.0004 | 0.0006 | 0.0009 | 0.0011 |        |
|                |  |  | vf (in/min)                  | 78.4        | 78.4  | 78.4               | 78.4      | 78.4   |        |        |        |        |
| PLASTIC (HARD) | 1.00                                     | 1.00                                     | 1425                         | -           | 1725  | n (min-1)          | 69132     | 46088  | 34566  | 23044  | 17283  |        |
|                |  |  |                              |             |       | fz (in)            | 0.0003    | 0.0004 | 0.0006 | 0.0009 | 0.0011 |        |
|                |  |  | vf (in/min)                  | 78.4        | 78.4  | 78.4               | 78.4      | 78.4   |        |        |        |        |
| THERMOPLAST    | CFRP                                     | 1.00                                     | 1310                         | -           | 1465  | n (min-1)          | 63553     | 42369  | 31777  | 21184  | 15888  |        |
|                |  |  |                              |             |       | fz (in)            | 0.0003    | 0.0005 | 0.0006 | 0.0009 | 0.0013 |        |
|                |  |  | vf (in/min)                  | 80.1        | 80.1  | 80.1               | 80.1      | 80.1   |        |        |        |        |
|                | GRP                                      | 0.80                                     | 1.00                         | 1425        | -     | 1515               | n (min-1) | 69132  | 46088  | 34566  | 23044  | 17283  |
|                |  |  |                              |             |       |                    | fz (in)   | 0.0006 | 0.0009 | 0.0012 | 0.0019 | 0.0025 |
|                |  |  |                              | vf (in/min) | 172.0 | 172.0              | 172.0     | 172.0  | 172.0  |        |        |        |
| THERMOSET      | CFRP                                     | 1.00                                     | 1310                         | -           | 1465  | n (min-1)          | 63553     | 42369  | 31777  | 21184  | 15888  |        |
|                |  |  |                              |             |       | fz (in)            | 0.0003    | 0.0005 | 0.0006 | 0.0009 | 0.0013 |        |
|                |  |  | vf (in/min)                  | 80.1        | 80.1  | 80.1               | 80.1      | 80.1   |        |        |        |        |
|                | GRP                                      | 0.80                                     | 1.00                         | 1425        | -     | 1515               | n (min-1) | 69132  | 46088  | 34566  | 23044  | 17283  |
|                |  |  |                              |             |       |                    | fz (in)   | 0.0006 | 0.0009 | 0.0012 | 0.0019 | 0.0025 |
|                |  |  |                              | vf (in/min) | 172.0 | 172.0              | 172.0     | 172.0  | 172.0  |        |        |        |



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SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## DIA430M - START VALUES

| SIDE MILLING - ROUGHING |  |  |                              |      |      |                    |             |        |        |        |        |        |
|-------------------------|--|--|------------------------------|------|------|--------------------|-------------|--------|--------|--------|--------|--------|
| SMG                     | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |      |      | Z <sub>n</sub> = 4 |             |        |        |        |        |        |
|                         |  |  |                              |      |      | 2                  | 3           | 4      | 6      | 8      |        |        |
| GRAPHITE                | 1.00                                     | 0.40                                     | 1900                         |      |      | n (min-1)          | 92177       | 61451  | 46088  | 30726  | 23044  |        |
|                         |  |  |                              |      |      | fz (in)            | 0.0004      | 0.0006 | 0.0009 | 0.0013 | 0.0017 |        |
|                         |  |  | 1600                         | -    | 2200 | vf (in/min)        | 159.7       | 159.7  | 159.7  | 159.7  | 159.7  |        |
| PLASTIC<br>(SOFT)       | 1.00                                     | 0.40                                     | 1900                         |      |      | n (min-1)          | 92177       | 61451  | 46088  | 30726  | 23044  |        |
|                         |  |  |                              |      |      | fz (in)            | 0.0003      | 0.0004 | 0.0006 | 0.0009 | 0.0011 |        |
|                         |  |  | 1600                         | -    | 2200 | vf (in/min)        | 104.5       | 104.5  | 104.5  | 104.5  | 104.5  |        |
| PLASTIC<br>(HARD)       | 1.00                                     | 0.40                                     | 1900                         |      |      | n (min-1)          | 92177       | 61451  | 46088  | 30726  | 23044  |        |
|                         |  |  |                              |      |      | fz (in)            | 0.0003      | 0.0004 | 0.0006 | 0.0009 | 0.0011 |        |
|                         |  |  | 1600                         | -    | 2200 | vf (in/min)        | 104.5       | 104.5  | 104.5  | 104.5  | 104.5  |        |
| THERMOPLAST             | CFRP                                     | 1.00                                     | 0.40                         | 1750 |      |                    | n (min-1)   | 84900  | 56600  | 42450  | 28300  | 21225  |
|                         |  |  |                              |      |      |                    | fz (in)     | 0.0003 | 0.0005 | 0.0006 | 0.0009 | 0.0013 |
|                         |  |  |                              | 1600 | -    | 1900               | vf (in/min) | 107.0  | 107.0  | 107.0  | 107.0  | 107.0  |
|                         | GRP                                      | 1.00                                     | 0.40                         | 1900 |      |                    | n (min-1)   | 92177  | 61451  | 46088  | 30726  | 23044  |
|                         |  |  |                              |      |      |                    | fz (in)     | 0.0006 | 0.0009 | 0.0012 | 0.0019 | 0.0025 |
|                         |  |  |                              | 1810 | -    | 1990               | vf (in/min) | 229.4  | 229.4  | 229.4  | 229.4  | 229.4  |
| THERMOSET               | CFRP                                     | 1.00                                     | 0.40                         | 1750 |      |                    | n (min-1)   | 84900  | 56600  | 42450  | 28300  | 21225  |
|                         |  |  |                              |      |      |                    | fz (in)     | 0.0003 | 0.0005 | 0.0006 | 0.0009 | 0.0013 |
|                         |  |  |                              | 1600 | -    | 1900               | vf (in/min) | 107.0  | 107.0  | 107.0  | 107.0  | 107.0  |
|                         | GRP                                      | 1.00                                     | 0.40                         | 1900 |      |                    | n (min-1)   | 92177  | 61451  | 46088  | 30726  | 23044  |
|                         |  |  |                              |      |      |                    | fz (in)     | 0.0006 | 0.0009 | 0.0012 | 0.0019 | 0.0025 |
|                         |  |  |                              | 1810 | -    | 1990               | vf (in/min) | 229.4  | 229.4  | 229.4  | 229.4  | 229.4  |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## DIACC COARSE-PITCH - START VALUES

| SLOTING                 |  |  |                              |      |      |                         |                         |                    |        |        |
|-------------------------|--|--|------------------------------|------|------|-------------------------|-------------------------|--------------------|--------|--------|
| SMG                     | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | V <sub>c</sub><br>(sf / min) |      |      | Z <sub>n</sub> = 3      |                         | Z <sub>n</sub> = 5 |        |        |
|                         |  |  |                              |      |      | 1/4                     | 3/8                     | 1/2                |        |        |
| GRAPHITE                | 1.00                                     | 1.00                                     | 1425                         | -    | 1725 | n (rev/min)             | 21774                   | 14516              | 10887  |        |
|                         |  |  |                              |      |      | f <sub>z</sub> (in)     | 0.0009                  | 0.0014             | 0.0018 |        |
|                         |  |  |                              |      |      | v <sub>f</sub> (in/min) | 59.3                    | 59.3               | 98.8   |        |
| PLASTIC<br>(SOFT)       | 1.00                                     | 1.00                                     | 1425                         | -    | 1725 | n (rev/min)             | 21774                   | 14516              | 10887  |        |
|                         |  |  |                              |      |      | f <sub>z</sub> (in)     | 0.0009                  | 0.0014             | 0.0018 |        |
|                         |  |  |                              |      |      | v <sub>f</sub> (in/min) | 59.3                    | 59.3               | 98.8   |        |
| PLASTIC<br>(HARD)       | 1.00                                     | 1.00                                     | 1425                         | -    | 1725 | n (rev/min)             | 21774                   | 14516              | 10887  |        |
|                         |  |  |                              |      |      | f <sub>z</sub> (in)     | 0.0009                  | 0.0014             | 0.0018 |        |
|                         |  |  |                              |      |      | v <sub>f</sub> (in/min) | 59.3                    | 59.3               | 98.8   |        |
| THERMOPLAST             | CFRP                                     | 1.00                                     | 1.00                         | 1313 | -    | 1463                    | n (rev/min)             | 20055              | 13370  | 10028  |
|                         |  |  |                              |      |      |                         | f <sub>z</sub> (in)     | 0.0010             | 0.0015 | 0.0020 |
|                         |  |  |                              |      |      |                         | v <sub>f</sub> (in/min) | 59.6               | 59.6   | 99.3   |
|                         | GRP                                      | 0.80                                     | 1.00                         | 1425 | -    | 1515                    | n (rev/min)             | 21774              | 14516  | 10887  |
|                         |  |  |                              |      |      |                         | f <sub>z</sub> (in)     | 0.0010             | 0.0015 | 0.0020 |
|                         |  |  |                              |      |      |                         | v <sub>f</sub> (in/min) | 64.7               | 64.7   | 107.8  |
| THERMOSET               | CFRP                                     | 1.00                                     | 1.00                         | 1313 | -    | 1462.5                  | n (rev/min)             | 20055              | 13370  | 10028  |
|                         |  |  |                              |      |      |                         | f <sub>z</sub> (in)     | 0.0010             | 0.0015 | 0.0020 |
|                         |  |  |                              |      |      |                         | v <sub>f</sub> (in/min) | 59.6               | 59.6   | 99.3   |
|                         | GRP                                      | 0.80                                     | 1.00                         | 1425 | -    | 1515                    | n (rev/min)             | 21774              | 14516  | 10887  |
|                         |  |  |                              |      |      |                         | f <sub>z</sub> (in)     | 0.0010             | 0.0015 | 0.0020 |
|                         |  |  |                              |      |      |                         | v <sub>f</sub> (in/min) | 64.7               | 64.7   | 107.8  |
| SIDE MILLING - ROUGHING |  |  |                              |      |      |                         |                         |                    |        |        |
| GRAPHITE                | 2.00                                     | 0.40                                     | 1900                         | -    | 2200 | n (rev/min)             | 29032                   | 19355              | 14516  |        |
|                         |  |  |                              |      |      | f <sub>z</sub> (in)     | 0.0014                  | 0.0021             | 0.0028 |        |
|                         |  |  |                              |      |      | v <sub>f</sub> (in/min) | 119.8                   | 119.8              | 199.6  |        |
| PLASTIC<br>(SOFT)       | 2.00                                     | 0.40                                     | 1900                         | -    | 2200 | n (rev/min)             | 29032                   | 19355              | 14516  |        |
|                         |  |  |                              |      |      | f <sub>z</sub> (in)     | 0.0014                  | 0.0021             | 0.0028 |        |
|                         |  |  |                              |      |      | v <sub>f</sub> (in/min) | 119.8                   | 119.8              | 199.6  |        |
| PLASTIC<br>(HARD)       | 2.00                                     | 0.40                                     | 1900                         | -    | 2200 | n (rev/min)             | 29032                   | 19355              | 14516  |        |
|                         |  |  |                              |      |      | f <sub>z</sub> (in)     | 0.0014                  | 0.0021             | 0.0028 |        |
|                         |  |  |                              |      |      | v <sub>f</sub> (in/min) | 119.8                   | 119.8              | 199.6  |        |
| THERMOPLAST             | CFRP                                     | 2.00                                     | 0.40                         | 1750 | -    | 1900                    | n (rev/min)             | 26740              | 17827  | 13370  |
|                         |  |  |                              |      |      |                         | f <sub>z</sub> (in)     | 0.0015             | 0.0023 | 0.0030 |
|                         |  |  |                              |      |      |                         | v <sub>f</sub> (in/min) | 120.3              | 120.3  | 200.6  |
|                         | GRP                                      | 2.00                                     | 0.40                         | 1900 | -    | 1990                    | n (rev/min)             | 29032              | 19355  | 14516  |
|                         |  |  |                              |      |      |                         | f <sub>z</sub> (in)     | 0.0015             | 0.0023 | 0.0030 |
|                         |  |  |                              |      |      |                         | v <sub>f</sub> (in/min) | 130.6              | 130.6  | 217.7  |
| THERMOSET               | CFRP                                     | 2.00                                     | 0.40                         | 1750 | -    | 1900                    | n (rev/min)             | 26740              | 17827  | 13370  |
|                         |  |  |                              |      |      |                         | f <sub>z</sub> (in)     | 0.0015             | 0.0023 | 0.0030 |
|                         |  |  |                              |      |      |                         | v <sub>f</sub> (in/min) | 120.3              | 120.3  | 200.6  |
|                         | GRP                                      | 2.00                                     | 0.40                         | 1900 | -    | 1990                    | n (rev/min)             | 29032              | 19355  | 14516  |
|                         |  |  |                              |      |      |                         | f <sub>z</sub> (in)     | 0.0015             | 0.0023 | 0.0030 |
|                         |  |  |                              |      |      |                         | v <sub>f</sub> (in/min) | 130.6              | 130.6  | 217.7  |



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## DIACC - FINE PITCH - START VALUES

|                |                           | SIDE MILLING - ROUGHING   |                     |   |      |                |           |        |           |
|----------------|---------------------------|---------------------------|---------------------|---|------|----------------|-----------|--------|-----------|
| SMG            | $a_p \times D_c$<br>(max) | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |   |      |                | $Z_n = 5$ |        | $Z_n = 7$ |
|                |                           |                           |                     |   |      |                | 1/4       | 3/8    | 1/2       |
| GRAPHITE       | 2.00                      | 0.40                      | 1600                | - | 2200 | n (rev/min)    | 29032     | 19355  | 14516     |
|                |                           |                           |                     |   |      | $f_z$ (in)     | 0.0014    | 0.0021 | 0.0028    |
|                |                           |                           |                     |   |      | $v_f$ (in/min) | 199.6     | 199.6  | 279.4     |
|                |                           |                           |                     |   |      | n (rev/min)    | 29032     | 19355  | 14516     |
|                |                           |                           |                     |   |      | $f_z$ (in)     | 0.0014    | 0.0021 | 0.0028    |
|                |                           |                           |                     |   |      | $v_f$ (in/min) | 199.6     | 199.6  | 279.4     |
| PLASTIC (SOFT) | 2.00                      | 0.40                      | 1600                | - | 2200 | n (rev/min)    | 29032     | 19355  | 14516     |
|                |                           |                           |                     |   |      | $f_z$ (in)     | 0.0014    | 0.0021 | 0.0028    |
|                |                           |                           |                     |   |      | $v_f$ (in/min) | 199.6     | 199.6  | 279.4     |
|                |                           |                           |                     |   |      | n (rev/min)    | 29032     | 19355  | 14516     |
|                |                           |                           |                     |   |      | $f_z$ (in)     | 0.0014    | 0.0021 | 0.0028    |
|                |                           |                           |                     |   |      | $v_f$ (in/min) | 199.6     | 199.6  | 279.4     |
| PLASTIC (HARD) | 2.00                      | 0.40                      | 1600                | - | 2200 | n (rev/min)    | 29032     | 19355  | 14516     |
|                |                           |                           |                     |   |      | $f_z$ (in)     | 0.0014    | 0.0021 | 0.0028    |
|                |                           |                           |                     |   |      | $v_f$ (in/min) | 199.6     | 199.6  | 279.4     |
|                |                           |                           |                     |   |      | n (rev/min)    | 29032     | 19355  | 14516     |
|                |                           |                           |                     |   |      | $f_z$ (in)     | 0.0014    | 0.0021 | 0.0028    |
|                |                           |                           |                     |   |      | $v_f$ (in/min) | 199.6     | 199.6  | 279.4     |
| THERMOPLAST    | 2.00                      | 0.40                      | 1600                | - | 1900 | n (rev/min)    | 26740     | 17827  | 13370     |
|                |                           |                           |                     |   |      | $f_z$ (in)     | 0.0015    | 0.0023 | 0.0030    |
|                |                           |                           |                     |   |      | $v_f$ (in/min) | 200.6     | 200.6  | 280.8     |
|                |                           |                           |                     |   |      | n (rev/min)    | 29032     | 19355  | 14516     |
|                |                           |                           |                     |   |      | $f_z$ (in)     | 0.0015    | 0.0023 | 0.0030    |
|                |                           |                           |                     |   |      | $v_f$ (in/min) | 217.7     | 217.7  | 304.8     |
| THERMOSET      | 2.00                      | 0.40                      | 1600                | - | 1900 | n (rev/min)    | 26740     | 17827  | 13370     |
|                |                           |                           |                     |   |      | $f_z$ (in)     | 0.0015    | 0.0023 | 0.0030    |
|                |                           |                           |                     |   |      | $v_f$ (in/min) | 200.6     | 200.6  | 280.8     |
|                |                           |                           |                     |   |      | n (rev/min)    | 29032     | 19355  | 14516     |
|                |                           |                           |                     |   |      | $f_z$ (in)     | 0.0015    | 0.0023 | 0.0030    |
|                |                           |                           |                     |   |      | $v_f$ (in/min) | 217.7     | 217.7  | 304.8     |

SMG = Seco Material Group  
 n [min-1] = RPM  
 $v_c$  (sf/min) = Surface feet/min

$f_z$  [in] = Feed/tooth  
 $a_p/D_c$  = % of diameter  
 $v_f$  [in/min] = Feed rate  
 $a_e/D_c$  = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## DIARTRBE / DIARTREM - START VALUES

| SLOTTING                                    |      |         |         |                  |             |        |        |        |        |        |        |        |        |
|---|------|---------|---------|------------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP                                   | SMG  | ap x DC | ae x DC | vc (m/min)       |             | Zn=6   |        | Zn=8   |        |        | Zn=10  | Zn=12  | Zn=14  |
|   |      |         |         |                  |             | 1/8    | 3/16   | 1/8    | 3/16   | 1/4    | 1/4    | 3/8    | 1/2    |
| A<br>Thermoset<br>Carbon &<br>Glass Fiber   | CFRP | 1.00    | 1.00    | 510<br>425 - 595 | n [min-1]   | 15586  | 10390  | 15586  | 10390  | 7793   | 7793   | 5195   | 3896   |
|   |      |         |         |                  | fz [in]     | 0.0003 | 0.0004 | 0.0003 | 0.0004 | 0.0006 | 0.0006 | 0.0008 | 0.0011 |
|   |      |         |         |                  | vf [in/min] | 25.7   | 25.7   | 34.3   | 34.3   | 34.3   | 42.9   | 51.4   | 60.0   |
|   | CRP  | 1.00    | 1.00    | 330<br>260 - 400 | n [min-1]   | 10085  | 6723   | 10085  | 6723   | 5042   | 5042   | 3362   | 2521   |
|   |      |         |         |                  | fz [in]     | 0.0003 | 0.0004 | 0.0003 | 0.0004 | 0.0006 | 0.0006 | 0.0008 | 0.0011 |
|   |      |         |         |                  | vf [in/min] | 16.6   | 16.6   | 22.2   | 22.2   | 22.2   | 27.7   | 33.3   | 38.8   |
| A<br>Thermoplast<br>Carbon &<br>Glass Fiber | CFRP | 1.00    | 1.00    | 330<br>275 - 385 | n [min-1]   | 10085  | 6723   | 10085  | 6723   | 5042   | 5042   | 3362   | 2521   |
|   |      |         |         |                  | fz [in]     | 0.0003 | 0.0004 | 0.0003 | 0.0004 | 0.0006 | 0.0006 | 0.0008 | 0.0011 |
|   |      |         |         |                  | vf [in/min] | 16.6   | 16.6   | 22.2   | 22.2   | 22.2   | 27.7   | 33.3   | 38.8   |
|   | CRP  | 1.00    | 1.00    | 165<br>100 - 230 | n [min-1]   | 5042   | 3362   | 5042   | 3362   | 2521   | 2521   | 1681   | 1261   |
|   |      |         |         |                  | fz [in]     | 0.0003 | 0.0004 | 0.0003 | 0.0004 | 0.0006 | 0.0006 | 0.0008 | 0.0011 |
|   |      |         |         |                  | vf [in/min] | 8.3    | 8.3    | 11.1   | 11.1   | 11.1   | 13.9   | 16.6   | 19.4   |

| SIDE MILLING - ROUGHING                     |      |         |         |                  |             |        |        |        |        |        |        |        |        |
|---|------|---------|---------|------------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP                                   | SMG  | ap x DC | ae x DC | vc (m/min)       |             | Zn=6   |        | Zn=8   |        |        | Zn=10  | Zn=12  | Zn=14  |
|   |      |         |         |                  |             | 1/8    | 3/16   | 1/8    | 3/16   | 1/4    | 1/4    | 3/8    | 1/2    |
| A<br>Thermoset<br>Carbon &<br>Glass Fiber   | CFRP | 1.50    | 0.35    | 605<br>510 - 700 | n [min-1]   | 18489  | 12326  | 18489  | 12326  | 9244   | 9244   | 6163   | 4622   |
|   |      |         |         |                  | fz [in]     | 0.0004 | 0.0006 | 0.0004 | 0.0006 | 0.0008 | 0.0008 | 0.0012 | 0.0016 |
|   |      |         |         |                  | vf [in/min] | 44.4   | 44.4   | 59.2   | 59.2   | 59.2   | 74.0   | 88.7   | 103.5  |
|   | CRP  | 1.50    | 0.35    | 410<br>330 - 490 | n [min-1]   | 12530  | 8353   | 12530  | 8353   | 6265   | 6265   | 4177   | 3132   |
|   |      |         |         |                  | fz [in]     | 0.0004 | 0.0006 | 0.0004 | 0.0006 | 0.0008 | 0.0008 | 0.0012 | 0.0016 |
|   |      |         |         |                  | vf [in/min] | 30.1   | 30.1   | 40.1   | 40.1   | 40.1   | 50.1   | 60.1   | 70.2   |
| A<br>Thermoplast<br>Carbon &<br>Glass Fiber | CFRP | 1.50    | 0.35    | 410<br>295 - 525 | n [min-1]   | 12530  | 8353   | 12530  | 8353   | 6265   | 6265   | 4177   | 3132   |
|   |      |         |         |                  | fz [in]     | 0.0004 | 0.0006 | 0.0004 | 0.0006 | 0.0008 | 0.0008 | 0.0012 | 0.0016 |
|   |      |         |         |                  | vf [in/min] | 30.1   | 30.1   | 40.1   | 40.1   | 40.1   | 50.1   | 60.1   | 70.2   |
|   | CRP  | 1.50    | 0.35    | 195<br>120 - 270 | n [min-1]   | 5959   | 3973   | 5959   | 3973   | 2980   | 2980   | 1986   | 1490   |
|   |      |         |         |                  | fz [in]     | 0.0004 | 0.0006 | 0.0004 | 0.0006 | 0.0008 | 0.0008 | 0.0012 | 0.0016 |
|   |      |         |         |                  | vf [in/min] | 14.3   | 14.3   | 19.1   | 19.1   | 19.1   | 23.8   | 28.6   | 33.4   |



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SMG = Seco Material Group  
n [min-1] = RPM  
vc (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
ap/DC = % of diameter  
vf [in/min] = Feed rate  
ae/DC = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.



## DIAEPB / DIAPPB / DIABEB COARSE PITCH - START VALUES

| SLOTTING       |  |  |                              |   |      |                         |             |                     |                         |             |                     |                         |             |
|----------------|--|--|------------------------------|---|------|-------------------------|-------------|---------------------|-------------------------|-------------|---------------------|-------------------------|-------------|
| SMG            | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |   |      |                         | 1/8         | 3/16                | 1/4                     | 5/16        | 3/8                 | 1/2                     |             |
|                |  |  |                              |   |      |                         | n (rev/min) | f <sub>z</sub> (in) | v <sub>f</sub> (in/min) | n (rev/min) | f <sub>z</sub> (in) | v <sub>f</sub> (in/min) | n (rev/min) |
| GRAPHITE       | 1.00                                     | 1.00                                     | 1800                         | - | 2000 | n (rev/min)             | 55008       | 36672               | 27504                   | 22003       | 18336               | 13752                   |             |
|                |  |  |                              |   |      | f <sub>z</sub> (in)     | 0.0006      | 0.0009              | 0.0012                  | 0.0015      | 0.0018              | 0.0024                  |             |
|                |  |  | 1600                         | - | 2000 | v <sub>f</sub> (in/min) | 32.9        | 32.9                | 32.9                    | 32.9        | 32.9                | 32.9                    | 32.9        |
|                |  |  |                              |   |      | n (rev/min)             | 55008       | 36672               | 27504                   | 22003       | 18336               | 13752                   |             |
|                |  |  | 1800                         | - | 2000 | f <sub>z</sub> (in)     | 0.0006      | 0.0009              | 0.0012                  | 0.0015      | 0.0018              | 0.0024                  |             |
|                |  |  |                              |   |      | v <sub>f</sub> (in/min) | 32.9        | 32.9                | 32.9                    | 32.9        | 32.9                | 32.9                    |             |
| PLASTIC (SOFT) | 1.00                                     | 1.00                                     | 1800                         | - | 2000 | n (rev/min)             | 55008       | 36672               | 27504                   | 22003       | 18336               | 13752                   |             |
|                |  |  |                              |   |      | f <sub>z</sub> (in)     | 0.0006      | 0.0009              | 0.0012                  | 0.0015      | 0.0018              | 0.0024                  |             |
|                |  |  | 1600                         | - | 2000 | v <sub>f</sub> (in/min) | 32.9        | 32.9                | 32.9                    | 32.9        | 32.9                | 32.9                    |             |
|                |  |  |                              |   |      | n (rev/min)             | 55008       | 36672               | 27504                   | 22003       | 18336               | 13752                   |             |
|                |  |  | 1800                         | - | 2000 | f <sub>z</sub> (in)     | 0.0006      | 0.0009              | 0.0012                  | 0.0015      | 0.0018              | 0.0024                  |             |
|                |  |  |                              |   |      | v <sub>f</sub> (in/min) | 32.9        | 32.9                | 32.9                    | 32.9        | 32.9                | 32.9                    |             |
| PLASTIC (HARD) | 1.00                                     | 1.00                                     | 1800                         | - | 2000 | n (rev/min)             | 55008       | 36672               | 27504                   | 22003       | 18336               | 13752                   |             |
|                |  |  |                              |   |      | f <sub>z</sub> (in)     | 0.0006      | 0.0009              | 0.0012                  | 0.0015      | 0.0018              | 0.0024                  |             |
|                |  |  | 1600                         | - | 2000 | v <sub>f</sub> (in/min) | 32.9        | 32.9                | 32.9                    | 32.9        | 32.9                | 32.9                    |             |
|                |  |  |                              |   |      | n (rev/min)             | 55008       | 36672               | 27504                   | 22003       | 18336               | 13752                   |             |
|                |  |  | 1800                         | - | 2000 | f <sub>z</sub> (in)     | 0.0006      | 0.0009              | 0.0012                  | 0.0015      | 0.0018              | 0.0024                  |             |
|                |  |  |                              |   |      | v <sub>f</sub> (in/min) | 32.9        | 32.9                | 32.9                    | 32.9        | 32.9                | 32.9                    |             |
| THERMOPLAST    | 1.00                                     | 1.00                                     | 1800                         | - | 2000 | n (rev/min)             | 55008       | 36672               | 27504                   | 22003       | 18336               | 13752                   |             |
|                |  |  |                              |   |      | f <sub>z</sub> (in)     | 0.0005      | 0.0007              | 0.0010                  | 0.0012      | 0.0015              | 0.0020                  |             |
|                |  |  | 1600                         | - | 2000 | v <sub>f</sub> (in/min) | 27.2        | 27.2                | 27.2                    | 27.2        | 27.2                | 27.2                    |             |
|                |  |  |                              |   |      | n (rev/min)             | 55008       | 36672               | 27504                   | 22003       | 18336               | 13752                   |             |
|                |  |  | 1800                         | - | 2000 | f <sub>z</sub> (in)     | 0.0005      | 0.0007              | 0.0010                  | 0.0012      | 0.0015              | 0.0020                  |             |
|                |  |  |                              |   |      | v <sub>f</sub> (in/min) | 27.2        | 27.2                | 27.2                    | 27.2        | 27.2                | 27.2                    |             |
| THERMOSET      | 1.00                                     | 1.00                                     | 1800                         | - | 2000 | n (rev/min)             | 55008       | 36672               | 27504                   | 22003       | 18336               | 13752                   |             |
|                |  |  |                              |   |      | f <sub>z</sub> (in)     | 0.0005      | 0.0007              | 0.0010                  | 0.0012      | 0.0015              | 0.0020                  |             |
|                |  |  | 1600                         | - | 2000 | v <sub>f</sub> (in/min) | 27.2        | 27.2                | 27.2                    | 27.2        | 27.2                | 27.2                    |             |
|                |  |  |                              |   |      | n (rev/min)             | 55008       | 36672               | 27504                   | 22003       | 18336               | 13752                   |             |
|                |  |  | 1800                         | - | 2000 | f <sub>z</sub> (in)     | 0.0005      | 0.0007              | 0.0010                  | 0.0012      | 0.0015              | 0.0020                  |             |
|                |  |  |                              |   |      | v <sub>f</sub> (in/min) | 27.2        | 27.2                | 27.2                    | 27.2        | 27.2                | 27.2                    |             |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## DIAEPB / DIAPPB / DIABEB COARSE PITCH - START VALUES

| SIDE MILLING - ROUGHING |  |  |                              |                         |        |        |                     |        |        |        |        |        |        |
|-------------------------|--|--|------------------------------|-------------------------|--------|--------|---------------------|--------|--------|--------|--------|--------|--------|
| SMG                     | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |                         |        |        |                     |        |        |        |        |        |        |
|                         |  |  |                              |                         | 1/8    | 3/16   | 1/4                 | 5/16   | 3/8    | 1/2    |        |        |        |
| GRAPHITE                | 2.00                                     | 0.50                                     | 2400                         | n (rev/min)             | 73344  | 48896  | 36672               | 29338  | 24448  | 18336  |        |        |        |
|                         |  |  |                              | f <sub>z</sub> (in)     | 0.0009 | 0.0014 | 0.0018              | 0.0023 | 0.0027 | 0.0036 |        |        |        |
|                         |  |  | 2200 - 2600                  | v <sub>f</sub> (in/min) | 66.5   | 66.5   | 66.5                | 66.5   | 66.5   | 66.5   |        |        |        |
|                         |  |  |                              |                         |        |        |                     |        |        |        |        |        |        |
|                         |  |  | PLASTIC (SOFT)               | 2.00                    | 0.50   | 2400   | n (rev/min)         | 73344  | 48896  | 36672  | 29338  | 24448  | 18336  |
|                         |  |  |                              |                         |        |        | f <sub>z</sub> (in) | 0.0009 | 0.0014 | 0.0018 | 0.0023 | 0.0027 | 0.0036 |
| 2200 - 2600             | v <sub>f</sub> (in/min)                  | 66.5                                     |                              |                         |        | 66.5   | 66.5                | 66.5   | 66.5   | 66.5   |        |        |        |
|                         |  |  |                              |                         |        |        |                     |        |        |        |        |        |        |
| PLASTIC (HARD)          | 2.00                                     | 0.50                                     |                              |                         |        | 2400   | n (rev/min)         | 73344  | 48896  | 36672  | 29338  | 24448  | 18336  |
|                         |  |  |                              |                         |        |        | f <sub>z</sub> (in) | 0.0009 | 0.0014 | 0.0018 | 0.0023 | 0.0027 | 0.0036 |
|                         |  |  | 2200 - 2600                  | v <sub>f</sub> (in/min) | 66.5   | 66.5   | 66.5                | 66.5   | 66.5   | 66.5   |        |        |        |
|                         |  |  |                              |                         |        |        |                     |        |        |        |        |        |        |
|                         |  |  | THERMOPLAST                  | 2.00                    | 0.50   | 2400   | n (rev/min)         | 73344  | 48896  | 36672  | 29338  | 24448  | 18336  |
|                         |  |  |                              |                         |        |        | f <sub>z</sub> (in) | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
| 2200 - 2600             | v <sub>f</sub> (in/min)                  | 55.0                                     |                              |                         |        | 55.0   | 55.0                | 55.0   | 55.0   | 55.0   |        |        |        |
|                         |  |  |                              |                         |        |        |                     |        |        |        |        |        |        |
| THERMOSET               | 2.00                                     | 0.50                                     |                              |                         |        | 2400   | n (rev/min)         | 73344  | 48896  | 36672  | 29338  | 24448  | 18336  |
|                         |  |  |                              |                         |        |        | f <sub>z</sub> (in) | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|                         |  |  | 2200 - 2600                  | v <sub>f</sub> (in/min) | 55.0   | 55.0   | 55.0                | 55.0   | 55.0   | 55.0   |        |        |        |
|                         |  |  |                              |                         |        |        |                     |        |        |        |        |        |        |
|                         |  |  | THERMOSET                    | 2.00                    | 0.50   | 2400   | n (rev/min)         | 73344  | 48896  | 36672  | 29338  | 24448  | 18336  |
|                         |  |  |                              |                         |        |        | f <sub>z</sub> (in) | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
| 2200 - 2600             | v <sub>f</sub> (in/min)                  | 55.0                                     |                              |                         |        | 55.0   | 55.0                | 55.0   | 55.0   | 55.0   |        |        |        |
|                         |  |  |                              |                         |        |        |                     |        |        |        |        |        |        |



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SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## DIAEPB / DIAPPB / DIABEB FINE PITCH - START VALUES

| SIDE MILLING - ROUGHING |  |  |                              |      |                         |                     |                     |                         |                     |                     |                         |        |        |
|-------------------------|--|--|------------------------------|------|-------------------------|---------------------|---------------------|-------------------------|---------------------|---------------------|-------------------------|--------|--------|
| SMG                     | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |      |                         | 1/8                 | 1/4                 | 3/8                     | 1/2                 |                     |                         |        |        |
|                         |  |  |                              |      |                         | n (rev/min)         | f <sub>z</sub> (in) | v <sub>f</sub> (in/min) | n (rev/min)         | f <sub>z</sub> (in) | v <sub>f</sub> (in/min) |        |        |
| GRAPHITE                | 2.00                                     | 0.25                                     | 2100                         | -    | 2700                    | n (rev/min)         | 73344               | 36672                   | 24448               | 18336               |                         |        |        |
|                         |  |  |                              |      |                         | f <sub>z</sub> (in) | 0.0009              | 0.0018                  | 0.0027              | 0.0036              |                         |        |        |
|                         |  |  |                              |      | v <sub>f</sub> (in/min) | 66.5                | 66.5                | 66.5                    | 66.5                |                     |                         |        |        |
|                         |  |  |                              |      | n (rev/min)             | 73344               | 36672               | 24448                   | 18336               |                     |                         |        |        |
| PLASTIC<br>(SOFT)       | 2.00                                     | 0.25                                     | 2100                         | -    | 2700                    | n (rev/min)         | 73344               | 36672                   | 24448               | 18336               |                         |        |        |
|                         |  |  |                              |      |                         | f <sub>z</sub> (in) | 0.0009              | 0.0018                  | 0.0027              | 0.0036              |                         |        |        |
|                         |  |  |                              |      | v <sub>f</sub> (in/min) | 66.5                | 66.5                | 66.5                    | 66.5                |                     |                         |        |        |
|                         |  |  |                              |      | n (rev/min)             | 73344               | 36672               | 24448                   | 18336               |                     |                         |        |        |
| PLASTIC<br>(HARD)       | 2.00                                     | 0.25                                     | 2100                         | -    | 2700                    | n (rev/min)         | 73344               | 36672                   | 24448               | 18336               |                         |        |        |
|                         |  |  |                              |      |                         | f <sub>z</sub> (in) | 0.0009              | 0.0018                  | 0.0027              | 0.0036              |                         |        |        |
|                         |  |  |                              |      | v <sub>f</sub> (in/min) | 66.5                | 66.5                | 66.5                    | 66.5                |                     |                         |        |        |
|                         |  |  |                              |      | n (rev/min)             | 73344               | 36672               | 24448                   | 18336               |                     |                         |        |        |
| THERMOPLAST             | 2.00                                     | 0.25                                     | 2250                         | -    | 2550                    | n (rev/min)         | 73344               | 36672                   | 24448               | 18336               |                         |        |        |
|                         |  |  |                              |      |                         | f <sub>z</sub> (in) | 0.0008              | 0.0015                  | 0.0023              | 0.0030              |                         |        |        |
|                         |  |  |                              |      | v <sub>f</sub> (in/min) | 55.0                | 55.0                | 55.0                    | 55.0                |                     |                         |        |        |
|                         |  |  | GRP                          | 2.00 | 0.25                    | 2310                | -                   | 2490                    | n (rev/min)         | 73344               | 36672                   | 24448  | 18336  |
|                         |  |  |                              |      |                         |                     |                     |                         | f <sub>z</sub> (in) | 0.0008              | 0.0015                  | 0.0023 | 0.0030 |
|                         |  |  |                              |      |                         |                     |                     | v <sub>f</sub> (in/min) | 55.0                | 55.0                | 55.0                    | 55.0   |        |
|                         |  | n (rev/min)                              |                              |      |                         | 73344               | 36672               | 24448                   | 18336               |                     |                         |        |        |
| THERMOSET               | 2.00                                     | 0.25                                     | 2250                         | -    | 2550                    | n (rev/min)         | 73344               | 36672                   | 24448               | 18336               |                         |        |        |
|                         |  |  |                              |      |                         | f <sub>z</sub> (in) | 0.0008              | 0.0015                  | 0.0023              | 0.0030              |                         |        |        |
|                         |  |  |                              |      | v <sub>f</sub> (in/min) | 55.0                | 55.0                | 55.0                    | 55.0                |                     |                         |        |        |
|                         |  |  | GRP                          | 2.00 | 0.25                    | 2310                | -                   | 2490                    | n (rev/min)         | 73344               | 36672                   | 24448  | 18336  |
|                         |  |  |                              |      |                         |                     |                     |                         | f <sub>z</sub> (in) | 0.0008              | 0.0015                  | 0.0023 | 0.0030 |
|                         |  |  |                              |      |                         |                     |                     | v <sub>f</sub> (in/min) | 55.0                | 55.0                | 55.0                    | 55.0   |        |
|                         |  | n (rev/min)                              |                              |      |                         | 73344               | 36672               | 24448                   | 18336               |                     |                         |        |        |

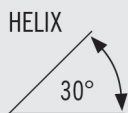
SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## C230

SOLID  
CARBIDE



CENTER  
CUTTING

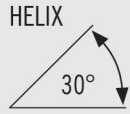


- General Purpose
- General machining of most material types
- Cutting Data - Page 224-225
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N85261</a> | C230-0.031-F3-S.0-Z2 | 1/32      | 1/8       | 5/64          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85337</a> | C230-0.031-F3-S.0-Z2 | 1/32      | 1/8       | 5/64          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N54012</a> | C230-0.031-F4-S.0-Z2 | 1/32      | 1/8       | 3/32          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N54018</a> | C230-0.031-F4-S.0-Z2 | 1/32      | 1/8       | 3/32          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85262</a> | C230-0.047-F2-S.0-Z2 | 3/64      | 1/8       | 7/64          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85338</a> | C230-0.047-F2-S.0-Z2 | 3/64      | 1/8       | 7/64          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N54013</a> | C230-0.047-F3-S.0-Z2 | 3/64      | 1/8       | 1/8           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N54019</a> | C230-0.047-F3-S.0-Z2 | 3/64      | 1/8       | 1/8           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85408</a> | C230-0.063-F2-S.0-Z2 | 1/16      | 1/8       | 1/8           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85434</a> | C230-0.063-F2-S.0-Z2 | 1/16      | 1/8       | 1/8           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85263</a> | C230-0.063-F3-S.0-Z2 | 1/16      | 1/8       | 3/16          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85339</a> | C230-0.063-F3-S.0-Z2 | 1/16      | 1/8       | 3/16          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55334</a> | C230-0.063-F4-S.0-Z2 | 1/16      | 1/8       | 1/4           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55430</a> | C230-0.063-F4-S.0-Z2 | 1/16      | 1/8       | 1/4           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55335</a> | C230-0.078-F3-S.0-Z2 | 5/64      | 1/8       | 1/4           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55431</a> | C230-0.078-F3-S.0-Z2 | 5/64      | 1/8       | 1/4           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85409</a> | C230-0.094-F2-S.0-Z2 | 3/32      | 1/8       | 3/16          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85435</a> | C230-0.094-F2-S.0-Z2 | 3/32      | 1/8       | 3/16          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85265</a> | C230-0.094-F3-S.0-Z2 | 3/32      | 1/8       | 9/32          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85341</a> | C230-0.094-F3-S.0-Z2 | 3/32      | 1/8       | 9/32          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55336</a> | C230-0.094-F4-S.0-Z2 | 3/32      | 1/8       | 3/8           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55432</a> | C230-0.094-F4-S.0-Z2 | 3/32      | 1/8       | 3/8           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85266</a> | C230-0.109-F3-S.0-Z2 | 7/64      | 1/8       | 3/8           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85342</a> | C230-0.109-F3-S.0-Z2 | 7/64      | 1/8       | 3/8           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85410</a> | C230-0.125-D2-S.0-Z2 | 1/8       | 1/8       | 1/4           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85436</a> | C230-0.125-D2-S.0-Z2 | 1/8       | 1/8       | 1/4           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85267</a> | C230-0.125-D4-S.0-Z2 | 1/8       | 1/8       | 1/2           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85343</a> | C230-0.125-D4-S.0-Z2 | 1/8       | 1/8       | 1/2           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55337</a> | C230-0.125-D5-S.0-Z2 | 1/8       | 1/8       | 5/8           | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55433</a> | C230-0.125-D5-S.0-Z2 | 1/8       | 1/8       | 5/8           | 2              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55338</a> | C230-0.125-D6-S.0-Z2 | 1/8       | 1/8       | 3/4           | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55434</a> | C230-0.125-D6-S.0-Z2 | 1/8       | 1/8       | 3/4           | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55339</a> | C230-0.125-D8-S.0-Z2 | 1/8       | 1/8       | 1             | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55435</a> | C230-0.125-D8-S.0-Z2 | 1/8       | 1/8       | 1             | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85411</a> | C230-0.156-F2-S.0-Z2 | 5/32      | 3/16      | 5/16          | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85437</a> | C230-0.156-F2-S.0-Z2 | 5/32      | 3/16      | 5/16          | 2              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85269</a> | C230-0.156-F3-S.0-Z2 | 5/32      | 3/16      | 1/2           | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85345</a> | C230-0.156-F3-S.0-Z2 | 5/32      | 3/16      | 1/2           | 2              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85412</a> | C230-0.188-D2-S.0-Z2 | 3/16      | 3/16      | 3/8           | 2              | 2      | UNCOATED | CYLINDRICAL |

## C230 (CONT'D)

SOLID  
CARBIDE



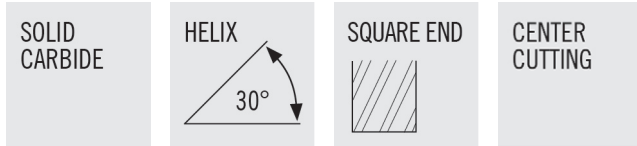
CENTER  
CUTTING



- General Purpose
- General machining of most material types
- Cutting Data - Page 224-225
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N85438</a> | C230-0.188-D2-S.0-Z2 | 3/16      | 3/16      | 3/8           | 2              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85271</a> | C230-0.188-D3-S.0-Z2 | 3/16      | 3/16      | 5/8           | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85347</a> | C230-0.188-D3-S.0-Z2 | 3/16      | 3/16      | 5/8           | 2              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85448</a> | C230-0.188-D4-S.0-Z2 | 3/16      | 3/16      | 3/4           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85484</a> | C230-0.188-D4-S.0-Z2 | 3/16      | 3/16      | 3/4           | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55341</a> | C230-0.188-D6-S.0-Z2 | 3/16      | 3/16      | 1             | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55437</a> | C230-0.188-D6-S.0-Z2 | 3/16      | 3/16      | 1             | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85272</a> | C230-0.203-F3-S.0-Z2 | 13/64     | 1/4       | 5/8           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85348</a> | C230-0.203-F3-S.0-Z2 | 13/64     | 1/4       | 5/8           | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85273</a> | C230-0.219-F3-S.0-Z2 | 7/32      | 1/4       | 5/8           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85349</a> | C230-0.219-F3-S.0-Z2 | 7/32      | 1/4       | 5/8           | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85414</a> | C230-0.250-D2-S.0-Z2 | 1/4       | 1/4       | 1/2           | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85440</a> | C230-0.250-D2-S.0-Z2 | 1/4       | 1/4       | 1/2           | 2              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85275</a> | C230-0.250-D3-S.0-Z2 | 1/4       | 1/4       | 3/4           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85351</a> | C230-0.250-D3-S.0-Z2 | 1/4       | 1/4       | 3/4           | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55342</a> | C230-0.250-D4-S.0-Z2 | 1/4       | 1/4       | 1             | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55438</a> | C230-0.250-D4-S.0-Z2 | 1/4       | 1/4       | 1             | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85451</a> | C230-0.250-D7-S.0-Z2 | 1/4       | 1/4       | 1-1/2         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85487</a> | C230-0.250-D7-S.0-Z2 | 1/4       | 1/4       | 1-1/2         | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85277</a> | C230-0.281-F3-S.0-Z2 | 9/32      | 5/16      | 3/4           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85353</a> | C230-0.281-F3-S.0-Z2 | 9/32      | 5/16      | 3/4           | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85415</a> | C230-0.313-D2-S.0-Z2 | 5/16      | 5/16      | 1/2           | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85441</a> | C230-0.313-D2-S.0-Z2 | 5/16      | 5/16      | 1/2           | 2              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85279</a> | C230-0.313-D3-S.0-Z2 | 5/16      | 5/16      | 13/16         | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85355</a> | C230-0.313-D3-S.0-Z2 | 5/16      | 5/16      | 13/16         | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55345</a> | C230-0.313-D4-S.0-Z2 | 5/16      | 5/16      | 1             | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55441</a> | C230-0.313-D4-S.0-Z2 | 5/16      | 5/16      | 1             | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85281</a> | C230-0.344-F3-S.0-Z2 | 11/32     | 3/8       | 1             | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85357</a> | C230-0.344-F3-S.0-Z2 | 11/32     | 3/8       | 1             | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85416</a> | C230-0.375-D1-S.0-Z2 | 3/8       | 3/8       | 5/8           | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85442</a> | C230-0.375-D1-S.0-Z2 | 3/8       | 3/8       | 5/8           | 2              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85283</a> | C230-0.375-D2-S.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85359</a> | C230-0.375-D2-S.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55348</a> | C230-0.375-D3-S.0-Z2 | 3/8       | 3/8       | 1             | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55444</a> | C230-0.375-D3-S.0-Z2 | 3/8       | 3/8       | 1             | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55349</a> | C230-0.375-D4-S.0-Z2 | 3/8       | 3/8       | 1             | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55445</a> | C230-0.375-D4-S.0-Z2 | 3/8       | 3/8       | 1             | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85454</a> | C230-0.375-D5-S.0-Z2 | 3/8       | 3/8       | 1-1/8         | 3              | 2      | UNCOATED | CYLINDRICAL |



## C230 (CONT'D)



- General Purpose
- General machining of most material types
- Cutting Data - Page 224-225
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N85490</a> | C230-0.375-D5-S.0-Z2 | 3/8       | 3/8       | 1-1/8         | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55350</a> | C230-0.375-D6-S.0-Z2 | 3/8       | 3/8       | 1-1/2         | 6              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55446</a> | C230-0.375-D6-S.0-Z2 | 3/8       | 3/8       | 1-1/2         | 6              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85287</a> | C230-0.438-D2-S.0-Z2 | 7/16      | 7/16      | 1             | 2-3/4          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85363</a> | C230-0.438-D2-S.0-Z2 | 7/16      | 7/16      | 1             | 2-3/4          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55355</a> | C230-0.438-D5-S.0-Z2 | 7/16      | 7/16      | 2             | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55451</a> | C230-0.438-D5-S.0-Z2 | 7/16      | 7/16      | 2             | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85418</a> | C230-0.500-D1-S.0-Z2 | 1/2       | 1/2       | 5/8           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85444</a> | C230-0.500-D1-S.0-Z2 | 1/2       | 1/2       | 5/8           | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85291</a> | C230-0.500-D2-S.0-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85367</a> | C230-0.500-D2-S.0-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55356</a> | C230-0.500-D3-S.0-Z2 | 1/2       | 1/2       | 1             | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55452</a> | C230-0.500-D3-S.0-Z2 | 1/2       | 1/2       | 1             | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55357</a> | C230-0.500-D4-S.0-Z2 | 1/2       | 1/2       | 1-1/2         | 6              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55453</a> | C230-0.500-D4-S.0-Z2 | 1/2       | 1/2       | 1-1/2         | 6              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55358</a> | C230-0.500-D5-S.0-Z2 | 1/2       | 1/2       | 2             | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55454</a> | C230-0.500-D5-S.0-Z2 | 1/2       | 1/2       | 2             | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85459</a> | C230-0.500-D7-S.0-Z2 | 1/2       | 1/2       | 3             | 6              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85495</a> | C230-0.500-D7-S.0-Z2 | 1/2       | 1/2       | 3             | 6              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85292</a> | C230-0.563-D2-S.0-Z2 | 9/16      | 9/16      | 1-1/8         | 3-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85368</a> | C230-0.563-D2-S.0-Z2 | 9/16      | 9/16      | 1-1/8         | 3-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85293</a> | C230-0.625-D2-S.0-Z2 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85369</a> | C230-0.625-D2-S.0-Z2 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85460</a> | C230-0.625-D4-S.0-Z2 | 5/8       | 5/8       | 2-1/4         | 5              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85496</a> | C230-0.625-D4-S.0-Z2 | 5/8       | 5/8       | 2-1/4         | 5              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85461</a> | C230-0.625-D5-S.0-Z2 | 5/8       | 5/8       | 3             | 6              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85497</a> | C230-0.625-D5-S.0-Z2 | 5/8       | 5/8       | 3             | 6              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85294</a> | C230-0.688-F2-S.0-Z2 | 11/16     | 3/4       | 1-3/8         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85370</a> | C230-0.688-F2-S.0-Z2 | 11/16     | 3/4       | 1-3/8         | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85420</a> | C230-0.750-D1-S.0-Z2 | 3/4       | 3/4       | 1             | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85446</a> | C230-0.750-D1-S.0-Z2 | 3/4       | 3/4       | 1             | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85295</a> | C230-0.750-D2-S.0-Z2 | 3/4       | 3/4       | 1-1/2         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85371</a> | C230-0.750-D2-S.0-Z2 | 3/4       | 3/4       | 1-1/2         | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55362</a> | C230-0.750-D3-S.0-Z2 | 3/4       | 3/4       | 2             | 6              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55458</a> | C230-0.750-D3-S.0-Z2 | 3/4       | 3/4       | 2             | 6              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85462</a> | C230-0.750-D4-S.0-Z2 | 3/4       | 3/4       | 2-1/4         | 5              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85498</a> | C230-0.750-D4-S.0-Z2 | 3/4       | 3/4       | 2-1/4         | 5              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85463</a> | C230-0.750-D5-S.0-Z2 | 3/4       | 3/4       | 3             | 6              | 2      | UNCOATED | CYLINDRICAL |

## C230 (CONT'D)

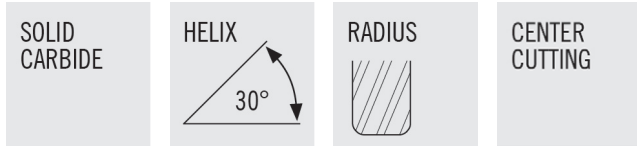
|               |   |   |                |
|---------------|---|---|----------------|
| SOLID CARBIDE |  |  | CENTER CUTTING |
|---------------|---|---|----------------|



- General Purpose
- General machining of most material types
- Cutting Data - Page 224-225
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N85499</a> | C230-0.750-D5-S.0-Z2 | 3/4       | 3/4       | 3             | 6              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85296</a> | C230-0.875-D2-S.0-Z2 | 7/8       | 7/8       | 1-1/2         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85372</a> | C230-0.875-D2-S.0-Z2 | 7/8       | 7/8       | 1-1/2         | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N85297</a> | C230-1.000-D2-S.0-Z2 | 1         | 1         | 1-1/2         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N85373</a> | C230-1.000-D2-S.0-Z2 | 1         | 1         | 1-1/2         | 4              | 2      | TIALN    | CYLINDRICAL |

## C230R



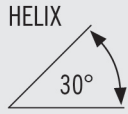
- General Purpose
- General machining of most material types
- Cutting Data - Page 224-225
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N91170</a> | C230R-0.250-D3-R015.0-Z2 | 1/4       | 1/4       | 3/4           | 2-1/2          | 2      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91173</a> | C230R-0.250-D3-R030.0-Z2 | 1/4       | 1/4       | 3/4           | 2-1/2          | 2      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91321</a> | C230R-0.375-D3-R015.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91323</a> | C230R-0.375-D3-R030.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91335</a> | C230R-0.500-D2-R015.0-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91337</a> | C230R-0.500-D2-R030.0-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91339</a> | C230R-0.500-D2-R060.0-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | TIALN   | 0.060  | CYLINDRICAL |
| <a href="#">N91341</a> | C230R-0.500-D2-R090.0-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | TIALN   | 0.090  | CYLINDRICAL |
| <a href="#">N91342</a> | C230R-0.500-D2-R125.0-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | TIALN   | 0.125  | CYLINDRICAL |
| <a href="#">N91343</a> | C230R-0.625-D2-R015.0-Z2 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 2      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91345</a> | C230R-0.625-D2-R030.0-Z2 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 2      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91347</a> | C230R-0.625-D2-R060.0-Z2 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 2      | TIALN   | 0.060  | CYLINDRICAL |
| <a href="#">N91348</a> | C230R-0.625-D2-R090.0-Z2 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 2      | TIALN   | 0.090  | CYLINDRICAL |
| <a href="#">N91349</a> | C230R-0.625-D2-R125.0-Z2 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 2      | TIALN   | 0.125  | CYLINDRICAL |
| <a href="#">N91132</a> | C230R-0.750-D2-R015.0-Z2 | 3/4       | 3/4       | 1-1/2         | 4              | 2      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91352</a> | C230R-0.750-D2-R030.0-Z2 | 3/4       | 3/4       | 1-1/2         | 4              | 2      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91159</a> | C230R-0.750-D2-R060.0-Z2 | 3/4       | 3/4       | 1-1/2         | 4              | 2      | TIALN   | 0.060  | CYLINDRICAL |
| <a href="#">N91356</a> | C230R-0.750-D2-R090.0-Z2 | 3/4       | 3/4       | 1-1/2         | 4              | 2      | TIALN   | 0.090  | CYLINDRICAL |
| <a href="#">N91358</a> | C230R-0.750-D2-R125.0-Z2 | 3/4       | 3/4       | 1-1/2         | 4              | 2      | TIALN   | 0.125  | CYLINDRICAL |
| <a href="#">N91362</a> | C230R-0.750-D2-R190.0-Z2 | 3/4       | 3/4       | 1-1/2         | 4              | 2      | TIALN   | 0.190  | CYLINDRICAL |



## CB230

SOLID  
CARBIDE



CENTER  
CUTTING

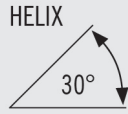


- General Purpose
- General machining of most material types
- Cutting Data - Page 226-227
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N86149</a> | CB230-0.016-F2-B.0-Z2 | 1/64      | 1/8       | 1/32          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86225</a> | CB230-0.016-F2-B.0-Z2 | 1/64      | 1/8       | 1/32          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86150</a> | CB230-0.031-F3-B.0-Z2 | 1/32      | 1/8       | 5/64          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86226</a> | CB230-0.031-F3-B.0-Z2 | 1/32      | 1/8       | 5/64          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N54020</a> | CB230-0.031-F4-B.0-Z2 | 1/32      | 1/8       | 3/32          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N54032</a> | CB230-0.031-F4-B.0-Z2 | 1/32      | 1/8       | 3/32          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86151</a> | CB230-0.047-F2-B.0-Z2 | 3/64      | 1/8       | 7/64          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86227</a> | CB230-0.047-F2-B.0-Z2 | 3/64      | 1/8       | 7/64          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N54021</a> | CB230-0.047-F3-B.0-Z2 | 3/64      | 1/8       | 1/8           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N54033</a> | CB230-0.047-F3-B.0-Z2 | 3/64      | 1/8       | 1/8           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55462</a> | CB230-0.063-F2-B.0-Z2 | 1/16      | 1/8       | 1/8           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55615</a> | CB230-0.063-F2-B.0-Z2 | 1/16      | 1/8       | 1/8           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86152</a> | CB230-0.063-F3-B.0-Z2 | 1/16      | 1/8       | 3/16          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86228</a> | CB230-0.063-F3-B.0-Z2 | 1/16      | 1/8       | 3/16          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N54022</a> | CB230-0.063-F4-B.0-Z2 | 1/16      | 1/8       | 1/4           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N54034</a> | CB230-0.063-F4-B.0-Z2 | 1/16      | 1/8       | 1/4           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86153</a> | CB230-0.078-F2-B.0-Z2 | 5/64      | 1/8       | 3/16          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86229</a> | CB230-0.078-F2-B.0-Z2 | 5/64      | 1/8       | 3/16          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N54023</a> | CB230-0.078-F3-B.0-Z2 | 5/64      | 1/8       | 1/4           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N54035</a> | CB230-0.078-F3-B.0-Z2 | 5/64      | 1/8       | 1/4           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55463</a> | CB230-0.094-F2-B.0-Z2 | 3/32      | 1/8       | 3/16          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55616</a> | CB230-0.094-F2-B.0-Z2 | 3/32      | 1/8       | 3/16          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86154</a> | CB230-0.094-F3-B.0-Z2 | 3/32      | 1/8       | 9/32          | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86230</a> | CB230-0.094-F3-B.0-Z2 | 3/32      | 1/8       | 9/32          | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55464</a> | CB230-0.094-F4-B.0-Z2 | 3/32      | 1/8       | 3/8           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55617</a> | CB230-0.094-F4-B.0-Z2 | 3/32      | 1/8       | 3/8           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55465</a> | CB230-0.125-D2-B.0-Z2 | 1/8       | 1/8       | 1/4           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55618</a> | CB230-0.125-D2-B.0-Z2 | 1/8       | 1/8       | 1/4           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86156</a> | CB230-0.125-D4-B.0-Z2 | 1/8       | 1/8       | 1/2           | 1-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86232</a> | CB230-0.125-D4-B.0-Z2 | 1/8       | 1/8       | 1/2           | 1-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55466</a> | CB230-0.125-D5-B.0-Z2 | 1/8       | 1/8       | 5/8           | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55619</a> | CB230-0.125-D5-B.0-Z2 | 1/8       | 1/8       | 5/8           | 2              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55467</a> | CB230-0.125-D6-B.0-Z2 | 1/8       | 1/8       | 3/4           | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55620</a> | CB230-0.125-D6-B.0-Z2 | 1/8       | 1/8       | 3/4           | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86158</a> | CB230-0.156-F3-B.0-Z2 | 5/32      | 3/16      | 1/2           | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86234</a> | CB230-0.156-F3-B.0-Z2 | 5/32      | 3/16      | 1/2           | 2              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55470</a> | CB230-0.188-D2-B.0-Z2 | 3/16      | 3/16      | 3/8           | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55623</a> | CB230-0.188-D2-B.0-Z2 | 3/16      | 3/16      | 3/8           | 2              | 2      | TIALN    | CYLINDRICAL |

## CB230 (CONT'D)

SOLID  
CARBIDE



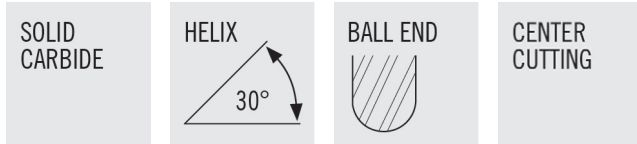
CENTER  
CUTTING



- General Purpose
- General machining of most material types
- Cutting Data - Page 226-227
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N86160</a> | CB230-0.188-D3-B.0-Z2 | 3/16      | 3/16      | 5/8           | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86236</a> | CB230-0.188-D3-B.0-Z2 | 3/16      | 3/16      | 5/8           | 2              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55471</a> | CB230-0.188-D4-B.0-Z2 | 3/16      | 3/16      | 1             | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55624</a> | CB230-0.188-D4-B.0-Z2 | 3/16      | 3/16      | 1             | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55475</a> | CB230-0.250-D2-B.0-Z2 | 1/4       | 1/4       | 1/2           | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55628</a> | CB230-0.250-D2-B.0-Z2 | 1/4       | 1/4       | 1/2           | 2              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86164</a> | CB230-0.250-D3-B.0-Z2 | 1/4       | 1/4       | 3/4           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86240</a> | CB230-0.250-D3-B.0-Z2 | 1/4       | 1/4       | 3/4           | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55476</a> | CB230-0.250-D4-B.0-Z2 | 1/4       | 1/4       | 1             | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55629</a> | CB230-0.250-D4-B.0-Z2 | 1/4       | 1/4       | 1             | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55477</a> | CB230-0.250-D5-B.0-Z2 | 1/4       | 1/4       | 1             | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55630</a> | CB230-0.250-D5-B.0-Z2 | 1/4       | 1/4       | 1             | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55478</a> | CB230-0.250-D6-B.0-Z2 | 1/4       | 1/4       | 1-1/2         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55631</a> | CB230-0.250-D6-B.0-Z2 | 1/4       | 1/4       | 1-1/2         | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86166</a> | CB230-0.281-F3-B.0-Z2 | 9/32      | 5/16      | 3/4           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86242</a> | CB230-0.281-F3-B.0-Z2 | 9/32      | 5/16      | 3/4           | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86168</a> | CB230-0.313-D3-B.0-Z2 | 5/16      | 5/16      | 13/16         | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86244</a> | CB230-0.313-D3-B.0-Z2 | 5/16      | 5/16      | 13/16         | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55482</a> | CB230-0.313-D5-B.0-Z2 | 5/16      | 5/16      | 1             | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55635</a> | CB230-0.313-D5-B.0-Z2 | 5/16      | 5/16      | 1             | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55484</a> | CB230-0.313-D7-B.0-Z2 | 5/16      | 5/16      | 1-5/8         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55637</a> | CB230-0.313-D7-B.0-Z2 | 5/16      | 5/16      | 1-5/8         | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55485</a> | CB230-0.375-D2-B.0-Z2 | 3/8       | 3/8       | 5/8           | 2              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55638</a> | CB230-0.375-D2-B.0-Z2 | 3/8       | 3/8       | 5/8           | 2              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86172</a> | CB230-0.375-D3-B.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86248</a> | CB230-0.375-D3-B.0-Z2 | 3/8       | 3/8       | 1             | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55486</a> | CB230-0.375-D4-B.0-Z2 | 3/8       | 3/8       | 1             | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55639</a> | CB230-0.375-D4-B.0-Z2 | 3/8       | 3/8       | 1             | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55488</a> | CB230-0.375-D6-B.0-Z2 | 3/8       | 3/8       | 1-1/2         | 6              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55641</a> | CB230-0.375-D6-B.0-Z2 | 3/8       | 3/8       | 1-1/2         | 6              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55489</a> | CB230-0.375-D7-B.0-Z2 | 3/8       | 3/8       | 2             | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55642</a> | CB230-0.375-D7-B.0-Z2 | 3/8       | 3/8       | 2             | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55496</a> | CB230-0.500-D1-B.0-Z2 | 1/2       | 1/2       | 5/8           | 2-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55649</a> | CB230-0.500-D1-B.0-Z2 | 1/2       | 1/2       | 5/8           | 2-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86180</a> | CB230-0.500-D2-B.0-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86256</a> | CB230-0.500-D2-B.0-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55497</a> | CB230-0.500-D3-B.0-Z2 | 1/2       | 1/2       | 1             | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55650</a> | CB230-0.500-D3-B.0-Z2 | 1/2       | 1/2       | 1             | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55498</a> | CB230-0.500-D4-B.0-Z2 | 1/2       | 1/2       | 1-1/2         | 6              | 2      | UNCOATED | CYLINDRICAL |

## CB230 (CONT'D)

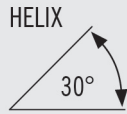


- General Purpose
- General machining of most material types
- Cutting Data - Page 226-227
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N55651</a> | CB230-0.500-D4-B.0-Z2 | 1/2       | 1/2       | 1-1/2         | 6              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55499</a> | CB230-0.500-D5-B.0-Z2 | 1/2       | 1/2       | 2             | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55652</a> | CB230-0.500-D5-B.0-Z2 | 1/2       | 1/2       | 2             | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55500</a> | CB230-0.500-D6-B.0-Z2 | 1/2       | 1/2       | 3             | 6              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55653</a> | CB230-0.500-D6-B.0-Z2 | 1/2       | 1/2       | 3             | 6              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86182</a> | CB230-0.625-D2-B.0-Z2 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86258</a> | CB230-0.625-D2-B.0-Z2 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55506</a> | CB230-0.750-D1-B.0-Z2 | 3/4       | 3/4       | 1             | 3              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55659</a> | CB230-0.750-D1-B.0-Z2 | 3/4       | 3/4       | 1             | 3              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86184</a> | CB230-0.750-D2-B.0-Z2 | 3/4       | 3/4       | 1-1/2         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86260</a> | CB230-0.750-D2-B.0-Z2 | 3/4       | 3/4       | 1-1/2         | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55507</a> | CB230-0.750-D3-B.0-Z2 | 3/4       | 3/4       | 2             | 6              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55660</a> | CB230-0.750-D3-B.0-Z2 | 3/4       | 3/4       | 2             | 6              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55508</a> | CB230-0.750-D4-B.0-Z2 | 3/4       | 3/4       | 3             | 6              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55661</a> | CB230-0.750-D4-B.0-Z2 | 3/4       | 3/4       | 3             | 6              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86185</a> | CB230-0.875-D2-B.0-Z2 | 7/8       | 7/8       | 1-1/2         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86261</a> | CB230-0.875-D2-B.0-Z2 | 7/8       | 7/8       | 1-1/2         | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N86186</a> | CB230-1.000-D1-B.0-Z2 | 1         | 1         | 1-1/2         | 4              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N86262</a> | CB230-1.000-D1-B.0-Z2 | 1         | 1         | 1-1/2         | 4              | 2      | TIALN    | CYLINDRICAL |
| <a href="#">N55512</a> | CB230-1.000-D4-B.0-Z2 | 1         | 1         | 4             | 7              | 2      | UNCOATED | CYLINDRICAL |
| <a href="#">N55665</a> | CB230-1.000-D4-B.0-Z2 | 1         | 1         | 4             | 7              | 2      | TIALN    | CYLINDRICAL |

## CD230

SOLID  
CARBIDE



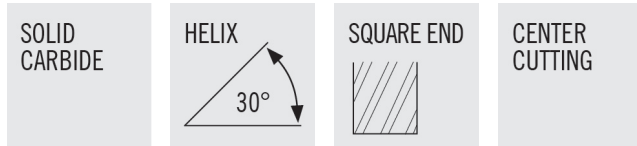
CENTER  
CUTTING



- General Purpose
- General machining of most material types
- Cutting Data - Page 224-225
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|----------|------------|
| <a href="#">N85375</a> | CD230-0.125-XF3-S.3-Z2 | 1/8       | 3/8       | 3/8           | 3-1/16         | 2      | UNCOATED | WELDON     |
| <a href="#">N85397</a> | CD230-0.125-XF3-S.3-Z2 | 1/8       | 3/8       | 3/8           | 3-1/16         | 2      | TIALN    | WELDON     |
| <a href="#">N85377</a> | CD230-0.188-XF3-S.3-Z2 | 3/16      | 3/8       | 1/2           | 3-1/4          | 2      | UNCOATED | WELDON     |
| <a href="#">N85399</a> | CD230-0.188-XF3-S.3-Z2 | 3/16      | 3/8       | 1/2           | 3-1/4          | 2      | TIALN    | WELDON     |
| <a href="#">N85379</a> | CD230-0.250-XF3-S.3-Z2 | 1/4       | 3/8       | 5/8           | 3-3/8          | 2      | UNCOATED | WELDON     |
| <a href="#">N85401</a> | CD230-0.250-XF3-S.3-Z2 | 1/4       | 3/8       | 5/8           | 3-3/8          | 2      | TIALN    | WELDON     |
| <a href="#">N85381</a> | CD230-0.313-XF2-S.3-Z2 | 5/16      | 3/8       | 3/4           | 3-1/2          | 2      | UNCOATED | WELDON     |
| <a href="#">N85403</a> | CD230-0.313-XF2-S.3-Z2 | 5/16      | 3/8       | 3/4           | 3-1/2          | 2      | TIALN    | WELDON     |
| <a href="#">N85383</a> | CD230-0.375-XD2-S.3-Z2 | 3/8       | 3/8       | 3/4           | 3-1/2          | 2      | UNCOATED | WELDON     |
| <a href="#">N85405</a> | CD230-0.375-XD2-S.3-Z2 | 3/8       | 3/8       | 3/4           | 3-1/2          | 2      | TIALN    | WELDON     |
| <a href="#">N85385</a> | CD230-0.500-XD2-S.3-Z2 | 1/2       | 1/2       | 1             | 4              | 2      | UNCOATED | WELDON     |
| <a href="#">N85407</a> | CD230-0.500-XD2-S.3-Z2 | 1/2       | 1/2       | 1             | 4              | 2      | TIALN    | WELDON     |

## CSD230

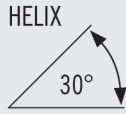


- General Purpose
- Stub Length
- General Machining for most material types
- Cutting Data - Page 224-225
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION             | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|-------------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N89653</a> | CSD230-0.031-XF2-S.0-Z2 | 1/32      | 1/8       | 1/16          | 1-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89657</a> | CSD230-0.047-XF2-S.0-Z2 | 3/64      | 1/8       | 3/32          | 1-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89661</a> | CSD230-0.063-XF2-S.0-Z2 | 1/16      | 1/8       | 1/8           | 1-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89665</a> | CSD230-0.078-XF2-S.0-Z2 | 5/64      | 1/8       | 1/8           | 1-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89669</a> | CSD230-0.094-XF2-S.0-Z2 | 3/32      | 1/8       | 3/16          | 1-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89677</a> | CSD230-0.125-XD2-S.0-Z2 | 1/8       | 1/8       | 1/4           | 1-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89693</a> | CSD230-0.188-XD2-S.0-Z2 | 3/16      | 3/16      | 3/8           | 2              | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89709</a> | CSD230-0.250-XD2-S.0-Z2 | 1/4       | 1/4       | 1/2           | 2-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89717</a> | CSD230-0.313-XD2-S.0-Z2 | 5/16      | 5/16      | 1/2           | 2-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89725</a> | CSD230-0.375-XD2-S.0-Z2 | 3/8       | 3/8       | 9/16          | 2-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89733</a> | CSD230-0.500-XD1-S.0-Z2 | 1/2       | 1/2       | 5/8           | 3              | 2      | TIALN   | CYLINDRICAL |

## CSDB230

SOLID  
CARBIDE



CENTER  
CUTTING



- General Purpose Stub Length
- General machining of most material types
- Cutting Data - Page 226-227
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N89737</a> | CSDB230-0.031-XF2-B.0-Z2 | 1/32      | 1/8       | 1/16          | 1-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89741</a> | CSDB230-0.047-XF2-B.0-Z2 | 3/64      | 1/8       | 3/32          | 1-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89745</a> | CSDB230-0.063-XF2-B.0-Z2 | 1/16      | 1/8       | 1/8           | 1-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89749</a> | CSDB230-0.078-XF2-B.0-Z2 | 5/64      | 1/8       | 1/8           | 1-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89753</a> | CSDB230-0.094-XF2-B.0-Z2 | 3/32      | 1/8       | 3/16          | 1-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89761</a> | CSDB230-0.125-XD2-B.0-Z2 | 1/8       | 1/8       | 1/4           | 1-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89777</a> | CSDB230-0.188-XD2-B.0-Z2 | 3/16      | 3/16      | 3/8           | 2              | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89793</a> | CSDB230-0.250-XD2-B.0-Z2 | 1/4       | 1/4       | 1/2           | 2-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89801</a> | CSDB230-0.313-XD2-B.0-Z2 | 5/16      | 5/16      | 1/2           | 2-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89809</a> | CSDB230-0.375-XD2-B.0-Z2 | 3/8       | 3/8       | 9/16          | 2-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N89817</a> | CSDB230-0.500-XD1-B.0-Z2 | 1/2       | 1/2       | 5/8           | 3              | 2      | TIALN   | CYLINDRICAL |

## CNC230

SOLID  
CARBIDE



CENTER  
CUTTING

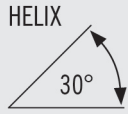


- General Purpose
- NC Tolerance
- General machining of most material types
- Cutting Data - Page 224-225
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N85779</a> | CNC230-0.250-D3-S.0-Z2 | 1/4       | 1/4       | 3/4           | 2-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N85781</a> | CNC230-0.313-D3-S.0-Z2 | 5/16      | 5/16      | 13/16         | 2-1/2          | 2      | TIALN   | CYLINDRICAL |
| <a href="#">N85782</a> | CNC230-0.375-D2-S.3-Z2 | 3/8       | 3/8       | 7/8           | 2-1/2          | 2      | TIALN   | WELDON      |
| <a href="#">N85784</a> | CNC230-0.500-D2-S.3-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | TIALN   | WELDON      |
| <a href="#">N85786</a> | CNC230-0.625-D2-S.3-Z2 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 2      | TIALN   | WELDON      |
| <a href="#">N85787</a> | CNC230-0.750-D2-S.3-Z2 | 3/4       | 3/4       | 1-1/2         | 4              | 2      | TIALN   | WELDON      |

## C330

SOLID  
CARBIDE



CENTER  
CUTTING





- General Purpose
- General machining (slotting/pocketing/profiling) of most material types

- Cutting Data - Page 228-229
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N85920</a> | C330-0.031-F3-S.0-Z3 | 1/32      | 1/8       | 5/64          | 1-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N85996</a> | C330-0.031-F3-S.0-Z3 | 1/32      | 1/8       | 5/64          | 1-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85921</a> | C330-0.047-F2-S.0-Z3 | 3/64      | 1/8       | 7/64          | 1-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N85997</a> | C330-0.047-F2-S.0-Z3 | 3/64      | 1/8       | 7/64          | 1-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85922</a> | C330-0.063-F3-S.0-Z3 | 1/16      | 1/8       | 3/16          | 1-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N85998</a> | C330-0.063-F3-S.0-Z3 | 1/16      | 1/8       | 3/16          | 1-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85923</a> | C330-0.078-F2-S.0-Z3 | 5/64      | 1/8       | 3/16          | 1-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N85999</a> | C330-0.078-F2-S.0-Z3 | 5/64      | 1/8       | 3/16          | 1-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85924</a> | C330-0.094-F3-S.0-Z3 | 3/32      | 1/8       | 9/32          | 1-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86000</a> | C330-0.094-F3-S.0-Z3 | 3/32      | 1/8       | 9/32          | 1-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85925</a> | C330-0.109-F3-S.0-Z3 | 7/64      | 1/8       | 3/8           | 1-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86001</a> | C330-0.109-F3-S.0-Z3 | 7/64      | 1/8       | 3/8           | 1-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85926</a> | C330-0.125-D4-S.0-Z3 | 1/8       | 1/8       | 1/2           | 1-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86002</a> | C330-0.125-D4-S.0-Z3 | 1/8       | 1/8       | 1/2           | 1-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85928</a> | C330-0.156-F3-S.0-Z3 | 5/32      | 3/16      | 1/2           | 2              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86004</a> | C330-0.156-F3-S.0-Z3 | 5/32      | 3/16      | 1/2           | 2              | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85930</a> | C330-0.188-D3-S.0-Z3 | 3/16      | 3/16      | 5/8           | 2              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86006</a> | C330-0.188-D3-S.0-Z3 | 3/16      | 3/16      | 5/8           | 2              | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85932</a> | C330-0.219-F3-S.0-Z3 | 7/32      | 1/4       | 5/8           | 2-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86008</a> | C330-0.219-F3-S.0-Z3 | 7/32      | 1/4       | 5/8           | 2-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85934</a> | C330-0.250-D3-S.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86010</a> | C330-0.250-D3-S.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85938</a> | C330-0.313-D3-S.0-Z3 | 5/16      | 5/16      | 13/16         | 2-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86014</a> | C330-0.313-D3-S.0-Z3 | 5/16      | 5/16      | 13/16         | 2-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85942</a> | C330-0.375-D3-S.0-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86018</a> | C330-0.375-D3-S.0-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85946</a> | C330-0.438-D2-S.0-Z3 | 7/16      | 7/16      | 1             | 2-3/4          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86022</a> | C330-0.438-D2-S.0-Z3 | 7/16      | 7/16      | 1             | 2-3/4          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85950</a> | C330-0.500-D2-S.0-Z3 | 1/2       | 1/2       | 1             | 3              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86026</a> | C330-0.500-D2-S.0-Z3 | 1/2       | 1/2       | 1             | 3              | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85951</a> | C330-0.563-D2-S.0-Z3 | 9/16      | 9/16      | 1-1/8         | 3-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86027</a> | C330-0.563-D2-S.0-Z3 | 9/16      | 9/16      | 1-1/8         | 3-1/2          | 3      | TIALN    | CYLINDRICAL |



## C330 (CONT'D)

|               |   |   |                |
|---------------|---|---|----------------|
| SOLID CARBIDE |  |  | CENTER CUTTING |
|---------------|---|---|----------------|

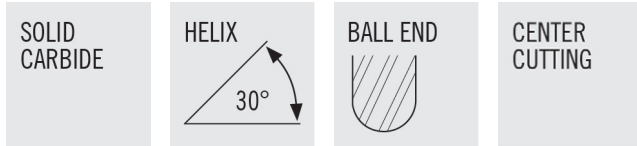


- General Purpose
- General machining (slotting/pocketing/profiling) of most material types

- Cutting Data C330 - Page 228-229
- Tolerance Specs C330 - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N85952</a> | C330-0.625-D2-S.0-Z3 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86028</a> | C330-0.625-D2-S.0-Z3 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85954</a> | C330-0.750-D2-S.0-Z3 | 3/4       | 3/4       | 1-1/2         | 4              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86030</a> | C330-0.750-D2-S.0-Z3 | 3/4       | 3/4       | 1-1/2         | 4              | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N85956</a> | C330-1.000-D2-S.0-Z3 | 1         | 1         | 1-1/2         | 4              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86032</a> | C330-1.000-D2-S.0-Z3 | 1         | 1         | 1-1/2         | 4              | 3      | TIALN    | CYLINDRICAL |

## CB330



- General Purpose
- General machining (slotting/pocketing/profiling) of most material types
- Cutting Data - Page 230-231
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N86110</a> | CB330-0.016-F2-B.0-Z3 | 1/64      | 1/8       | 1/32          | 1-1/2          | 3      | TIALN   | CYLINDRICAL |
| <a href="#">N86111</a> | CB330-0.031-F3-B.0-Z3 | 1/32      | 1/8       | 5/64          | 1-1/2          | 3      | TIALN   | CYLINDRICAL |
| <a href="#">N86113</a> | CB330-0.063-F3-B.0-Z3 | 1/16      | 1/8       | 3/16          | 1-1/2          | 3      | TIALN   | CYLINDRICAL |
| <a href="#">N86115</a> | CB330-0.094-F3-B.0-Z3 | 3/32      | 1/8       | 9/32          | 1-1/2          | 3      | TIALN   | CYLINDRICAL |
| <a href="#">N86117</a> | CB330-0.125-D4-B.0-Z3 | 1/8       | 1/8       | 1/2           | 1-1/2          | 3      | TIALN   | CYLINDRICAL |
| <a href="#">N86119</a> | CB330-0.156-F3-B.0-Z3 | 5/32      | 3/16      | 1/2           | 2              | 3      | TIALN   | CYLINDRICAL |
| <a href="#">N86121</a> | CB330-0.188-D3-B.0-Z3 | 3/16      | 3/16      | 5/8           | 2              | 3      | TIALN   | CYLINDRICAL |
| <a href="#">N86123</a> | CB330-0.219-F3-B.0-Z3 | 7/32      | 1/4       | 5/8           | 2-1/2          | 3      | TIALN   | CYLINDRICAL |
| <a href="#">N86125</a> | CB330-0.250-D3-B.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | TIALN   | CYLINDRICAL |
| <a href="#">N86133</a> | CB330-0.375-D3-B.0-Z3 | 3/8       | 3/8       | 1             | 2-1/2          | 3      | TIALN   | CYLINDRICAL |
| <a href="#">N86141</a> | CB330-0.500-D2-B.0-Z3 | 1/2       | 1/2       | 1             | 3              | 3      | TIALN   | CYLINDRICAL |
| <a href="#">N86142</a> | CB330-0.563-D2-B.0-Z3 | 9/16      | 9/16      | 1-1/8         | 3-1/2          | 3      | TIALN   | CYLINDRICAL |
| <a href="#">N86143</a> | CB330-0.625-D2-B.0-Z3 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 3      | TIALN   | CYLINDRICAL |
| <a href="#">N86145</a> | CB330-0.750-D2-B.0-Z3 | 3/4       | 3/4       | 1-1/2         | 4              | 3      | TIALN   | CYLINDRICAL |

## C360

SOLID  
CARBIDE



CENTER  
CUTTING

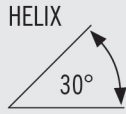


- General Purpose
- General machining of most material types
- Cutting Data - Page 232
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N18854</a> | C360-0.250-D3-S.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86850</a> | C360-0.250-D3-S.0-Z3 | 1/4       | 1/4       | 3/4           | 2-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N18858</a> | C360-0.375-D2-S.0-Z3 | 3/8       | 3/8       | 7/8           | 2-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86852</a> | C360-0.375-D2-S.0-Z3 | 3/8       | 3/8       | 7/8           | 2-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N18862</a> | C360-0.500-D2-S.0-Z3 | 1/2       | 1/2       | 1             | 3              | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86854</a> | C360-0.500-D2-S.0-Z3 | 1/2       | 1/2       | 1             | 3              | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N18866</a> | C360-0.625-D2-S.0-Z3 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 3      | UNCOATED | CYLINDRICAL |
| <a href="#">N86856</a> | C360-0.625-D2-S.0-Z3 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 3      | TIALN    | CYLINDRICAL |
| <a href="#">N18870</a> | C360-0.750-D3-S.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N86858</a> | C360-0.750-D3-S.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | TIALN    | CYLINDRICAL |

## C430

SOLID  
CARBIDE



CENTER  
CUTTING



- General Purpose
- General machining of most material types
- Cutting Data - Page 233-234
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N85503</a> | C430-0.016-F2-S.0-Z4 | 1/64      | 1/8       | 1/32          | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85579</a> | C430-0.016-F2-S.0-Z4 | 1/64      | 1/8       | 1/32          | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85504</a> | C430-0.031-F3-S.0-Z4 | 1/32      | 1/8       | 5/64          | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85580</a> | C430-0.031-F3-S.0-Z4 | 1/32      | 1/8       | 5/64          | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55666</a> | C430-0.031-F4-S.0-Z4 | 1/32      | 1/8       | 3/32          | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55792</a> | C430-0.031-F4-S.0-Z4 | 1/32      | 1/8       | 3/32          | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85505</a> | C430-0.047-F2-S.0-Z4 | 3/64      | 1/8       | 7/64          | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85581</a> | C430-0.047-F2-S.0-Z4 | 3/64      | 1/8       | 7/64          | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55667</a> | C430-0.047-F3-S.0-Z4 | 3/64      | 1/8       | 1/8           | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55793</a> | C430-0.047-F3-S.0-Z4 | 3/64      | 1/8       | 1/8           | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85652</a> | C430-0.063-F2-S.0-Z4 | 1/16      | 1/8       | 1/8           | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85678</a> | C430-0.063-F2-S.0-Z4 | 1/16      | 1/8       | 1/8           | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85506</a> | C430-0.063-F3-S.0-Z4 | 1/16      | 1/8       | 3/16          | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85582</a> | C430-0.063-F3-S.0-Z4 | 1/16      | 1/8       | 3/16          | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55668</a> | C430-0.063-F4-S.0-Z4 | 1/16      | 1/8       | 1/4           | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55794</a> | C430-0.063-F4-S.0-Z4 | 1/16      | 1/8       | 1/4           | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55669</a> | C430-0.063-F8-S.0-Z4 | 1/16      | 1/8       | 1             | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55795</a> | C430-0.063-F8-S.0-Z4 | 1/16      | 1/8       | 1             | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85507</a> | C430-0.078-F2-S.0-Z4 | 5/64      | 1/8       | 3/16          | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85583</a> | C430-0.078-F2-S.0-Z4 | 5/64      | 1/8       | 3/16          | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55671</a> | C430-0.078-F3-S.0-Z4 | 5/64      | 1/8       | 1/4           | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55797</a> | C430-0.078-F3-S.0-Z4 | 5/64      | 1/8       | 1/4           | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85653</a> | C430-0.094-F2-S.0-Z4 | 3/32      | 1/8       | 3/16          | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85679</a> | C430-0.094-F2-S.0-Z4 | 3/32      | 1/8       | 3/16          | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85508</a> | C430-0.094-F3-S.0-Z4 | 3/32      | 1/8       | 9/32          | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85584</a> | C430-0.094-F3-S.0-Z4 | 3/32      | 1/8       | 9/32          | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55672</a> | C430-0.094-F4-S.0-Z4 | 3/32      | 1/8       | 3/8           | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55798</a> | C430-0.094-F4-S.0-Z4 | 3/32      | 1/8       | 3/8           | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55673</a> | C430-0.094-F8-S.0-Z4 | 3/32      | 1/8       | 1             | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55799</a> | C430-0.094-F8-S.0-Z4 | 3/32      | 1/8       | 1             | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85509</a> | C430-0.109-F3-S.0-Z4 | 7/64      | 1/8       | 3/8           | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85585</a> | C430-0.109-F3-S.0-Z4 | 7/64      | 1/8       | 3/8           | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85654</a> | C430-0.125-D2-S.0-Z4 | 1/8       | 1/8       | 1/4           | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85680</a> | C430-0.125-D2-S.0-Z4 | 1/8       | 1/8       | 1/4           | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85510</a> | C430-0.125-D4-S.0-Z4 | 1/8       | 1/8       | 1/2           | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85586</a> | C430-0.125-D4-S.0-Z4 | 1/8       | 1/8       | 1/2           | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55675</a> | C430-0.125-D5-S.0-Z4 | 1/8       | 1/8       | 5/8           | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55801</a> | C430-0.125-D5-S.0-Z4 | 1/8       | 1/8       | 5/8           | 2              | 4      | TIALN    | CYLINDRICAL |

## C430 (CONT'D)

SOLID  
CARBIDE



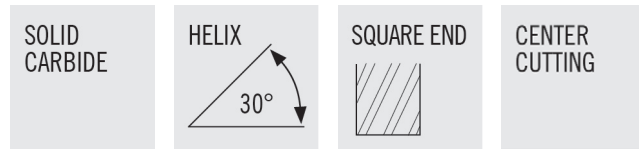
CENTER  
CUTTING



- General Purpose
- General machining of most material types
- Cutting Data - Page 233-234
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N55676</a> | C430-0.125-D6-S.0-Z4 | 1/8       | 1/8       | 3/4           | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55802</a> | C430-0.125-D6-S.0-Z4 | 1/8       | 1/8       | 3/4           | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55677</a> | C430-0.125-D8-S.0-Z4 | 1/8       | 1/8       | 1             | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55803</a> | C430-0.125-D8-S.0-Z4 | 1/8       | 1/8       | 1             | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55678</a> | C430-0.125-D9-S.0-Z4 | 1/8       | 1/8       | 1             | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55804</a> | C430-0.125-D9-S.0-Z4 | 1/8       | 1/8       | 1             | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85511</a> | C430-0.141-F4-S.0-Z4 | 9/64      | 3/16      | 1/2           | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85587</a> | C430-0.141-F4-S.0-Z4 | 9/64      | 3/16      | 1/2           | 2              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85655</a> | C430-0.156-F2-S.0-Z4 | 5/32      | 3/16      | 5/16          | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85681</a> | C430-0.156-F2-S.0-Z4 | 5/32      | 3/16      | 5/16          | 2              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85512</a> | C430-0.156-F3-S.0-Z4 | 5/32      | 3/16      | 1/2           | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85588</a> | C430-0.156-F3-S.0-Z4 | 5/32      | 3/16      | 1/2           | 2              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85513</a> | C430-0.172-F4-S.0-Z4 | 11/64     | 3/16      | 5/8           | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85589</a> | C430-0.172-F4-S.0-Z4 | 11/64     | 3/16      | 5/8           | 2              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85656</a> | C430-0.188-D2-S.0-Z4 | 3/16      | 3/16      | 3/8           | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85682</a> | C430-0.188-D2-S.0-Z4 | 3/16      | 3/16      | 3/8           | 2              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85514</a> | C430-0.188-D3-S.0-Z4 | 3/16      | 3/16      | 5/8           | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85590</a> | C430-0.188-D3-S.0-Z4 | 3/16      | 3/16      | 5/8           | 2              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85692</a> | C430-0.188-D4-S.0-Z4 | 3/16      | 3/16      | 3/4           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85728</a> | C430-0.188-D4-S.0-Z4 | 3/16      | 3/16      | 3/4           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55679</a> | C430-0.188-D5-S.0-Z4 | 3/16      | 3/16      | 1             | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55805</a> | C430-0.188-D5-S.0-Z4 | 3/16      | 3/16      | 1             | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55680</a> | C430-0.188-D6-S.0-Z4 | 3/16      | 3/16      | 1             | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55806</a> | C430-0.188-D6-S.0-Z4 | 3/16      | 3/16      | 1             | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85693</a> | C430-0.188-D7-S.0-Z4 | 3/16      | 3/16      | 1-1/8         | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85729</a> | C430-0.188-D7-S.0-Z4 | 3/16      | 3/16      | 1-1/8         | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85515</a> | C430-0.203-F3-S.0-Z4 | 13/64     | 1/4       | 5/8           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85591</a> | C430-0.203-F3-S.0-Z4 | 13/64     | 1/4       | 5/8           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85657</a> | C430-0.219-F2-S.0-Z4 | 7/32      | 1/4       | 7/16          | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85683</a> | C430-0.219-F2-S.0-Z4 | 7/32      | 1/4       | 7/16          | 2              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85516</a> | C430-0.219-F3-S.0-Z4 | 7/32      | 1/4       | 5/8           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85592</a> | C430-0.219-F3-S.0-Z4 | 7/32      | 1/4       | 5/8           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85517</a> | C430-0.234-F3-S.0-Z4 | 15/64     | 1/4       | 3/4           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85593</a> | C430-0.234-F3-S.0-Z4 | 15/64     | 1/4       | 3/4           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85658</a> | C430-0.250-D2-S.0-Z4 | 1/4       | 1/4       | 1/2           | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85684</a> | C430-0.250-D2-S.0-Z4 | 1/4       | 1/4       | 1/2           | 2              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85518</a> | C430-0.250-D3-S.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85594</a> | C430-0.250-D3-S.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |

## C430 (CONT'D)

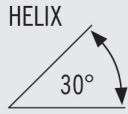


- General Purpose
- General machining of most material types
- Cutting Data - Page 233-234
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N55681</a> | C430-0.250-D4-S.0-Z4 | 1/4       | 1/4       | 1             | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55807</a> | C430-0.250-D4-S.0-Z4 | 1/4       | 1/4       | 1             | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55682</a> | C430-0.250-D5-S.0-Z4 | 1/4       | 1/4       | 1             | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55808</a> | C430-0.250-D5-S.0-Z4 | 1/4       | 1/4       | 1             | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85694</a> | C430-0.250-D6-S.0-Z4 | 1/4       | 1/4       | 1-1/8         | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85730</a> | C430-0.250-D6-S.0-Z4 | 1/4       | 1/4       | 1-1/8         | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85695</a> | C430-0.250-D7-S.0-Z4 | 1/4       | 1/4       | 1-1/2         | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85731</a> | C430-0.250-D7-S.0-Z4 | 1/4       | 1/4       | 1-1/2         | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55683</a> | C430-0.250-D8-S.0-Z4 | 1/4       | 1/4       | 1-1/2         | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55809</a> | C430-0.250-D8-S.0-Z4 | 1/4       | 1/4       | 1-1/2         | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85519</a> | C430-0.266-F3-S.0-Z4 | 17/64     | 5/16      | 3/4           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85595</a> | C430-0.266-F3-S.0-Z4 | 17/64     | 5/16      | 3/4           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85520</a> | C430-0.281-F3-S.0-Z4 | 9/32      | 5/16      | 3/4           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85596</a> | C430-0.281-F3-S.0-Z4 | 9/32      | 5/16      | 3/4           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85521</a> | C430-0.297-F3-S.0-Z4 | 19/64     | 5/16      | 13/16         | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85597</a> | C430-0.297-F3-S.0-Z4 | 19/64     | 5/16      | 13/16         | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85659</a> | C430-0.313-D2-S.0-Z4 | 5/16      | 5/16      | 1/2           | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85685</a> | C430-0.313-D2-S.0-Z4 | 5/16      | 5/16      | 1/2           | 2              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85522</a> | C430-0.313-D3-S.0-Z4 | 5/16      | 5/16      | 13/16         | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85598</a> | C430-0.313-D3-S.0-Z4 | 5/16      | 5/16      | 13/16         | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55684</a> | C430-0.313-D4-S.0-Z4 | 5/16      | 5/16      | 1             | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55810</a> | C430-0.313-D4-S.0-Z4 | 5/16      | 5/16      | 1             | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55685</a> | C430-0.313-D5-S.0-Z4 | 5/16      | 5/16      | 1             | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55811</a> | C430-0.313-D5-S.0-Z4 | 5/16      | 5/16      | 1             | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85696</a> | C430-0.313-D6-S.0-Z4 | 5/16      | 5/16      | 1-1/8         | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85732</a> | C430-0.313-D6-S.0-Z4 | 5/16      | 5/16      | 1-1/8         | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55686</a> | C430-0.313-D7-S.0-Z4 | 5/16      | 5/16      | 1-1/2         | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55812</a> | C430-0.313-D7-S.0-Z4 | 5/16      | 5/16      | 1-1/2         | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85697</a> | C430-0.313-D8-S.0-Z4 | 5/16      | 5/16      | 1-5/8         | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85733</a> | C430-0.313-D8-S.0-Z4 | 5/16      | 5/16      | 1-5/8         | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85523</a> | C430-0.328-F3-S.0-Z4 | 21/64     | 3/8       | 1             | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85599</a> | C430-0.328-F3-S.0-Z4 | 21/64     | 3/8       | 1             | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85524</a> | C430-0.344-F3-S.0-Z4 | 11/32     | 3/8       | 1             | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85600</a> | C430-0.344-F3-S.0-Z4 | 11/32     | 3/8       | 1             | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85525</a> | C430-0.359-F3-S.0-Z4 | 23/64     | 3/8       | 1             | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85601</a> | C430-0.359-F3-S.0-Z4 | 23/64     | 3/8       | 1             | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85660</a> | C430-0.375-D1-S.0-Z4 | 3/8       | 3/8       | 5/8           | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85686</a> | C430-0.375-D1-S.0-Z4 | 3/8       | 3/8       | 5/8           | 2              | 4      | TIALN    | CYLINDRICAL |

## C430 (CONT'D)

SOLID  
CARBIDE



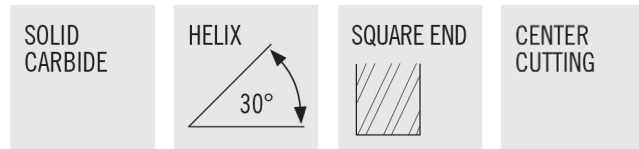
CENTER  
CUTTING



- General Purpose
- General machining of most material types
- Cutting Data - Page 233-234
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N85526</a> | C430-0.375-D2-S.0-Z4 | 3/8       | 3/8       | 1             | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85602</a> | C430-0.375-D2-S.0-Z4 | 3/8       | 3/8       | 1             | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55687</a> | C430-0.375-D3-S.0-Z4 | 3/8       | 3/8       | 1             | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55813</a> | C430-0.375-D3-S.0-Z4 | 3/8       | 3/8       | 1             | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55688</a> | C430-0.375-D4-S.0-Z4 | 3/8       | 3/8       | 1             | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55814</a> | C430-0.375-D4-S.0-Z4 | 3/8       | 3/8       | 1             | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85698</a> | C430-0.375-D5-S.0-Z4 | 3/8       | 3/8       | 1-1/8         | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85734</a> | C430-0.375-D5-S.0-Z4 | 3/8       | 3/8       | 1-1/8         | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55689</a> | C430-0.375-D6-S.0-Z4 | 3/8       | 3/8       | 1-1/2         | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55815</a> | C430-0.375-D6-S.0-Z4 | 3/8       | 3/8       | 1-1/2         | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85699</a> | C430-0.375-D7-S.0-Z4 | 3/8       | 3/8       | 1-3/4         | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85735</a> | C430-0.375-D7-S.0-Z4 | 3/8       | 3/8       | 1-3/4         | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55690</a> | C430-0.375-D8-S.0-Z4 | 3/8       | 3/8       | 2             | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55816</a> | C430-0.375-D8-S.0-Z4 | 3/8       | 3/8       | 2             | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55691</a> | C430-0.375-D9-S.0-Z4 | 3/8       | 3/8       | 3             | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55817</a> | C430-0.375-D9-S.0-Z4 | 3/8       | 3/8       | 3             | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85527</a> | C430-0.391-F3-S.0-Z4 | 25/64     | 7/16      | 1             | 2-3/4          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85603</a> | C430-0.391-F3-S.0-Z4 | 25/64     | 7/16      | 1             | 2-3/4          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85528</a> | C430-0.406-F2-S.0-Z4 | 13/32     | 7/16      | 1             | 2-3/4          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85604</a> | C430-0.406-F2-S.0-Z4 | 13/32     | 7/16      | 1             | 2-3/4          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85529</a> | C430-0.422-F2-S.0-Z4 | 27/64     | 7/16      | 1             | 2-3/4          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85605</a> | C430-0.422-F2-S.0-Z4 | 27/64     | 7/16      | 1             | 2-3/4          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85661</a> | C430-0.438-D1-S.0-Z4 | 7/16      | 7/16      | 5/8           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85687</a> | C430-0.438-D1-S.0-Z4 | 7/16      | 7/16      | 5/8           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85530</a> | C430-0.438-D2-S.0-Z4 | 7/16      | 7/16      | 1             | 2-3/4          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85606</a> | C430-0.438-D2-S.0-Z4 | 7/16      | 7/16      | 1             | 2-3/4          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55692</a> | C430-0.438-D3-S.0-Z4 | 7/16      | 7/16      | 1             | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55818</a> | C430-0.438-D3-S.0-Z4 | 7/16      | 7/16      | 1             | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55693</a> | C430-0.438-D4-S.0-Z4 | 7/16      | 7/16      | 1-1/2         | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55819</a> | C430-0.438-D4-S.0-Z4 | 7/16      | 7/16      | 1-1/2         | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55694</a> | C430-0.438-D5-S.0-Z4 | 7/16      | 7/16      | 2             | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55820</a> | C430-0.438-D5-S.0-Z4 | 7/16      | 7/16      | 2             | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85700</a> | C430-0.438-D6-S.0-Z4 | 7/16      | 7/16      | 2             | 4-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85736</a> | C430-0.438-D6-S.0-Z4 | 7/16      | 7/16      | 2             | 4-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85701</a> | C430-0.438-D7-S.0-Z4 | 7/16      | 7/16      | 3             | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85737</a> | C430-0.438-D7-S.0-Z4 | 7/16      | 7/16      | 3             | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85532</a> | C430-0.469-F2-S.0-Z4 | 15/32     | 1/2       | 1             | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85608</a> | C430-0.469-F2-S.0-Z4 | 15/32     | 1/2       | 1             | 3              | 4      | TIALN    | CYLINDRICAL |

## C430 (CONT'D)



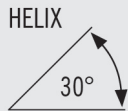
- General Purpose
- General machining of most material types
- Cutting Data - Page 233-234
- Tolerance Specs - Page 323

| PRODUCT NUMBER              | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|-----------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N85662</a>      | C430-0.500-D1-S.0-Z4 | 1/2       | 1/2       | 5/8           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85688</a>      | C430-0.500-D1-S.0-Z4 | 1/2       | 1/2       | 5/8           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85534</a>      | C430-0.500-D2-S.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85610</a>      | C430-0.500-D2-S.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55695</a>      | C430-0.500-D3-S.0-Z4 | 1/2       | 1/2       | 1             | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55821</a>      | C430-0.500-D3-S.0-Z4 | 1/2       | 1/2       | 1             | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55696</a>      | C430-0.500-D4-S.0-Z4 | 1/2       | 1/2       | 1-1/2         | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55822</a>      | C430-0.500-D4-S.0-Z4 | 1/2       | 1/2       | 1-1/2         | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55697</a>      | C430-0.500-D5-S.0-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55823</a>      | C430-0.500-D5-S.0-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85702</a>      | C430-0.500-D6-S.0-Z4 | 1/2       | 1/2       | 2             | 4-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85738</a>      | C430-0.500-D6-S.0-Z4 | 1/2       | 1/2       | 2             | 4-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85703</a>      | C430-0.500-D7-S.0-Z4 | 1/2       | 1/2       | 3             | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85739</a>      | C430-0.500-D7-S.0-Z4 | 1/2       | 1/2       | 3             | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85535</a>      | C430-0.563-D2-S.0-Z4 | 9/16      | 9/16      | 1-1/8         | 3-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85611</a>      | C430-0.563-D2-S.0-Z4 | 9/16      | 9/16      | 1-1/8         | 3-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85663</a>      | C430-0.625-D1-S.0-Z4 | 5/8       | 5/8       | 3/4           | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85689</a>      | C430-0.625-D1-S.0-Z4 | 5/8       | 5/8       | 3/4           | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85536</a>      | C430-0.625-D2-S.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85612</a>      | C430-0.625-D2-S.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55700</a>      | C430-0.625-D3-S.0-Z4 | 5/8       | 5/8       | 2             | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55826</a>      | C430-0.625-D3-S.0-Z4 | 5/8       | 5/8       | 2             | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85704</a>      | C430-0.625-D4-S.0-Z4 | 5/8       | 5/8       | 2-1/4         | 5              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85740</a>      | C430-0.625-D4-S.0-Z4 | 5/8       | 5/8       | 2-1/4         | 5              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85705</a>      | C430-0.625-D5-S.0-Z4 | 5/8       | 5/8       | 3             | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85741</a>      | C430-0.625-D5-S.0-Z4 | 5/8       | 5/8       | 3             | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85537</a>      | C430-0.688-F2-S.0-Z4 | 11/16     | 3/4       | 1-3/8         | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85613</a>      | C430-0.688-F2-S.0-Z4 | 11/16     | 3/4       | 1-3/8         | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85664</a>      | C430-0.750-D1-S.0-Z4 | 3/4       | 3/4       | 1             | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85690</a>      | C430-0.750-D1-S.0-Z4 | 3/4       | 3/4       | 1             | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85538</a>      | C430-0.750-D2-S.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85614</a>      | C430-0.750-D2-S.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55701</a>      | C430-0.750-D3-S.0-Z4 | 3/4       | 3/4       | 2             | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55827</a>      | C430-0.750-D3-S.0-Z4 | 3/4       | 3/4       | 2             | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85706</a>      | C430-0.750-D4-S.0-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85742</a>      | C430-0.750-D4-S.0-Z4 | 3/4       | 3/4       | 2-1/4         | 5              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85707</a>      | C430-0.750-D5-S.0-Z4 | 3/4       | 3/4       | 3             | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85743</a>      | C430-0.750-D5-S.0-Z4 | 3/4       | 3/4       | 3             | 6              | 4      | TIALN    | CYLINDRICAL |
| <b>INCH - C430 (CONT'D)</b> |                      |           |           |               |                |        |          |             |
| <a href="#">N55702</a>      | C430-0.750-D6-S.0-Z4 | 3/4       | 3/4       | 4             | 6              | 4      | UNCOATED | CYLINDRICAL |



## C430 (CONT'D) & C430M

SOLID CARBIDE



CENTER CUTTING



- General Purpose
- General machining of most material types

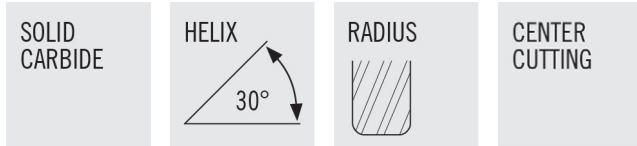
- Cutting Data C430 - Page 233-234
- Tolerance Specs C430 - Page 323
- Cutting Data C430M - Page 237-238
- Tolerance Specs C430M - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N55828</a> | C430-0.750-D6-S.0-Z4 | 3/4       | 3/4       | 4             | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85539</a> | C430-0.875-D2-S.0-Z4 | 7/8       | 7/8       | 1-1/2         | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85615</a> | C430-0.875-D2-S.0-Z4 | 7/8       | 7/8       | 1-1/2         | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55703</a> | C430-1.000-D1-S.0-Z4 | 1         | 1         | 1             | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55829</a> | C430-1.000-D1-S.0-Z4 | 1         | 1         | 1             | 3              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85540</a> | C430-1.000-D2-S.0-Z4 | 1         | 1         | 1-1/2         | 4              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85616</a> | C430-1.000-D2-S.0-Z4 | 1         | 1         | 1-1/2         | 4              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55704</a> | C430-1.000-D3-S.0-Z4 | 1         | 1         | 2             | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55830</a> | C430-1.000-D3-S.0-Z4 | 1         | 1         | 2             | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85708</a> | C430-1.000-D4-S.0-Z4 | 1         | 1         | 2-1/4         | 5              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85744</a> | C430-1.000-D4-S.0-Z4 | 1         | 1         | 2-1/4         | 5              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N85709</a> | C430-1.000-D5-S.0-Z4 | 1         | 1         | 3             | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N85745</a> | C430-1.000-D5-S.0-Z4 | 1         | 1         | 3             | 6              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55705</a> | C430-1.000-D6-S.0-Z4 | 1         | 1         | 4             | 7              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55831</a> | C430-1.000-D6-S.0-Z4 | 1         | 1         | 4             | 7              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55706</a> | C430-1.250-D2-S.0-Z4 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55832</a> | C430-1.250-D2-S.0-Z4 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N55707</a> | C430-1.250-D3-S.0-Z4 | 1-1/4     | 1-1/4     | 3             | 6              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N55833</a> | C430-1.250-D3-S.0-Z4 | 1-1/4     | 1-1/4     | 3             | 6              | 4      | TIALN    | CYLINDRICAL |

### METRIC - C430M

|                        |                     |       |      |       |       |   |       |             |
|------------------------|---------------------|-------|------|-------|-------|---|-------|-------------|
| <a href="#">N46412</a> | C430M-010-F4-S.0-Z4 | 1mm   | 3mm  | 4mm   | 39mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N46414</a> | C430M-015-F3-S.0-Z4 | 1.5mm | 3mm  | 4.5mm | 39mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N34456</a> | C430M-020-F2-S.0-Z4 | 2mm   | 3mm  | 4mm   | 39mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N46416</a> | C430M-020-F3-S.0-Z4 | 2mm   | 3mm  | 6.3mm | 39mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N46420</a> | C430M-030-D4-S.0-Z4 | 3mm   | 3mm  | 12mm  | 39mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N46422</a> | C430M-035-F3-S.0-Z4 | 3.5mm | 4mm  | 12mm  | 51mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N46424</a> | C430M-040-D4-S.0-Z4 | 4mm   | 4mm  | 14mm  | 51mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N34332</a> | C430M-050-F5-S.0-Z4 | 5mm   | 6mm  | 25mm  | 75mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N46428</a> | C430M-050-F3-S.0-Z4 | 5mm   | 6mm  | 16mm  | 51mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N46430</a> | C430M-060-D3-S.0-Z4 | 6mm   | 6mm  | 19mm  | 51mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N46434</a> | C430M-080-D2-S.0-Z4 | 8mm   | 8mm  | 20mm  | 64mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N46436</a> | C430M-090-F2-S.0-Z4 | 9mm   | 10mm | 22mm  | 73mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N46438</a> | C430M-100-D2-S.0-Z4 | 10mm  | 10mm | 22mm  | 73mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N46442</a> | C430M-120-D2-S.0-Z4 | 12mm  | 12mm | 25mm  | 74mm  | 4 | ALTIN | CYLINDRICAL |
| <a href="#">N34346</a> | C430M-120-D4-S.0-Z4 | 12mm  | 12mm | 50mm  | 100mm | 4 | ALTIN | CYLINDRICAL |

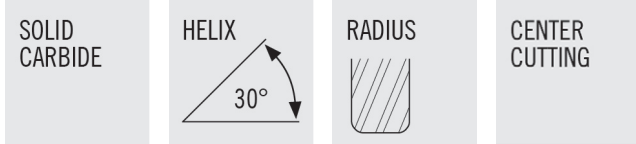
## C430R



- General Purpose
- Standard with radius
- General machining of most material types
- Cutting Data - Page 233-234
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N91372</a> | C430R-0.125-D4-R015.0-Z4 | 1/8       | 1/8       | 1/2           | 1-1/2          | 4      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91373</a> | C430R-0.125-D4-R020.0-Z4 | 1/8       | 1/8       | 1/2           | 1-1/2          | 4      | TIALN   | 0.020  | CYLINDRICAL |
| <a href="#">N91374</a> | C430R-0.125-D4-R030.0-Z4 | 1/8       | 1/8       | 1/2           | 1-1/2          | 4      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91375</a> | C430R-0.188-D3-R015.0-Z4 | 3/16      | 3/16      | 5/8           | 2              | 4      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91376</a> | C430R-0.188-D3-R020.0-Z4 | 3/16      | 3/16      | 5/8           | 2              | 4      | TIALN   | 0.020  | CYLINDRICAL |
| <a href="#">N91377</a> | C430R-0.188-D3-R030.0-Z4 | 3/16      | 3/16      | 5/8           | 2              | 4      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91378</a> | C430R-0.250-D3-R015.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91379</a> | C430R-0.250-D3-R020.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | TIALN   | 0.020  | CYLINDRICAL |
| <a href="#">N91380</a> | C430R-0.250-D3-R030.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91381</a> | C430R-0.250-D3-R045.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | TIALN   | 0.045  | CYLINDRICAL |
| <a href="#">N91382</a> | C430R-0.313-D3-R015.0-Z4 | 5/16      | 5/16      | 13/16         | 2-1/2          | 4      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91383</a> | C430R-0.313-D3-R020.0-Z4 | 5/16      | 5/16      | 13/16         | 2-1/2          | 4      | TIALN   | 0.020  | CYLINDRICAL |
| <a href="#">N91384</a> | C430R-0.313-D3-R030.0-Z4 | 5/16      | 5/16      | 13/16         | 2-1/2          | 4      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91385</a> | C430R-0.313-D3-R045.0-Z4 | 5/16      | 5/16      | 13/16         | 2-1/2          | 4      | TIALN   | 0.045  | CYLINDRICAL |
| <a href="#">N91386</a> | C430R-0.375-D3-R015.0-Z4 | 3/8       | 3/8       | 1             | 2-1/2          | 4      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91387</a> | C430R-0.375-D3-R020.0-Z4 | 3/8       | 3/8       | 1             | 2-1/2          | 4      | TIALN   | 0.020  | CYLINDRICAL |
| <a href="#">N91389</a> | C430R-0.375-D3-R030.0-Z4 | 3/8       | 3/8       | 1             | 2-1/2          | 4      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91390</a> | C430R-0.375-D3-R045.0-Z4 | 3/8       | 3/8       | 1             | 2-1/2          | 4      | TIALN   | 0.045  | CYLINDRICAL |
| <a href="#">N91391</a> | C430R-0.438-D2-R015.0-Z4 | 7/16      | 7/16      | 1             | 2-3/4          | 4      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91393</a> | C430R-0.438-D2-R030.0-Z4 | 7/16      | 7/16      | 1             | 2-3/4          | 4      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91395</a> | C430R-0.438-D2-R060.0-Z4 | 7/16      | 7/16      | 1             | 2-3/4          | 4      | TIALN   | 0.060  | CYLINDRICAL |
| <a href="#">N91397</a> | C430R-0.438-D2-R125.0-Z4 | 7/16      | 7/16      | 1             | 2-3/4          | 4      | TIALN   | 0.125  | CYLINDRICAL |
| <a href="#">N91392</a> | C430R-0.438-D2-R020.0-Z4 | 7/16      | 7/16      | 1             | 2-3/4          | 4      | TIALN   | 0.020  | CYLINDRICAL |
| <a href="#">N91394</a> | C430R-0.438-D2-R045.0-Z4 | 7/16      | 7/16      | 1             | 2-3/4          | 4      | TIALN   | 0.045  | CYLINDRICAL |
| <a href="#">N91396</a> | C430R-0.438-D2-R090.0-Z4 | 7/16      | 7/16      | 1             | 2-3/4          | 4      | TIALN   | 0.090  | CYLINDRICAL |
| <a href="#">N91398</a> | C430R-0.500-D2-R020.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | TIALN   | 0.020  | CYLINDRICAL |
| <a href="#">N91399</a> | C430R-0.500-D2-R030.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91401</a> | C430R-0.500-D2-R045.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | TIALN   | 0.045  | CYLINDRICAL |
| <a href="#">N91402</a> | C430R-0.500-D2-R060.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | TIALN   | 0.060  | CYLINDRICAL |
| <a href="#">N91403</a> | C430R-0.500-D2-R090.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | TIALN   | 0.090  | CYLINDRICAL |
| <a href="#">N91404</a> | C430R-0.500-D2-R125.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | TIALN   | 0.125  | CYLINDRICAL |
| <a href="#">N91353</a> | C430R-0.500-D2-R015.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | TIALN   | 0.015  | CYLINDRICAL |

## C430R (CONT'D)

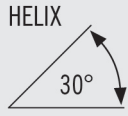


- General Purpose
- Standard with radius
- General machining of most material types
- Cutting Data - Page 233-234
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|-------------|
| <a href="#">N91406</a> | C430R-0.625-D2-R015.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91408</a> | C430R-0.625-D2-R020.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | TIALN   | 0.020  | CYLINDRICAL |
| <a href="#">N91409</a> | C430R-0.625-D2-R030.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91410</a> | C430R-0.625-D2-R045.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | TIALN   | 0.045  | CYLINDRICAL |
| <a href="#">N91411</a> | C430R-0.625-D2-R060.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | TIALN   | 0.060  | CYLINDRICAL |
| <a href="#">N91412</a> | C430R-0.625-D2-R090.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | TIALN   | 0.090  | CYLINDRICAL |
| <a href="#">N91413</a> | C430R-0.625-D2-R125.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | TIALN   | 0.125  | CYLINDRICAL |
| <a href="#">N91415</a> | C430R-0.750-D2-R020.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | TIALN   | 0.020  | CYLINDRICAL |
| <a href="#">N91416</a> | C430R-0.750-D2-R030.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | TIALN   | 0.030  | CYLINDRICAL |
| <a href="#">N91417</a> | C430R-0.750-D2-R045.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | TIALN   | 0.045  | CYLINDRICAL |
| <a href="#">N91418</a> | C430R-0.750-D2-R060.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | TIALN   | 0.060  | CYLINDRICAL |
| <a href="#">N91419</a> | C430R-0.750-D2-R090.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | TIALN   | 0.090  | CYLINDRICAL |
| <a href="#">N91420</a> | C430R-0.750-D2-R125.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | TIALN   | 0.125  | CYLINDRICAL |
| <a href="#">N91421</a> | C430R-0.750-D2-R190.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | TIALN   | 0.190  | CYLINDRICAL |
| <a href="#">N91361</a> | C430R-0.750-D2-R015.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91422</a> | C430R-1.000-D2-R015.0-Z4 | 1         | 1         | 1-1/2         | 4              | 4      | TIALN   | 0.015  | CYLINDRICAL |
| <a href="#">N91425</a> | C430R-1.000-D2-R060.0-Z4 | 1         | 1         | 1-1/2         | 4              | 4      | TIALN   | 0.060  | CYLINDRICAL |
| <a href="#">N91426</a> | C430R-1.000-D2-R090.0-Z4 | 1         | 1         | 1-1/2         | 4              | 4      | TIALN   | 0.090  | CYLINDRICAL |
| <a href="#">N91427</a> | C430R-1.000-D2-R125.0-Z4 | 1         | 1         | 1-1/2         | 4              | 4      | TIALN   | 0.125  | CYLINDRICAL |
| <a href="#">N91428</a> | C430R-1.000-D2-R190.0-Z4 | 1         | 1         | 1-1/2         | 4              | 4      | TIALN   | 0.190  | CYLINDRICAL |
| <a href="#">N91405</a> | C430R-1.000-D2-R030.0-Z4 | 1         | 1         | 1-1/2         | 4              | 4      | TIALN   | 0.030  | CYLINDRICAL |

## CB430

SOLID  
CARBIDE



CENTER  
CUTTING

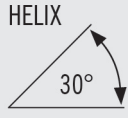


- General Purpose
- General machining for most material types
- Cutting Data - Page 235-236
- Tolerance Specs - Page 323

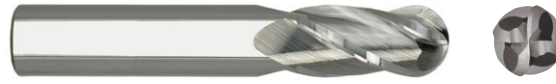
| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N86340</a> | CB430-0.016-F2-B.0-Z4 | 1/64      | 1/8       | 1/32          | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86341</a> | CB430-0.031-F3-B.0-Z4 | 1/32      | 1/8       | 5/64          | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56014</a> | CB430-0.031-F4-B.0-Z4 | 1/32      | 1/8       | 3/32          | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86342</a> | CB430-0.047-F2-B.0-Z4 | 3/64      | 1/8       | 7/64          | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56015</a> | CB430-0.047-F3-B.0-Z4 | 3/64      | 1/8       | 1/8           | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56016</a> | CB430-0.063-F2-B.0-Z4 | 1/16      | 1/8       | 1/8           | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86343</a> | CB430-0.063-F3-B.0-Z4 | 1/16      | 1/8       | 3/16          | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56017</a> | CB430-0.063-F4-B.0-Z4 | 1/16      | 1/8       | 1/4           | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56018</a> | CB430-0.063-F8-B.0-Z4 | 1/16      | 1/8       | 1             | 3              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86344</a> | CB430-0.078-F2-B.0-Z4 | 5/64      | 1/8       | 3/16          | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56020</a> | CB430-0.078-F3-B.0-Z4 | 5/64      | 1/8       | 1/4           | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56021</a> | CB430-0.094-F2-B.0-Z4 | 3/32      | 1/8       | 3/16          | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86345</a> | CB430-0.094-F3-B.0-Z4 | 3/32      | 1/8       | 9/32          | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56022</a> | CB430-0.094-F4-B.0-Z4 | 3/32      | 1/8       | 3/8           | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56023</a> | CB430-0.094-F8-B.0-Z4 | 3/32      | 1/8       | 1             | 3              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86346</a> | CB430-0.109-F3-B.0-Z4 | 7/64      | 1/8       | 3/8           | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56025</a> | CB430-0.125-D2-B.0-Z4 | 1/8       | 1/8       | 1/4           | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86347</a> | CB430-0.125-D4-B.0-Z4 | 1/8       | 1/8       | 1/2           | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56026</a> | CB430-0.125-D5-B.0-Z4 | 1/8       | 1/8       | 5/8           | 2              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56027</a> | CB430-0.125-D6-B.0-Z4 | 1/8       | 1/8       | 3/4           | 3              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56028</a> | CB430-0.125-D7-B.0-Z4 | 1/8       | 1/8       | 1             | 3              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56029</a> | CB430-0.125-D8-B.0-Z4 | 1/8       | 1/8       | 1             | 4              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86348</a> | CB430-0.141-F4-B.0-Z4 | 9/64      | 3/16      | 1/2           | 2              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56030</a> | CB430-0.156-F2-B.0-Z4 | 5/32      | 3/16      | 5/16          | 2              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86349</a> | CB430-0.156-F3-B.0-Z4 | 5/32      | 3/16      | 1/2           | 2              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86350</a> | CB430-0.172-F4-B.0-Z4 | 11/64     | 3/16      | 5/8           | 2              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56031</a> | CB430-0.188-D2-B.0-Z4 | 3/16      | 3/16      | 3/8           | 2              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86351</a> | CB430-0.188-D3-B.0-Z4 | 3/16      | 3/16      | 5/8           | 2              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56032</a> | CB430-0.188-D4-B.0-Z4 | 3/16      | 3/16      | 1             | 3              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N56033</a> | CB430-0.188-D5-B.0-Z4 | 3/16      | 3/16      | 1             | 4              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53972</a> | CB430-0.188-D6-B.0-Z4 | 3/16      | 3/16      | 1-1/8         | 3              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86352</a> | CB430-0.203-F3-B.0-Z4 | 13/64     | 1/4       | 5/8           | 2-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86353</a> | CB430-0.219-F3-B.0-Z4 | 7/32      | 1/4       | 5/8           | 2-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86354</a> | CB430-0.234-F3-B.0-Z4 | 15/64     | 1/4       | 3/4           | 2-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53974</a> | CB430-0.250-D2-B.0-Z4 | 1/4       | 1/4       | 1/2           | 2              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86355</a> | CB430-0.250-D3-B.0-Z4 | 1/4       | 1/4       | 3/4           | 2-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53975</a> | CB430-0.250-D4-B.0-Z4 | 1/4       | 1/4       | 1             | 3              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53976</a> | CB430-0.250-D5-B.0-Z4 | 1/4       | 1/4       | 1             | 4              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53977</a> | CB430-0.250-D6-B.0-Z4 | 1/4       | 1/4       | 1-1/2         | 4              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53978</a> | CB430-0.250-D7-B.0-Z4 | 1/4       | 1/4       | 1-1/2         | 6              | 4      | TIALN   | CYLINDRICAL |

## CB430 (CONT'D)

SOLID CARBIDE



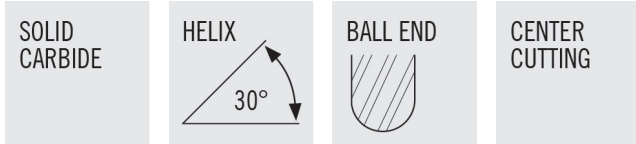
CENTER CUTTING



- General Purpose
- General machining for most material types
- Cutting Data - Page 235-236
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N86357</a> | CB430-0.281-F3-B.0-Z4 | 9/32      | 5/16      | 3/4           | 2-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53979</a> | CB430-0.313-D2-B.0-Z4 | 5/16      | 5/16      | 1/2           | 2              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86359</a> | CB430-0.313-D3-B.0-Z4 | 5/16      | 5/16      | 13/16         | 2-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53980</a> | CB430-0.313-D4-B.0-Z4 | 5/16      | 5/16      | 1             | 3              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53982</a> | CB430-0.313-D6-B.0-Z4 | 5/16      | 5/16      | 1-1/2         | 6              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86360</a> | CB430-0.328-F3-B.0-Z4 | 21/64     | 3/8       | 1             | 2-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86361</a> | CB430-0.344-F3-B.0-Z4 | 11/32     | 3/8       | 1             | 2-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53984</a> | CB430-0.375-D2-B.0-Z4 | 3/8       | 3/8       | 5/8           | 2              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86363</a> | CB430-0.375-D3-B.0-Z4 | 3/8       | 3/8       | 1             | 2-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53985</a> | CB430-0.375-D4-B.0-Z4 | 3/8       | 3/8       | 1             | 3              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53986</a> | CB430-0.375-D5-B.0-Z4 | 3/8       | 3/8       | 1             | 4              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53987</a> | CB430-0.375-D6-B.0-Z4 | 3/8       | 3/8       | 1-1/2         | 6              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53988</a> | CB430-0.375-D7-B.0-Z4 | 3/8       | 3/8       | 2             | 4              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53989</a> | CB430-0.375-D8-B.0-Z4 | 3/8       | 3/8       | 3             | 6              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86365</a> | CB430-0.406-F2-B.0-Z4 | 13/32     | 7/16      | 1             | 2-3/4          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86367</a> | CB430-0.438-D2-B.0-Z4 | 7/16      | 7/16      | 1             | 2-3/4          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53991</a> | CB430-0.438-D3-B.0-Z4 | 7/16      | 7/16      | 1             | 4              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86369</a> | CB430-0.469-F2-B.0-Z4 | 15/32     | 1/2       | 1             | 3              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53995</a> | CB430-0.500-D1-B.0-Z4 | 1/2       | 1/2       | 5/8           | 2-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86371</a> | CB430-0.500-D2-B.0-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53996</a> | CB430-0.500-D3-B.0-Z4 | 1/2       | 1/2       | 1             | 4              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53997</a> | CB430-0.500-D4-B.0-Z4 | 1/2       | 1/2       | 1-1/2         | 6              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53998</a> | CB430-0.500-D5-B.0-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N53999</a> | CB430-0.500-D6-B.0-Z4 | 1/2       | 1/2       | 3             | 6              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86372</a> | CB430-0.563-D2-B.0-Z4 | 9/16      | 9/16      | 1-1/8         | 3-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N54002</a> | CB430-0.625-D1-B.0-Z4 | 5/8       | 5/8       | 3/4           | 3              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86373</a> | CB430-0.625-D2-B.0-Z4 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N54003</a> | CB430-0.625-D3-B.0-Z4 | 5/8       | 5/8       | 2             | 6              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N54004</a> | CB430-0.625-D5-B.0-Z4 | 5/8       | 5/8       | 3             | 6              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N54005</a> | CB430-0.750-D1-B.0-Z4 | 3/4       | 3/4       | 1             | 3              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86375</a> | CB430-0.750-D2-B.0-Z4 | 3/4       | 3/4       | 1-1/2         | 4              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N54006</a> | CB430-0.750-D3-B.0-Z4 | 3/4       | 3/4       | 2             | 6              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N54007</a> | CB430-0.750-D4-B.0-Z4 | 3/4       | 3/4       | 3             | 6              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N54008</a> | CB430-0.750-D5-B.0-Z4 | 3/4       | 3/4       | 4             | 6              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86376</a> | CB430-0.875-D2-B.0-Z4 | 7/8       | 7/8       | 1-1/2         | 4              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N86377</a> | CB430-1.000-D2-B.0-Z4 | 1         | 1         | 1-1/2         | 4              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N54009</a> | CB430-1.000-D3-B.0-Z4 | 1         | 1         | 2             | 6              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N54010</a> | CB430-1.000-D4-B.0-Z4 | 1         | 1         | 3             | 6              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N54011</a> | CB430-1.000-D5-B.0-Z4 | 1         | 1         | 4             | 7              | 4      | TIALN   | CYLINDRICAL |

## CB430M

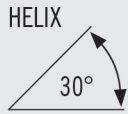


- General Purpose
- General machining for most material types
- Cutting Data - Page 239-240
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION          | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING |
|------------------------|----------------------|-----------|-----------|---------------|----------------|--------|---------|
| <a href="#">N46454</a> | CB430M-010-F4-B.0-Z4 | 1mm       | 3mm       | 4mm           | 39mm           | 4      | ALTIN   |
| <a href="#">N34478</a> | CB430M-020-F2-B.0-Z4 | 2mm       | 3mm       | 4mm           | 39mm           | 4      | ALTIN   |
| <a href="#">N47938</a> | CB430M-030-D2-B.0-Z4 | 3mm       | 3mm       | 6mm           | 39mm           | 4      | ALTIN   |
| <a href="#">N46462</a> | CB430M-030-D4-B.0-Z4 | 3mm       | 3mm       | 12mm          | 39mm           | 4      | ALTIN   |
| <a href="#">N46466</a> | CB430M-040-D4-B.0-Z4 | 4mm       | 4mm       | 14mm          | 51mm           | 4      | ALTIN   |
| <a href="#">N34362</a> | CB430M-040-D6-B.0-Z4 | 4mm       | 4mm       | 25mm          | 75mm           | 4      | ALTIN   |
| <a href="#">N46470</a> | CB430M-050-F3-B.0-Z4 | 5mm       | 6mm       | 16mm          | 51mm           | 4      | ALTIN   |
| <a href="#">N47942</a> | CB430M-060-D2-B.0-Z4 | 6mm       | 6mm       | 9mm           | 51mm           | 4      | ALTIN   |
| <a href="#">N46472</a> | CB430M-060-D3-B.0-Z4 | 6mm       | 6mm       | 19mm          | 51mm           | 4      | ALTIN   |
| <a href="#">N34370</a> | CB430M-080-D3-B.0-Z4 | 8mm       | 8mm       | 25mm          | 75mm           | 4      | ALTIN   |
| <a href="#">N34372</a> | CB430M-080-D4-B.0-Z4 | 8mm       | 8mm       | 25mm          | 150mm          | 4      | ALTIN   |
| <a href="#">N46480</a> | CB430M-100-D2-B.0-Z4 | 10mm      | 10mm      | 22mm          | 73mm           | 4      | ALTIN   |
| <a href="#">N46484</a> | CB430M-120-D2-B.0-Z4 | 12mm      | 12mm      | 25mm          | 74mm           | 4      | ALTIN   |

## CD430

SOLID CARBIDE



CENTER CUTTING

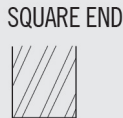
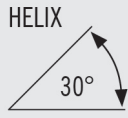


- General Purpose
- General machining for most material types
- Cutting Data - Page 233-234
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|----------|------------|
| <a href="#">N85618</a> | CD430-0.125-XF3-S.3-Z4 | 1/8       | 3/8       | 3/8           | 3-1/16         | 4      | UNCOATED | WELDON     |
| <a href="#">N85640</a> | CD430-0.125-XF3-S.3-Z4 | 1/8       | 3/8       | 3/8           | 3-1/16         | 4      | TIALN    | WELDON     |
| <a href="#">N85619</a> | CD430-0.156-XF3-S.3-Z4 | 5/32      | 3/8       | 7/16          | 3-1/8          | 4      | UNCOATED | WELDON     |
| <a href="#">N85641</a> | CD430-0.156-XF3-S.3-Z4 | 5/32      | 3/8       | 7/16          | 3-1/8          | 4      | TIALN    | WELDON     |
| <a href="#">N85620</a> | CD430-0.188-XF3-S.3-Z4 | 3/16      | 3/8       | 1/2           | 3-1/4          | 4      | UNCOATED | WELDON     |
| <a href="#">N85642</a> | CD430-0.188-XF3-S.3-Z4 | 3/16      | 3/8       | 1/2           | 3-1/4          | 4      | TIALN    | WELDON     |
| <a href="#">N85621</a> | CD430-0.219-XF3-S.3-Z4 | 7/32      | 3/8       | 9/16          | 3-3/8          | 4      | UNCOATED | WELDON     |
| <a href="#">N85643</a> | CD430-0.219-XF3-S.3-Z4 | 7/32      | 3/8       | 9/16          | 3-3/8          | 4      | TIALN    | WELDON     |
| <a href="#">N85622</a> | CD430-0.250-XF3-S.3-Z4 | 1/4       | 3/8       | 5/8           | 3-3/8          | 4      | UNCOATED | WELDON     |
| <a href="#">N85644</a> | CD430-0.250-XF3-S.3-Z4 | 1/4       | 3/8       | 5/8           | 3-3/8          | 4      | TIALN    | WELDON     |
| <a href="#">N85623</a> | CD430-0.281-XF2-S.3-Z4 | 9/32      | 3/8       | 11/16         | 3-1/2          | 4      | UNCOATED | WELDON     |
| <a href="#">N85645</a> | CD430-0.281-XF2-S.3-Z4 | 9/32      | 3/8       | 11/16         | 3-1/2          | 4      | TIALN    | WELDON     |
| <a href="#">N85624</a> | CD430-0.313-XF2-S.3-Z4 | 5/16      | 3/8       | 3/4           | 3-1/2          | 4      | UNCOATED | WELDON     |
| <a href="#">N85646</a> | CD430-0.313-XF2-S.3-Z4 | 5/16      | 3/8       | 3/4           | 3-1/2          | 4      | TIALN    | WELDON     |
| <a href="#">N85625</a> | CD430-0.344-XF2-S.3-Z4 | 11/32     | 3/8       | 3/4           | 3-1/2          | 4      | UNCOATED | WELDON     |
| <a href="#">N85647</a> | CD430-0.344-XF2-S.3-Z4 | 11/32     | 3/8       | 3/4           | 3-1/2          | 4      | TIALN    | WELDON     |
| <a href="#">N85626</a> | CD430-0.375-XD2-S.3-Z4 | 3/8       | 3/8       | 3/4           | 3-1/2          | 4      | UNCOATED | WELDON     |
| <a href="#">N85648</a> | CD430-0.375-XD2-S.3-Z4 | 3/8       | 3/8       | 3/4           | 3-1/2          | 4      | TIALN    | WELDON     |
| <a href="#">N85627</a> | CD430-0.438-XF2-S.3-Z4 | 7/16      | 1/2       | 7/8           | 4              | 4      | UNCOATED | WELDON     |
| <a href="#">N85649</a> | CD430-0.438-XF2-S.3-Z4 | 7/16      | 1/2       | 7/8           | 4              | 4      | TIALN    | WELDON     |
| <a href="#">N85628</a> | CD430-0.500-XD2-S.3-Z4 | 1/2       | 1/2       | 1             | 4              | 4      | UNCOATED | WELDON     |
| <a href="#">N85650</a> | CD430-0.500-XD2-S.3-Z4 | 1/2       | 1/2       | 1             | 4              | 4      | TIALN    | WELDON     |

## CSD430

SOLID CARBIDE



CENTER CUTTING



- General Purpose
- General machining for most material types
- Cutting Data - Page 233-234
- Tolerance Specs - Page 323

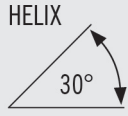
| PRODUCT NUMBER         | DESCRIPTION             | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | SHANK TYPE  |
|------------------------|-------------------------|-----------|-----------|---------------|----------------|--------|----------|-------------|
| <a href="#">N89818</a> | CSD430-0.031-XF2-S.0-Z4 | 1/32      | 1/8       | 1/16          | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89821</a> | CSD430-0.031-XF2-S.0-Z4 | 1/32      | 1/8       | 1/16          | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89822</a> | CSD430-0.047-XF2-S.0-Z4 | 3/64      | 1/8       | 3/32          | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89825</a> | CSD430-0.047-XF2-S.0-Z4 | 3/64      | 1/8       | 3/32          | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89826</a> | CSD430-0.063-XF2-S.0-Z4 | 1/16      | 1/8       | 1/8           | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89829</a> | CSD430-0.063-XF2-S.0-Z4 | 1/16      | 1/8       | 1/8           | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89830</a> | CSD430-0.078-XF2-S.0-Z4 | 5/64      | 1/8       | 1/8           | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89833</a> | CSD430-0.078-XF2-S.0-Z4 | 5/64      | 1/8       | 1/8           | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89834</a> | CSD430-0.094-XF2-S.0-Z4 | 3/32      | 1/8       | 3/16          | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89837</a> | CSD430-0.094-XF2-S.0-Z4 | 3/32      | 1/8       | 3/16          | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89838</a> | CSD430-0.109-XF2-S.0-Z4 | 7/64      | 1/8       | 3/16          | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89841</a> | CSD430-0.109-XF2-S.0-Z4 | 7/64      | 1/8       | 3/16          | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89842</a> | CSD430-0.125-XD2-S.0-Z4 | 1/8       | 1/8       | 1/4           | 1-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89845</a> | CSD430-0.125-XD2-S.0-Z4 | 1/8       | 1/8       | 1/4           | 1-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89846</a> | CSD430-0.141-XF2-S.0-Z4 | 9/64      | 3/16      | 5/16          | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89849</a> | CSD430-0.141-XF2-S.0-Z4 | 9/64      | 3/16      | 5/16          | 2              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89850</a> | CSD430-0.156-XF2-S.0-Z4 | 5/32      | 3/16      | 5/16          | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89853</a> | CSD430-0.156-XF2-S.0-Z4 | 5/32      | 3/16      | 5/16          | 2              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89854</a> | CSD430-0.172-XF2-S.0-Z4 | 11/64     | 3/16      | 5/16          | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89857</a> | CSD430-0.172-XF2-S.0-Z4 | 11/64     | 3/16      | 5/16          | 2              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89858</a> | CSD430-0.188-XD2-S.0-Z4 | 3/16      | 3/16      | 3/8           | 2              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89861</a> | CSD430-0.188-XD2-S.0-Z4 | 3/16      | 3/16      | 3/8           | 2              | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89862</a> | CSD430-0.203-XF2-S.0-Z4 | 13/64     | 1/4       | 1/2           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89865</a> | CSD430-0.203-XF2-S.0-Z4 | 13/64     | 1/4       | 1/2           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89866</a> | CSD430-0.219-XF2-S.0-Z4 | 7/32      | 1/4       | 1/2           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89869</a> | CSD430-0.219-XF2-S.0-Z4 | 7/32      | 1/4       | 1/2           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89870</a> | CSD430-0.234-XF2-S.0-Z4 | 15/64     | 1/4       | 1/2           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89873</a> | CSD430-0.234-XF2-S.0-Z4 | 15/64     | 1/4       | 1/2           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89874</a> | CSD430-0.250-XD2-S.0-Z4 | 1/4       | 1/4       | 1/2           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89877</a> | CSD430-0.250-XD2-S.0-Z4 | 1/4       | 1/4       | 1/2           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89878</a> | CSD430-0.281-XF2-S.0-Z4 | 9/32      | 5/16      | 1/2           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89881</a> | CSD430-0.281-XF2-S.0-Z4 | 9/32      | 5/16      | 1/2           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89882</a> | CSD430-0.313-XD2-S.0-Z4 | 5/16      | 5/16      | 1/2           | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89885</a> | CSD430-0.313-XD2-S.0-Z4 | 5/16      | 5/16      | 1/2           | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89886</a> | CSD430-0.344-XF2-S.0-Z4 | 11/32     | 3/8       | 9/16          | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89890</a> | CSD430-0.375-XD2-S.0-Z4 | 3/8       | 3/8       | 9/16          | 2-1/2          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89893</a> | CSD430-0.375-XD2-S.0-Z4 | 3/8       | 3/8       | 9/16          | 2-1/2          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89894</a> | CSD430-0.438-XD1-S.0-Z4 | 7/16      | 7/16      | 9/16          | 2-3/4          | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89897</a> | CSD430-0.438-XD1-S.0-Z4 | 7/16      | 7/16      | 9/16          | 2-3/4          | 4      | TIALN    | CYLINDRICAL |
| <a href="#">N89898</a> | CSD430-0.500-XD1-S.0-Z4 | 1/2       | 1/2       | 5/8           | 3              | 4      | UNCOATED | CYLINDRICAL |
| <a href="#">N89901</a> | CSD430-0.500-XD1-S.0-Z4 | 1/2       | 1/2       | 5/8           | 3              | 4      | TIALN    | CYLINDRICAL |

DISCOUNT CODE D42



## CSDB430

SOLID CARBIDE



CENTER CUTTING



- General Purpose
- General machining for most material types
- Cutting Data - Page 235-236
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION              | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | SHANK TYPE  |
|------------------------|--------------------------|-----------|-----------|---------------|----------------|--------|---------|-------------|
| <a href="#">N89905</a> | CSDB430-0.031-XF2-B.0-Z4 | 1/32      | 1/8       | 1/16          | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N89909</a> | CSDB430-0.047-XF2-B.0-Z4 | 3/64      | 1/8       | 3/32          | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N89913</a> | CSDB430-0.063-XF2-B.0-Z4 | 1/16      | 1/8       | 1/8           | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N89917</a> | CSDB430-0.078-XF2-B.0-Z4 | 5/64      | 1/8       | 1/8           | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N89921</a> | CSDB430-0.094-XF2-B.0-Z4 | 3/32      | 1/8       | 3/16          | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N89929</a> | CSDB430-0.125-XD2-B.0-Z4 | 1/8       | 1/8       | 1/4           | 1-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N89937</a> | CSDB430-0.156-XF2-B.0-Z4 | 5/32      | 3/16      | 5/16          | 2              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N89941</a> | CSDB430-0.172-XF2-B.0-Z4 | 11/64     | 3/16      | 5/16          | 2              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N89945</a> | CSDB430-0.188-XD2-B.0-Z4 | 3/16      | 3/16      | 3/8           | 2              | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N89961</a> | CSDB430-0.250-XD2-B.0-Z4 | 1/4       | 1/4       | 1/2           | 2-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N89969</a> | CSDB430-0.313-XD2-B.0-Z4 | 5/16      | 5/16      | 1/2           | 2-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N89977</a> | CSDB430-0.375-XD2-B.0-Z4 | 3/8       | 3/8       | 9/16          | 2-1/2          | 4      | TIALN   | CYLINDRICAL |
| <a href="#">N89985</a> | CSDB430-0.500-XD1-B.0-Z4 | 1/2       | 1/2       | 5/8           | 3              | 4      | TIALN   | CYLINDRICAL |

# CUTTING DATA - GENERAL PURPOSE SOLID CARBIDE



## C230 / G230R / CNC230 / CD230 / CSD230 - START VALUES

| SLOTING   |              |                           |                           |                           |                         |                    |        |        |        |        |        |        |        |
|-----------|--------------|---------------------------|---------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG          | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 2 |        |        |        |        |        |        |        |
|           |              |                           |                           |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P         | E 1 - 2      | 0.30                      | 1.00                      | 400                       | n (rev/min)             | 24448              | 12224  | 6112   | 4075   | 3056   | 2445   | 2037   | 1528   |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0005 | 0.0009 | 0.0014 | 0.0018 | 0.0023 | 0.0027 | 0.0036 |
|           |              |                           |                           | 340 - 460                 | v <sub>f</sub> (in/min) | 11.0               | 11.0   | 11.0   | 11.0   | 11.0   | 11.0   | 11.0   | 11.0   |
|           | E 3 - 4      | 0.20                      | 1.00                      | 200                       | n (rev/min)             | 12224              | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |
|           |              |                           |                           | 140 - 260                 | v <sub>f</sub> (in/min) | 3.4                | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    |
|           | E 5 - 6      | 0.20                      | 1.00                      | 100                       | n (rev/min)             | 6112               | 3056   | 1528   | 1019   | 764    | 611    | 509    | 382    |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0010 | 0.0012 | 0.0014 | 0.0019 |
|           |              |                           |                           | 40 - 160                  | v <sub>f</sub> (in/min) | 1.5                | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    |
| M         | E 8 - 9      | 0.50                      | 1.00                      | 320                       | n (rev/min)             | 19558              | 9779   | 4890   | 3260   | 2445   | 1956   | 1630   | 1222   |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0007 | 0.0009 | 0.0011 | 0.0013 | 0.0018 |
|           |              |                           |                           | 290 - 350                 | v <sub>f</sub> (in/min) | 4.3                | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    |
|           | E 10 - 11    | 0.30                      | 1.00                      | 250                       | n (rev/min)             | 15280              | 7640   | 3820   | 2547   | 1910   | 1528   | 1273   | 955    |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0016 |
|           |              |                           |                           | 220 - 280                 | v <sub>f</sub> (in/min) | 3.1                | 3.1    | 3.1    | 3.1    | 3.1    | 3.1    | 3.1    | 3.1    |
| K         | E 12 - 13    | 0.30                      | 1.00                      | 270                       | n (rev/min)             | 16502              | 8251   | 4126   | 2750   | 2063   | 1650   | 1375   | 1031   |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0006 | 0.0012 | 0.0017 | 0.0023 | 0.0029 | 0.0035 | 0.0046 |
|           |              |                           |                           | 210 - 330                 | v <sub>f</sub> (in/min) | 9.6                | 9.6    | 9.6    | 9.6    | 9.6    | 9.6    | 9.6    | 9.6    |
|           | E 14 - 15    | 0.20                      | 1.00                      | 145                       | n (rev/min)             | 8862               | 4431   | 2216   | 1477   | 1108   | 886    | 739    | 554    |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0007 | 0.0010 | 0.0014 | 0.0017 | 0.0020 | 0.0027 |
|           |              |                           |                           | 85 - 205                  | v <sub>f</sub> (in/min) | 3.0                | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    |
| N         | E / M / A 16 | 1.00                      | 1.00                      | 700                       | n (rev/min)             | 42784              | 21392  | 10696  | 7131   | 5348   | 4278   | 3565   | 2674   |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0005             | 0.0009 | 0.0018 | 0.0027 | 0.0036 | 0.0045 | 0.0054 | 0.0072 |
|           |              |                           |                           | 400 - 1000                | v <sub>f</sub> (in/min) | 38.5               | 38.5   | 38.5   | 38.5   | 38.5   | 38.5   | 38.5   | 38.5   |
|           | E / M / A 17 | 1.00                      | 1.00                      | 700                       | n (rev/min)             | 42784              | 21392  | 10696  | 7131   | 5348   | 4278   | 3565   | 2674   |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0005             | 0.0009 | 0.0018 | 0.0027 | 0.0036 | 0.0045 | 0.0054 | 0.0072 |
|           |              |                           |                           | 400 - 1000                | v <sub>f</sub> (in/min) | 38.5               | 38.5   | 38.5   | 38.5   | 38.5   | 38.5   | 38.5   | 38.5   |
| S         | E 19         | 0.30                      | 1.00                      | 80                        | n (rev/min)             | 4890               | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|           |              |                           |                           | 50 - 110                  | v <sub>f</sub> (in/min) | 1.5                | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    |
|           | E 20         | 0.30                      | 1.00                      | 80                        | n (rev/min)             | 4890               | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|           |              |                           |                           | 50 - 110                  | v <sub>f</sub> (in/min) | 1.5                | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    |
|           | E 21         | 0.30                      | 1.00                      | 80                        | n (rev/min)             | 4890               | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|           |              |                           |                           | 50 - 110                  | v <sub>f</sub> (in/min) | 1.5                | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    |
|           | E 22         | 0.30                      | 1.00                      | 140                       | n (rev/min)             | 8557               | 4278   | 2139   | 1426   | 1070   | 856    | 713    | 535    |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |
|           |              |                           |                           | 80 - 200                  | v <sub>f</sub> (in/min) | 2.4                | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE SOLID CARBIDE

## C230 / G230R / CNC230 / CD230 / CSD230 - START VALUES

| SIDE MILLING - ROUGHING |         |                                       |                                       |                           |     |                    |                         |                         |        |        |        |        |        |        |        |        |      |
|-------------------------|---------|---------------------------------------|---------------------------------------|---------------------------|-----|--------------------|-------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| ISO GROUP               | SMG     | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |     | Z <sub>n</sub> = 2 |                         |                         |        |        |        |        |        |        |        |        |      |
|                         |         |                                       |                                       |                           |     | 1/16               | 1/8                     | 1/4                     | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |        |        |      |
| P                       | E 1 - 2 | 1.00                                  | 0.25                                  | 400                       | 340 | -                  | 460                     | n (rev/min)             | 24448  | 12224  | 6112   | 4075   | 3056   | 2445   | 2037   | 1528   |      |
|                         |         |                                       |                                       |                           |     |                    |                         | f <sub>z</sub> (in)     | 0.0003 | 0.0006 | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |      |
|                         | E 3 - 4 | 1.00                                  | 0.25                                  | 200                       | 140 | -                  | 260                     | v <sub>f</sub> (in/min) | 13.8   | 13.8   | 13.8   | 13.8   | 13.8   | 13.8   | 13.8   | 13.8   | 13.8 |
|                         |         |                                       |                                       |                           |     |                    |                         | n (rev/min)             | 12224  | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |      |
|                         | E 5 - 6 | 1.00                                  | 0.20                                  | 100                       | 40  | -                  | 160                     | f <sub>z</sub> (in)     | 0.0002 | 0.0004 | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |      |
|                         |         |                                       |                                       |                           |     |                    |                         | v <sub>f</sub> (in/min) | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3  |
| E 8 - 9                 | 0.50    | 0.20                                  | 320                                   | 290                       | -   | 350                | n (rev/min)             | 6112                    | 3056   | 1528   | 1019   | 764    | 611    | 509    | 382    |        |      |
|                         |         |                                       |                                       |                           |     |                    | f <sub>z</sub> (in)     | 0.0002                  | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |        |      |
| E 10 - 11               | 0.30    | 0.20                                  | 250                                   | 220                       | -   | 280                | v <sub>f</sub> (in/min) | 1.8                     | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    |        |      |
|                         |         |                                       |                                       |                           |     |                    | n (rev/min)             | 19558                   | 9779   | 4890   | 3260   | 2445   | 1956   | 1630   | 1222   |        |      |
| E 12 - 13               | 1.00    | 0.25                                  | 270                                   | 210                       | -   | 330                | f <sub>z</sub> (in)     | 0.0001                  | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |        |      |
|                         |         |                                       |                                       |                           |     |                    | v <sub>f</sub> (in/min) | 5.4                     | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4  |
| E 14 - 15               | 0.50    | 0.25                                  | 145                                   | 85                        | -   | 205                | n (rev/min)             | 15280                   | 7640   | 3820   | 2547   | 1910   | 1528   | 1273   | 955    |        |      |
|                         |         |                                       |                                       |                           |     |                    | f <sub>z</sub> (in)     | 0.0001                  | 0.0003 | 0.0005 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |        |      |
| E 16 - 17               | 2.00    | 0.05                                  | 700                                   | 400                       | -   | 1000               | v <sub>f</sub> (in/min) | 3.8                     | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    |        |      |
|                         |         |                                       |                                       |                           |     |                    | n (rev/min)             | 16502                   | 8251   | 4126   | 2750   | 2063   | 1650   | 1375   | 1031   |        |      |
| E 19                    | 0.20    | 0.05                                  | 80                                    | 50                        | -   | 110                | f <sub>z</sub> (in)     | 0.0004                  | 0.0007 | 0.0015 | 0.0022 | 0.0029 | 0.0036 | 0.0044 | 0.0058 |        |      |
|                         |         |                                       |                                       |                           |     |                    | v <sub>f</sub> (in/min) | 12.0                    | 12.0   | 12.0   | 12.0   | 12.0   | 12.0   | 12.0   | 12.0   | 12.0   | 12.0 |
| E 20                    | 0.20    | 0.05                                  | 80                                    | 50                        | -   | 110                | n (rev/min)             | 8862                    | 4431   | 2216   | 1477   | 1108   | 886    | 739    | 554    |        |      |
|                         |         |                                       |                                       |                           |     |                    | f <sub>z</sub> (in)     | 0.0002                  | 0.0004 | 0.0009 | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 |        |      |
| E 21                    | 0.20    | 0.05                                  | 80                                    | 50                        | -   | 110                | v <sub>f</sub> (in/min) | 3.8                     | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    |        |      |
|                         |         |                                       |                                       |                           |     |                    | n (rev/min)             | 42784                   | 21392  | 10696  | 7131   | 5348   | 4278   | 3565   | 2674   |        |      |
| E 22                    | 0.30    | 0.15                                  | 140                                   | 80                        | -   | 200                | f <sub>z</sub> (in)     | 0.0006                  | 0.0011 | 0.0023 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 |        |      |
|                         |         |                                       |                                       |                           |     |                    | v <sub>f</sub> (in/min) | 48.1                    | 48.1   | 48.1   | 48.1   | 48.1   | 48.1   | 48.1   | 48.1   | 48.1   | 48.1 |
| E 19                    | 0.20    | 0.05                                  | 80                                    | 50                        | -   | 110                | n (rev/min)             | 42784                   | 21392  | 10696  | 7131   | 5348   | 4278   | 3565   | 2674   |        |      |
|                         |         |                                       |                                       |                           |     |                    | f <sub>z</sub> (in)     | 0.0006                  | 0.0011 | 0.0023 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 |        |      |
| E 20                    | 0.20    | 0.05                                  | 80                                    | 50                        | -   | 110                | v <sub>f</sub> (in/min) | 48.1                    | 48.1   | 48.1   | 48.1   | 48.1   | 48.1   | 48.1   | 48.1   |        |      |
|                         |         |                                       |                                       |                           |     |                    | n (rev/min)             | 4890                    | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |        |      |
| E 21                    | 0.20    | 0.05                                  | 80                                    | 50                        | -   | 110                | f <sub>z</sub> (in)     | 0.0002                  | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |        |      |
|                         |         |                                       |                                       |                           |     |                    | v <sub>f</sub> (in/min) | 1.8                     | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    | 1.8  |
| E 22                    | 0.30    | 0.15                                  | 140                                   | 80                        | -   | 200                | n (rev/min)             | 4890                    | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |        |      |
|                         |         |                                       |                                       |                           |     |                    | f <sub>z</sub> (in)     | 0.0002                  | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |        |      |
| E 22                    | 0.30    | 0.15                                  | 140                                   | 80                        | -   | 200                | v <sub>f</sub> (in/min) | 1.8                     | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    |        |      |
|                         |         |                                       |                                       |                           |     |                    | n (rev/min)             | 8557                    | 4278   | 2139   | 1426   | 1070   | 856    | 713    | 535    |        |      |
| E 22                    | 0.30    | 0.15                                  | 140                                   | 80                        | -   | 200                | f <sub>z</sub> (in)     | 0.0002                  | 0.0004 | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |        |      |
|                         |         |                                       |                                       |                           |     |                    | v <sub>f</sub> (in/min) | 3.0                     | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    | 3.0  |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE SOLID CARBIDE



## CB230 / CSDB230 - START VALUES

| SLOTTING            |              |                                       |                                       |                           |                     |                         |                         |        |        |        |        |        |        |        |
|---------------------|--------------|---------------------------------------|---------------------------------------|---------------------------|---------------------|-------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP           | SMG          | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                     |                         | Z <sub>n</sub> = 2      |        |        |        |        |        |        |        |
|                     |              |                                       |                                       |                           |                     |                         | 1/16                    | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                   | E 1-2        | 0.50                                  | 1.00                                  | 320                       |                     | n (rev/min)             | 19558                   | 9779   | 4890   | 3260   | 2445   | 1956   | 1630   | 1222   |
|                     |              |                                       |                                       |                           |                     | f <sub>z</sub> (in)     | 0.0002                  | 0.0005 | 0.0009 | 0.0014 | 0.0018 | 0.0023 | 0.0027 | 0.0036 |
|                     |              |                                       |                                       | 260                       | -                   | 380                     | v <sub>f</sub> (in/min) | 8.8    | 8.8    | 8.8    | 8.8    | 8.8    | 8.8    | 8.8    |
|                     | E 3-4        | 0.40                                  | 1.00                                  | 160                       |                     | n (rev/min)             | 9779                    | 4890   | 2445   | 1630   | 1222   | 978    | 815    | 611    |
|                     |              |                                       |                                       |                           |                     | f <sub>z</sub> (in)     | 0.0001                  | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |
|                     |              |                                       |                                       | 100                       | -                   | 220                     | v <sub>f</sub> (in/min) | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    |
| E 5-6               | 0.30         | 1.00                                  | 80                                    |                           | n (rev/min)         | 4890                    | 2445                    | 1222   | 815    | 611    | 489    | 407    | 306    |        |
|                     |              |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0001                  | 0.0002                  | 0.0005 | 0.0007 | 0.0010 | 0.0012 | 0.0014 | 0.0019 |        |
|                     |              |                                       | 20                                    | -                         | 140                 | v <sub>f</sub> (in/min) | 1.2                     | 1.2    | 1.2    | 1.2    | 1.2    | 1.2    | 1.2    | 1.2    |
| M                   | E 8-9        | 0.50                                  | 1.00                                  | 256                       |                     | n (rev/min)             | 15647                   | 7823   | 3912   | 2608   | 1956   | 1565   | 1304   | 978    |
|                     |              |                                       |                                       |                           |                     | f <sub>z</sub> (in)     | 0.0001                  | 0.0002 | 0.0004 | 0.0007 | 0.0009 | 0.0011 | 0.0013 | 0.0018 |
|                     | 226          | -                                     | 286                                   | v <sub>f</sub> (in/min)   | 3.4                 | 3.4                     | 3.4                     | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    |        |        |
|                     | E 10-11      | 0.40                                  | 1.00                                  | 200                       |                     | n (rev/min)             | 12224                   | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
| f <sub>z</sub> (in) |              |                                       |                                       |                           |                     | 0.0001                  | 0.0002                  | 0.0004 | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0016 |        |
|                     |              |                                       |                                       | 170                       | -                   | 230                     | v <sub>f</sub> (in/min) | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    |
| K                   | E 12-13      | 0.50                                  | 1.00                                  | 216                       |                     | n (rev/min)             | 13202                   | 6601   | 3300   | 2200   | 1650   | 1320   | 1100   | 825    |
|                     |              |                                       |                                       |                           |                     | f <sub>z</sub> (in)     | 0.0003                  | 0.0006 | 0.0012 | 0.0017 | 0.0023 | 0.0029 | 0.0035 | 0.0046 |
|                     | 156          | -                                     | 276                                   | v <sub>f</sub> (in/min)   | 7.7                 | 7.7                     | 7.7                     | 7.7    | 7.7    | 7.7    | 7.7    | 7.7    |        |        |
|                     | E 14-15      | 0.30                                  | 1.00                                  | 116                       |                     | n (rev/min)             | 7090                    | 3545   | 1772   | 1182   | 886    | 709    | 591    | 443    |
| f <sub>z</sub> (in) |              |                                       |                                       |                           |                     | 0.0002                  | 0.0003                  | 0.0007 | 0.0010 | 0.0014 | 0.0017 | 0.0020 | 0.0027 |        |
|                     |              |                                       |                                       | 56                        | -                   | 176                     | v <sub>f</sub> (in/min) | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    |
| N                   | E / M / A 16 | 1.00                                  | 1.00                                  | 560                       |                     | n (rev/min)             | 34227                   | 17114  | 8557   | 5705   | 4278   | 3423   | 2852   | 2139   |
|                     |              |                                       |                                       |                           |                     | f <sub>z</sub> (in)     | 0.0005                  | 0.0009 | 0.0018 | 0.0027 | 0.0036 | 0.0045 | 0.0054 | 0.0072 |
|                     | 260          | -                                     | 860                                   | v <sub>f</sub> (in/min)   | 30.8                | 30.8                    | 30.8                    | 30.8   | 30.8   | 30.8   | 30.8   | 30.8   | 30.8   |        |
|                     | E / M / A 17 | 1.00                                  | 1.00                                  | 560                       |                     | n (rev/min)             | 34227                   | 17114  | 8557   | 5705   | 4278   | 3423   | 2852   | 2139   |
| f <sub>z</sub> (in) |              |                                       |                                       |                           |                     | 0.0005                  | 0.0009                  | 0.0018 | 0.0027 | 0.0036 | 0.0045 | 0.0054 | 0.0072 |        |
|                     |              |                                       |                                       | 260                       | -                   | 860                     | v <sub>f</sub> (in/min) | 30.8   | 30.8   | 30.8   | 30.8   | 30.8   | 30.8   | 30.8   |
| S                   | E 19         | 0.20                                  | 1.00                                  | 70                        |                     | n (rev/min)             | 4278                    | 2139   | 1070   | 713    | 535    | 428    | 357    | 267    |
|                     |              |                                       |                                       |                           |                     | f <sub>z</sub> (in)     | 0.0002                  | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                     | 40           | -                                     | 100                                   | v <sub>f</sub> (in/min)   | 1.3                 | 1.3                     | 1.3                     | 1.3    | 1.3    | 1.3    | 1.3    | 1.3    |        |        |
|                     | E 20         | 0.20                                  | 1.00                                  | 70                        |                     | n (rev/min)             | 4278                    | 2139   | 1070   | 713    | 535    | 428    | 357    | 267    |
|                     |              |                                       |                                       |                           |                     | f <sub>z</sub> (in)     | 0.0002                  | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                     | 40           | -                                     | 100                                   | v <sub>f</sub> (in/min)   | 1.3                 | 1.3                     | 1.3                     | 1.3    | 1.3    | 1.3    | 1.3    | 1.3    |        |        |
|                     | E 21         | 0.20                                  | 1.00                                  | 70                        |                     | n (rev/min)             | 4278                    | 2139   | 1070   | 713    | 535    | 428    | 357    | 267    |
|                     |              |                                       |                                       |                           |                     | f <sub>z</sub> (in)     | 0.0002                  | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
| 40                  | -            | 100                                   | v <sub>f</sub> (in/min)               | 1.3                       | 1.3                 | 1.3                     | 1.3                     | 1.3    | 1.3    | 1.3    | 1.3    | 1.3    |        |        |
| E 22                | 0.30         | 1.00                                  | 112                                   |                           | n (rev/min)         | 6845                    | 3423                    | 1711   | 1141   | 856    | 685    | 570    | 428    |        |
|                     |              |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0001                  | 0.0003                  | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |        |
| 52                  | -            | 172                                   | v <sub>f</sub> (in/min)               | 1.9                       | 1.9                 | 1.9                     | 1.9                     | 1.9    | 1.9    | 1.9    | 1.9    | 1.9    |        |        |

SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
v<sub>f</sub> [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE SOLID CARBIDE

## CB230 / CSDB230 - START VALUES

| SIDE MILLING - ROUGHING |                 |                                       |                                       |                           |                     |                         |                         |        |        |        |        |        |        |
|-------------------------|-----------------|---------------------------------------|---------------------------------------|---------------------------|---------------------|-------------------------|-------------------------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG             | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                     | Z <sub>n</sub> = 2      |                         |        |        |        |        |        |        |
|                         |                 |                                       |                                       |                           |                     | 1/16                    | 1/8                     | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E<br>1 - 2      | 1.00                                  | 0.30                                  | 320                       | n (rev/min)         | 19558                   | 9779                    | 4890   | 3260   | 2445   | 1956   | 1630   | 1222   |
|                         |                 |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0003                  | 0.0006                  | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                         |                 |                                       |                                       | 260                       | -                   | 380                     | v <sub>f</sub> (in/min) | 11.0   | 11.0   | 11.0   | 11.0   | 11.0   | 11.0   |
|                         | E<br>3 - 4      | 1.00                                  | 0.30                                  | 160                       | n (rev/min)         | 9779                    | 4890                    | 2445   | 1630   | 1222   | 978    | 815    | 611    |
|                         |                 |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0002                  | 0.0004                  | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |
|                         |                 |                                       |                                       | 100                       | -                   | 220                     | v <sub>f</sub> (in/min) | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    |
| E<br>5 - 6              | 1.00            | 0.20                                  | 80                                    | n (rev/min)               | 4890                | 2445                    | 1222                    | 815    | 611    | 489    | 407    | 306    |        |
|                         |                 |                                       |                                       | f <sub>z</sub> (in)       | 0.0002              | 0.0003                  | 0.0006                  | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |        |
|                         |                 |                                       | 20                                    | -                         | 140                 | v <sub>f</sub> (in/min) | 1.5                     | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    | 1.5    |
| M                       | E<br>8 - 9      | 0.50                                  | 0.30                                  | 256                       | n (rev/min)         | 15647                   | 7823                    | 3912   | 2608   | 1956   | 1565   | 1304   | 978    |
|                         |                 |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0001                  | 0.0003                  | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |
|                         | 226             | -                                     | 286                                   | v <sub>f</sub> (in/min)   | 4.3                 | 4.3                     | 4.3                     | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    |        |
|                         | E<br>10 - 11    | 0.30                                  | 0.20                                  | 200                       | n (rev/min)         | 12224                   | 6112                    | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
| f <sub>z</sub> (in)     |                 |                                       |                                       |                           | 0.0001              | 0.0003                  | 0.0005                  | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |        |
| 170                     | -               | 230                                   | v <sub>f</sub> (in/min)               | 3.1                       | 3.1                 | 3.1                     | 3.1                     | 3.1    | 3.1    | 3.1    | 3.1    | 3.1    |        |
| K                       | E<br>12 - 13    | 1.00                                  | 0.50                                  | 216                       | n (rev/min)         | 13202                   | 6601                    | 3300   | 2200   | 1650   | 1320   | 1100   | 825    |
|                         |                 |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0004                  | 0.0007                  | 0.0015 | 0.0022 | 0.0029 | 0.0036 | 0.0044 | 0.0058 |
|                         | 156             | -                                     | 276                                   | v <sub>f</sub> (in/min)   | 9.6                 | 9.6                     | 9.6                     | 9.6    | 9.6    | 9.6    | 9.6    | 9.6    |        |
|                         | E<br>14 - 15    | 0.50                                  | 0.30                                  | 116                       | n (rev/min)         | 7090                    | 3545                    | 1772   | 1182   | 886    | 709    | 591    | 443    |
| f <sub>z</sub> (in)     |                 |                                       |                                       |                           | 0.0002              | 0.0004                  | 0.0009                  | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 |        |
| 56                      | -               | 176                                   | v <sub>f</sub> (in/min)               | 3.0                       | 3.0                 | 3.0                     | 3.0                     | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    |        |
| N                       | E / M / A<br>16 | 2.00                                  | 0.50                                  | 560                       | n (rev/min)         | 34227                   | 17114                   | 8557   | 5705   | 4278   | 3423   | 2852   | 2139   |
|                         |                 |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0006                  | 0.0011                  | 0.0023 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 |
|                         | 260             | -                                     | 860                                   | v <sub>f</sub> (in/min)   | 38.5                | 38.5                    | 38.5                    | 38.5   | 38.5   | 38.5   | 38.5   | 38.5   |        |
|                         | E / M / A<br>17 | 2.00                                  | 0.50                                  | 560                       | n (rev/min)         | 34227                   | 17114                   | 8557   | 5705   | 4278   | 3423   | 2852   | 2139   |
| f <sub>z</sub> (in)     |                 |                                       |                                       |                           | 0.0006              | 0.0011                  | 0.0023                  | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 |        |
| 260                     | -               | 860                                   | v <sub>f</sub> (in/min)               | 38.5                      | 38.5                | 38.5                    | 38.5                    | 38.5   | 38.5   | 38.5   | 38.5   | 38.5   |        |
| S                       | E<br>19         | 0.20                                  | 0.10                                  | 70                        | n (rev/min)         | 4278                    | 2139                    | 1070   | 713    | 535    | 428    | 357    | 267    |
|                         |                 |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0002                  | 0.0004                  | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|                         | 40              | -                                     | 100                                   | v <sub>f</sub> (in/min)   | 1.6                 | 1.6                     | 1.6                     | 1.6    | 1.6    | 1.6    | 1.6    | 1.6    |        |
|                         | E<br>20         | 0.20                                  | 0.10                                  | 70                        | n (rev/min)         | 4278                    | 2139                    | 1070   | 713    | 535    | 428    | 357    | 267    |
|                         |                 |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0002                  | 0.0004                  | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|                         | 40              | -                                     | 100                                   | v <sub>f</sub> (in/min)   | 1.6                 | 1.6                     | 1.6                     | 1.6    | 1.6    | 1.6    | 1.6    | 1.6    |        |
|                         | E<br>21         | 0.20                                  | 0.10                                  | 70                        | n (rev/min)         | 4278                    | 2139                    | 1070   | 713    | 535    | 428    | 357    | 267    |
|                         |                 |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0002                  | 0.0004                  | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|                         | 40              | -                                     | 100                                   | v <sub>f</sub> (in/min)   | 1.6                 | 1.6                     | 1.6                     | 1.6    | 1.6    | 1.6    | 1.6    | 1.6    |        |
|                         | E<br>22         | 0.30                                  | 0.20                                  | 112                       | n (rev/min)         | 6845                    | 3423                    | 1711   | 1141   | 856    | 685    | 570    | 428    |
| f <sub>z</sub> (in)     |                 |                                       |                                       |                           | 0.0002              | 0.0004                  | 0.0007                  | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |        |
| 52                      | -               | 172                                   | v <sub>f</sub> (in/min)               | 2.4                       | 2.4                 | 2.4                     | 2.4                     | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    |        |

SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
v<sub>f</sub> [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE SOLID CARBIDE



## C330 - START VALUES

| SLOTTING     |       |                                       |                                       |                           |      |                         |                         |        |        |        |        |        |        |        |        |      |
|--------------|-------|---------------------------------------|---------------------------------------|---------------------------|------|-------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| ISO GROUP    | SMG   | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |      | Z <sub>n</sub> = 3      |                         |        |        |        |        |        |        |        |        |      |
|              |       |                                       |                                       |                           |      | 1/16                    | 1/8                     | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |        |      |
| P            | E 1-2 | 0.50                                  | 1.00                                  | 400                       | -    | 460                     | n (rev/min)             | 24448  | 12224  | 6112   | 4075   | 3056   | 2445   | 2037   | 1528   |      |
|              |       |                                       |                                       |                           |      |                         | f <sub>z</sub> (in)     | 0.0002 | 0.0005 | 0.0009 | 0.0014 | 0.0018 | 0.0023 | 0.0027 | 0.0036 |      |
|              | E 3-4 | 0.40                                  | 1.00                                  | 200                       | -    | 260                     | v <sub>f</sub> (in/min) | 16.5   | 16.5   | 16.5   | 16.5   | 16.5   | 16.5   | 16.5   | 16.5   | 16.5 |
|              |       |                                       |                                       |                           |      |                         | n (rev/min)             | 12224  | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |      |
|              | E 5-6 | 0.30                                  | 1.00                                  | 100                       | -    | 160                     | f <sub>z</sub> (in)     | 0.0001 | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |      |
|              |       |                                       |                                       |                           |      |                         | v <sub>f</sub> (in/min) | 5.1    | 5.1    | 5.1    | 5.1    | 5.1    | 5.1    | 5.1    | 5.1    | 5.1  |
| E 8-9        | 0.50  | 1.00                                  | 320                                   | -                         | 350  | n (rev/min)             | 19558                   | 9779   | 4890   | 3260   | 2445   | 1956   | 1630   | 1222   |        |      |
|              |       |                                       |                                       |                           |      | f <sub>z</sub> (in)     | 0.0001                  | 0.0002 | 0.0004 | 0.0007 | 0.0009 | 0.0011 | 0.0013 | 0.0018 |        |      |
| E 10-11      | 0.40  | 1.00                                  | 290                                   | -                         | 320  | v <sub>f</sub> (in/min) | 6.5                     | 6.5    | 6.5    | 6.5    | 6.5    | 6.5    | 6.5    | 6.5    |        |      |
|              |       |                                       |                                       |                           |      | n (rev/min)             | 17725                   | 8862   | 4431   | 2954   | 2216   | 1772   | 1477   | 1108   |        |      |
| E 12-13      | 0.50  | 1.00                                  | 270                                   | -                         | 330  | f <sub>z</sub> (in)     | 0.0001                  | 0.0002 | 0.0004 | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0016 |        |      |
|              |       |                                       |                                       |                           |      | v <sub>f</sub> (in/min) | 5.3                     | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    |      |
| E 14-15      | 0.30  | 1.00                                  | 145                                   | -                         | 205  | n (rev/min)             | 16502                   | 8251   | 4126   | 2750   | 2063   | 1650   | 1375   | 1031   |        |      |
|              |       |                                       |                                       |                           |      | f <sub>z</sub> (in)     | 0.0003                  | 0.0006 | 0.0012 | 0.0017 | 0.0023 | 0.0029 | 0.0035 | 0.0046 |        |      |
| E 16-17      | 1.00  | 1.00                                  | 700                                   | -                         | 1000 | v <sub>f</sub> (in/min) | 14.4                    | 14.4   | 14.4   | 14.4   | 14.4   | 14.4   | 14.4   | 14.4   |        |      |
|              |       |                                       |                                       |                           |      | n (rev/min)             | 8862                    | 4431   | 2216   | 1477   | 1108   | 886    | 739    | 554    |        |      |
| E 18-19      | 0.20  | 1.00                                  | 80                                    | -                         | 110  | f <sub>z</sub> (in)     | 0.0002                  | 0.0003 | 0.0007 | 0.0010 | 0.0014 | 0.0017 | 0.0020 | 0.0027 |        |      |
|              |       |                                       |                                       |                           |      | v <sub>f</sub> (in/min) | 4.5                     | 4.5    | 4.5    | 4.5    | 4.5    | 4.5    | 4.5    | 4.5    | 4.5    |      |
| E / M / A 16 | 1.00  | 1.00                                  | 700                                   | -                         | 1000 | n (rev/min)             | 42784                   | 21392  | 10696  | 7131   | 5348   | 4278   | 3565   | 2674   |        |      |
|              |       |                                       |                                       |                           |      | f <sub>z</sub> (in)     | 0.0005                  | 0.0009 | 0.0018 | 0.0027 | 0.0036 | 0.0045 | 0.0054 | 0.0072 |        |      |
| E / M / A 17 | 1.00  | 1.00                                  | 700                                   | -                         | 1000 | v <sub>f</sub> (in/min) | 57.8                    | 57.8   | 57.8   | 57.8   | 57.8   | 57.8   | 57.8   | 57.8   |        |      |
|              |       |                                       |                                       |                           |      | n (rev/min)             | 42784                   | 21392  | 10696  | 7131   | 5348   | 4278   | 3565   | 2674   |        |      |
| E 20-21      | 0.20  | 1.00                                  | 80                                    | -                         | 110  | f <sub>z</sub> (in)     | 0.0005                  | 0.0009 | 0.0018 | 0.0027 | 0.0036 | 0.0045 | 0.0054 | 0.0072 |        |      |
|              |       |                                       |                                       |                           |      | v <sub>f</sub> (in/min) | 57.8                    | 57.8   | 57.8   | 57.8   | 57.8   | 57.8   | 57.8   | 57.8   |        |      |
| E 19         | 0.20  | 1.00                                  | 80                                    | -                         | 110  | n (rev/min)             | 4890                    | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |        |      |
|              |       |                                       |                                       |                           |      | f <sub>z</sub> (in)     | 0.0002                  | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |        |      |
| E 20         | 0.20  | 1.00                                  | 80                                    | -                         | 110  | v <sub>f</sub> (in/min) | 2.2                     | 2.2    | 2.2    | 2.2    | 2.2    | 2.2    | 2.2    | 2.2    |        |      |
|              |       |                                       |                                       |                           |      | n (rev/min)             | 4890                    | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |        |      |
| E 21         | 0.20  | 1.00                                  | 80                                    | -                         | 110  | f <sub>z</sub> (in)     | 0.0002                  | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |        |      |
|              |       |                                       |                                       |                           |      | v <sub>f</sub> (in/min) | 2.2                     | 2.2    | 2.2    | 2.2    | 2.2    | 2.2    | 2.2    | 2.2    |        |      |
| E 22         | 0.30  | 1.00                                  | 130                                   | -                         | 190  | n (rev/min)             | 7946                    | 3973   | 1986   | 1324   | 993    | 795    | 662    | 497    |        |      |
|              |       |                                       |                                       |                           |      | f <sub>z</sub> (in)     | 0.0001                  | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |        |      |
| E 22         | 0.30  | 1.00                                  | 130                                   | -                         | 190  | v <sub>f</sub> (in/min) | 3.3                     | 3.3    | 3.3    | 3.3    | 3.3    | 3.3    | 3.3    | 3.3    |        |      |
|              |       |                                       |                                       |                           |      | n (rev/min)             | 7946                    | 3973   | 1986   | 1324   | 993    | 795    | 662    | 497    |        |      |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE SOLID CARBIDE

## C330 - START VALUES

| SIDE MILLING - ROUGHING |              |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |        |
|-------------------------|--------------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG          | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        |        |        |
|                         |              |                                       |                                       |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E 1 - 2      | 1.00                                  | 0.30                                  | 400                       | n (rev/min)             | 24448              | 12224  | 6112   | 4075   | 3056   | 2445   | 2037   | 1528   |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0006 | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                         | E 3 - 4      | 1.00                                  | 0.30                                  | 200                       | v <sub>f</sub> (in/min) | 20.6               | 20.6   | 20.6   | 20.6   | 20.6   | 20.6   | 20.6   | 20.6   |
|                         |              |                                       |                                       |                           | n (rev/min)             | 12224              | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|                         | E 5 - 6      | 1.00                                  | 0.20                                  | 100                       | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |
|                         |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 6.4                | 6.4    | 6.4    | 6.4    | 6.4    | 6.4    | 6.4    | 6.4    |
| M                       | E 8 - 9      | 0.50                                  | 0.30                                  | 320                       | n (rev/min)             | 19558              | 9779   | 4890   | 3260   | 2445   | 1956   | 1630   | 1222   |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |
|                         | E 10 - 11    | 0.30                                  | 0.20                                  | 290                       | v <sub>f</sub> (in/min) | 8.1                | 8.1    | 8.1    | 8.1    | 8.1    | 8.1    | 8.1    | 8.1    |
|                         |              |                                       |                                       |                           | n (rev/min)             | 17725              | 8862   | 4431   | 2954   | 2216   | 1772   | 1477   | 1108   |
|                         | E 12 - 13    | 1.00                                  | 0.50                                  | 270                       | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0005 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |
|                         |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 6.6                | 6.6    | 6.6    | 6.6    | 6.6    | 6.6    | 6.6    | 6.6    |
| K                       | E 12 - 13    | 1.00                                  | 0.50                                  | 270                       | n (rev/min)             | 16502              | 8251   | 4126   | 2750   | 2063   | 1650   | 1375   | 1031   |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0004             | 0.0007 | 0.0015 | 0.0022 | 0.0029 | 0.0036 | 0.0044 | 0.0058 |
|                         | E 14 - 15    | 0.50                                  | 0.30                                  | 145                       | v <sub>f</sub> (in/min) | 17.9               | 17.9   | 17.9   | 17.9   | 17.9   | 17.9   | 17.9   | 17.9   |
|                         |              |                                       |                                       |                           | n (rev/min)             | 8862               | 4431   | 2216   | 1477   | 1108   | 886    | 739    | 554    |
|                         | E 16 - 17    | 2.00                                  | 0.50                                  | 700                       | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0009 | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 |
|                         |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 5.6                | 5.6    | 5.6    | 5.6    | 5.6    | 5.6    | 5.6    | 5.6    |
| N                       | E / M / A 16 | 2.00                                  | 0.50                                  | 700                       | n (rev/min)             | 42784              | 21392  | 10696  | 7131   | 5348   | 4278   | 3565   | 2674   |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0006             | 0.0011 | 0.0023 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 |
|                         | E / M / A 17 | 2.00                                  | 0.50                                  | 700                       | v <sub>f</sub> (in/min) | 72.2               | 72.2   | 72.2   | 72.2   | 72.2   | 72.2   | 72.2   | 72.2   |
|                         |              |                                       |                                       |                           | n (rev/min)             | 42784              | 21392  | 10696  | 7131   | 5348   | 4278   | 3565   | 2674   |
|                         | E 19         | 0.20                                  | 0.10                                  | 80                        | f <sub>z</sub> (in)     | 0.0006             | 0.0011 | 0.0023 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 |
|                         |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 72.2               | 72.2   | 72.2   | 72.2   | 72.2   | 72.2   | 72.2   | 72.2   |
| S                       | E 19         | 0.20                                  | 0.10                                  | 80                        | n (rev/min)             | 4890               | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|                         | E 20         | 0.20                                  | 0.10                                  | 80                        | v <sub>f</sub> (in/min) | 2.8                | 2.8    | 2.8    | 2.8    | 2.8    | 2.8    | 2.8    | 2.8    |
|                         |              |                                       |                                       |                           | n (rev/min)             | 4890               | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |
|                         | E 21         | 0.20                                  | 0.10                                  | 80                        | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|                         |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.8                | 2.8    | 2.8    | 2.8    | 2.8    | 2.8    | 2.8    | 2.8    |
| E 22                    | 0.30         | 0.20                                  | 130                                   | n (rev/min)               | 7946                    | 3973               | 1986   | 1324   | 993    | 795    | 662    | 497    |        |
|                         |              |                                       |                                       | f <sub>z</sub> (in)       | 0.0002                  | 0.0004             | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |        |
| E 23                    | 0.30         | 0.20                                  | 130                                   | v <sub>f</sub> (in/min)   | 4.2                     | 4.2                | 4.2    | 4.2    | 4.2    | 4.2    | 4.2    | 4.2    |        |
|                         |              |                                       |                                       | n (rev/min)               | 7946                    | 3973               | 1986   | 1324   | 993    | 795    | 662    | 497    |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## CB330 - START VALUES

| SLOTTING                |              |                                       |                                       |                           |      |             |                     |        |        |        |        |        |        |        |        |
|-------------------------|--------------|---------------------------------------|---------------------------------------|---------------------------|------|-------------|---------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG          | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |      | n (rev/min) | Z <sub>n</sub> = 3  |        |        |        |        |        |        |        |        |
|                         |              |                                       |                                       |                           |      |             | 1/16                | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |
| P                       | E 1 - 2      | 0.30                                  | 1.00                                  | 320                       | -    | 380         | n (rev/min)         | 19558  | 9779   | 4890   | 3260   | 2445   | 1956   | 1630   | 1222   |
|                         |              |                                       |                                       |                           |      |             | f <sub>z</sub> (in) | 0.0002 | 0.0005 | 0.0009 | 0.0014 | 0.0018 | 0.0023 | 0.0027 | 0.0036 |
|                         |              |                                       |                                       | v <sub>f</sub> (in/min)   | 13.2 | 13.2        | 13.2                | 13.2   | 13.2   | 13.2   | 13.2   | 13.2   | 13.2   |        |        |
|                         | E 3 - 4      | 0.20                                  | 1.00                                  | 150                       | -    | 210         | n (rev/min)         | 9168   | 4584   | 2292   | 1528   | 1146   | 917    | 764    | 573    |
|                         |              |                                       |                                       |                           |      |             | f <sub>z</sub> (in) | 0.0001 | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |
|                         |              |                                       |                                       | v <sub>f</sub> (in/min)   | 3.9  | 3.9         | 3.9                 | 3.9    | 3.9    | 3.9    | 3.9    | 3.9    | 3.9    |        |        |
|                         | E 5 - 6      | 0.20                                  | 1.00                                  | 80                        | -    | 140         | n (rev/min)         | 4890   | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |
|                         |              |                                       |                                       |                           |      |             | f <sub>z</sub> (in) | 0.0001 | 0.0002 | 0.0005 | 0.0007 | 0.0010 | 0.0012 | 0.0014 | 0.0019 |
|                         |              |                                       |                                       | v <sub>f</sub> (in/min)   | 1.8  | 1.8         | 1.8                 | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    |        |        |
| M                       | E 8 - 9      | 0.60                                  | 1.00                                  | 240                       | -    | 270         | n (rev/min)         | 14669  | 7334   | 3667   | 2445   | 1834   | 1467   | 1222   | 917    |
|                         |              |                                       |                                       |                           |      |             | f <sub>z</sub> (in) | 0.0001 | 0.0002 | 0.0004 | 0.0007 | 0.0009 | 0.0011 | 0.0013 | 0.0018 |
|                         |              |                                       |                                       | v <sub>f</sub> (in/min)   | 4.8  | 4.8         | 4.8                 | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    |        |        |
|                         | E 10 - 11    | 0.30                                  | 1.00                                  | 200                       | -    | 230         | n (rev/min)         | 12224  | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|                         |              |                                       |                                       |                           |      |             | f <sub>z</sub> (in) | 0.0001 | 0.0002 | 0.0004 | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0016 |
|                         |              |                                       |                                       | v <sub>f</sub> (in/min)   | 3.7  | 3.7         | 3.7                 | 3.7    | 3.7    | 3.7    | 3.7    | 3.7    | 3.7    |        |        |
| K                       | E 12 - 13    | 0.40                                  | 1.00                                  | 200                       | -    | 260         | n (rev/min)         | 12224  | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|                         |              |                                       |                                       |                           |      |             | f <sub>z</sub> (in) | 0.0003 | 0.0006 | 0.0012 | 0.0017 | 0.0023 | 0.0029 | 0.0035 | 0.0046 |
|                         |              |                                       |                                       | v <sub>f</sub> (in/min)   | 10.6 | 10.6        | 10.6                | 10.6   | 10.6   | 10.6   | 10.6   | 10.6   | 10.6   |        |        |
|                         | E 14 - 15    | 0.20                                  | 1.00                                  | 120                       | -    | 180         | n (rev/min)         | 7334   | 3667   | 1834   | 1222   | 917    | 733    | 611    | 458    |
|                         |              |                                       |                                       |                           |      |             | f <sub>z</sub> (in) | 0.0002 | 0.0003 | 0.0007 | 0.0010 | 0.0014 | 0.0017 | 0.0020 | 0.0027 |
|                         |              |                                       |                                       | v <sub>f</sub> (in/min)   | 3.7  | 3.7         | 3.7                 | 3.7    | 3.7    | 3.7    | 3.7    | 3.7    | 3.7    |        |        |
| N                       | E / M / A 16 | 0.20                                  | 1.00                                  | 400                       | -    | 700         | n (rev/min)         | 24448  | 12224  | 6112   | 4075   | 3056   | 2445   | 2037   | 1528   |
|                         |              |                                       |                                       |                           |      |             | f <sub>z</sub> (in) | 0.0005 | 0.0009 | 0.0018 | 0.0027 | 0.0036 | 0.0045 | 0.0054 | 0.0072 |
|                         |              |                                       |                                       | v <sub>f</sub> (in/min)   | 33.0 | 33.0        | 33.0                | 33.0   | 33.0   | 33.0   | 33.0   | 33.0   | 33.0   |        |        |
|                         | E / M / A 17 | 0.20                                  | 1.00                                  | 400                       | -    | 700         | n (rev/min)         | 24448  | 12224  | 6112   | 4075   | 3056   | 2445   | 2037   | 1528   |
|                         |              |                                       |                                       |                           |      |             | f <sub>z</sub> (in) | 0.0005 | 0.0009 | 0.0018 | 0.0027 | 0.0036 | 0.0045 | 0.0054 | 0.0072 |
|                         |              |                                       |                                       | v <sub>f</sub> (in/min)   | 33.0 | 33.0        | 33.0                | 33.0   | 33.0   | 33.0   | 33.0   | 33.0   | 33.0   |        |        |
| S                       | E 19         | 0.10                                  | 1.00                                  | 60                        | -    | 90          | n (rev/min)         | 3667   | 1834   | 917    | 611    | 458    | 367    | 306    | 229    |
|                         |              |                                       |                                       |                           |      |             | f <sub>z</sub> (in) | 0.0002 | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                         |              |                                       |                                       | v <sub>f</sub> (in/min)   | 1.7  | 1.7         | 1.7                 | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    |        |        |
|                         | E 20         | 0.10                                  | 1.00                                  | 60                        | -    | 90          | n (rev/min)         | 3667   | 1834   | 917    | 611    | 458    | 367    | 306    | 229    |
|                         |              |                                       |                                       |                           |      |             | f <sub>z</sub> (in) | 0.0002 | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                         |              |                                       |                                       | v <sub>f</sub> (in/min)   | 1.7  | 1.7         | 1.7                 | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    |        |        |
|                         | E 21         | 0.10                                  | 1.00                                  | 60                        | -    | 90          | n (rev/min)         | 3667   | 1834   | 917    | 611    | 458    | 367    | 306    | 229    |
|                         |              |                                       |                                       |                           |      |             | f <sub>z</sub> (in) | 0.0002 | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                         |              |                                       |                                       | v <sub>f</sub> (in/min)   | 1.7  | 1.7         | 1.7                 | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    |        |        |
|                         | E 22         | 0.10                                  | 1.00                                  | 100                       | -    | 160         | n (rev/min)         | 6112   | 3056   | 1528   | 1019   | 764    | 611    | 509    | 382    |
| f <sub>z</sub> (in)     |              |                                       |                                       |                           |      |             | 0.0001              | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |        |
| v <sub>f</sub> (in/min) |              |                                       |                                       | 2.6                       | 2.6  | 2.6         | 2.6                 | 2.6    | 2.6    | 2.6    | 2.6    | 2.6    |        |        |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.



# CUTTING DATA - GENERAL PURPOSE SOLID CARBIDE

## CB330 - START VALUES

| SIDE MILLING - ROUGHING |           |                                       |                                       |                           |                         |                         |        |        |        |        |        |        |        |        |
|-------------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3      |        |        |        |        |        |        |        |        |
|                         |           |                                       |                                       |                           |                         | 1/16                    | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |        |
| P                       | E 1 - 2   | 1.00                                  | 0.30                                  | 320                       | n (rev/min)             | 19558                   | 9779   | 4890   | 3260   | 2445   | 1956   | 1630   | 1222   |        |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003                  | 0.0006 | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |        |
|                         | E 3 - 4   | 1.00                                  | 0.30                                  | 150                       | v <sub>f</sub> (in/min) | 16.5                    | 16.5   | 16.5   | 16.5   | 16.5   | 16.5   | 16.5   | 16.5   |        |
|                         |           |                                       |                                       |                           | n (rev/min)             | 9168                    | 4584   | 2292   | 1528   | 1146   | 917    | 764    | 573    |        |
|                         | E 5 - 6   | 1.00                                  | 0.20                                  | 80                        | f <sub>z</sub> (in)     | 0.0002                  | 0.0004 | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |        |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 4.8                     | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    |        |
| M                       | E 8 - 9   | 1.00                                  | 0.30                                  | 240                       | n (rev/min)             | 14669                   | 7334   | 3667   | 2445   | 1834   | 1467   | 1222   | 917    |        |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001                  | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |        |
|                         | E 10 - 11 | 1.00                                  | 0.20                                  | 200                       | v <sub>f</sub> (in/min) | 6.1                     | 6.1    | 6.1    | 6.1    | 6.1    | 6.1    | 6.1    | 6.1    |        |
|                         |           |                                       |                                       |                           | n (rev/min)             | 12224                   | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |        |
|                         | E 12 - 13 | 1.00                                  | 0.40                                  | 200                       | f <sub>z</sub> (in)     | 0.0001                  | 0.0003 | 0.0005 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |        |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 4.6                     | 4.6    | 4.6    | 4.6    | 4.6    | 4.6    | 4.6    | 4.6    |        |
| K                       | E 14 - 15 | 1.00                                  | 0.20                                  | 120                       | n (rev/min)             | 12224                   | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |        |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0004                  | 0.0007 | 0.0015 | 0.0022 | 0.0029 | 0.0036 | 0.0044 | 0.0058 |        |
|                         | E 16 - 17 | 1.00                                  | 0.20                                  | 60                        | v <sub>f</sub> (in/min) | 13.3                    | 13.3   | 13.3   | 13.3   | 13.3   | 13.3   | 13.3   | 13.3   |        |
|                         |           |                                       |                                       |                           | n (rev/min)             | 7334                    | 3667   | 1834   | 1222   | 917    | 733    | 611    | 458    |        |
|                         | N         | E / M / A 16                          | 2.00                                  | 0.70                      | 400                     | f <sub>z</sub> (in)     | 0.0002 | 0.0004 | 0.0009 | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 |
|                         |           |                                       |                                       |                           |                         | v <sub>f</sub> (in/min) | 4.7    | 4.7    | 4.7    | 4.7    | 4.7    | 4.7    | 4.7    | 4.7    |
| E / M / A 17            |           | 2.00                                  | 0.70                                  | 400                       | n (rev/min)             | 24448                   | 12224  | 6112   | 4075   | 3056   | 2445   | 2037   | 1528   |        |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0006                  | 0.0011 | 0.0023 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 |        |
| S                       |           | E 19                                  | 0.50                                  | 0.30                      | 60                      | v <sub>f</sub> (in/min) | 41.3   | 41.3   | 41.3   | 41.3   | 41.3   | 41.3   | 41.3   | 41.3   |
|                         |           |                                       |                                       |                           |                         | n (rev/min)             | 3667   | 1834   | 917    | 611    | 458    | 367    | 306    | 229    |
|                         | E 20      | 0.50                                  | 0.30                                  | 60                        | f <sub>z</sub> (in)     | 0.0002                  | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |        |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.1                     | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    |        |
|                         | E 21      | 0.50                                  | 0.30                                  | 60                        | n (rev/min)             | 3667                    | 1834   | 917    | 611    | 458    | 367    | 306    | 229    |        |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002                  | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |        |
| E 22                    | 0.50      | 0.20                                  | 100                                   | v <sub>f</sub> (in/min)   | 2.1                     | 2.1                     | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    |        |        |
|                         |           |                                       |                                       | n (rev/min)               | 6112                    | 3056                    | 1528   | 1019   | 764    | 611    | 509    | 382    |        |        |
| E 23                    | 0.50      | 0.20                                  | 40                                    | f <sub>z</sub> (in)       | 0.0002                  | 0.0004                  | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |        |        |
|                         |           |                                       |                                       | v <sub>f</sub> (in/min)   | 3.2                     | 3.2                     | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    |        |        |

SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter  
v<sub>f</sub> [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

## C360 - START VALUES

| SIDE MILLING - ROUGHING |       |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |        |
|-------------------------|-------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG   | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        |        |        |
|                         |       |                                       |                                       |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E 1-2 | 1.00                                  | 0.15                                  | 400                       | n (rev/min)             | 24448              | 12224  | 6112   | 4075   | 3056   | 2445   | 2037   | 1528   |
|                         |       |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0006 | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                         | E 3-4 | 1.00                                  | 0.15                                  | 200                       | v <sub>f</sub> (in/min) | 20.6               | 20.6   | 20.6   | 20.6   | 20.6   | 20.6   | 20.6   | 20.6   |
|                         |       |                                       |                                       |                           | n (rev/min)             | 12224              | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|                         | E 5-6 | 1.00                                  | 0.15                                  | 100                       | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |
|                         |       |                                       |                                       |                           | v <sub>f</sub> (in/min) | 6.4                | 6.4    | 6.4    | 6.4    | 6.4    | 6.4    | 6.4    | 6.4    |
| E 8-9                   | 0.50  | 0.15                                  | 320                                   | n (rev/min)               | 19558                   | 9779               | 4890   | 3260   | 2445   | 1956   | 1630   | 1222   |        |
|                         |       |                                       |                                       | f <sub>z</sub> (in)       | 0.0001                  | 0.0003             | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |        |
| E 10-11                 | 0.30  | 0.15                                  | 290                                   | v <sub>f</sub> (in/min)   | 8.1                     | 8.1                | 8.1    | 8.1    | 8.1    | 8.1    | 8.1    | 8.1    |        |
|                         |       |                                       |                                       | n (rev/min)               | 17725                   | 8862               | 4431   | 2954   | 2216   | 1772   | 1477   | 1108   |        |
| E 12-13                 | 1.00  | 0.15                                  | 270                                   | f <sub>z</sub> (in)       | 0.0001                  | 0.0003             | 0.0005 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |        |
|                         |       |                                       |                                       | v <sub>f</sub> (in/min)   | 6.6                     | 6.6                | 6.6    | 6.6    | 6.6    | 6.6    | 6.6    | 6.6    |        |
| E 12-13                 | 1.00  | 0.15                                  | 270                                   | n (rev/min)               | 16502                   | 8251               | 4126   | 2750   | 2063   | 1650   | 1375   | 1031   |        |
|                         |       |                                       |                                       | f <sub>z</sub> (in)       | 0.0004                  | 0.0007             | 0.0015 | 0.0022 | 0.0029 | 0.0036 | 0.0044 | 0.0058 |        |
| E 14-15                 | 0.50  | 0.15                                  | 145                                   | v <sub>f</sub> (in/min)   | 17.9                    | 17.9               | 17.9   | 17.9   | 17.9   | 17.9   | 17.9   | 17.9   |        |
|                         |       |                                       |                                       | n (rev/min)               | 8862                    | 4431               | 2216   | 1477   | 1108   | 886    | 739    | 554    |        |
| E 14-15                 | 0.50  | 0.15                                  | 85                                    | f <sub>z</sub> (in)       | 0.0002                  | 0.0004             | 0.0009 | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 |        |
|                         |       |                                       |                                       | v <sub>f</sub> (in/min)   | 5.6                     | 5.6                | 5.6    | 5.6    | 5.6    | 5.6    | 5.6    | 5.6    |        |
| E / M / A 16            | 2.00  | 0.15                                  | 700                                   | n (rev/min)               | 42784                   | 21392              | 10696  | 7131   | 5348   | 4278   | 3565   | 2674   |        |
|                         |       |                                       |                                       | f <sub>z</sub> (in)       | 0.0006                  | 0.0011             | 0.0023 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 |        |
| E / M / A 17            | 2.00  | 0.15                                  | 400                                   | v <sub>f</sub> (in/min)   | 72.2                    | 72.2               | 72.2   | 72.2   | 72.2   | 72.2   | 72.2   | 72.2   |        |
|                         |       |                                       |                                       | n (rev/min)               | 42784                   | 21392              | 10696  | 7131   | 5348   | 4278   | 3565   | 2674   |        |
| E / M / A 17            | 2.00  | 0.15                                  | 700                                   | f <sub>z</sub> (in)       | 0.0006                  | 0.0011             | 0.0023 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0090 |        |
|                         |       |                                       |                                       | v <sub>f</sub> (in/min)   | 72.2                    | 72.2               | 72.2   | 72.2   | 72.2   | 72.2   | 72.2   | 72.2   |        |
| E 19                    | 0.20  | 0.15                                  | 80                                    | n (rev/min)               | 4890                    | 2445               | 1222   | 815    | 611    | 489    | 407    | 306    |        |
|                         |       |                                       |                                       | f <sub>z</sub> (in)       | 0.0002                  | 0.0004             | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |        |
| E 20                    | 0.20  | 0.15                                  | 50                                    | v <sub>f</sub> (in/min)   | 2.8                     | 2.8                | 2.8    | 2.8    | 2.8    | 2.8    | 2.8    | 2.8    |        |
|                         |       |                                       |                                       | n (rev/min)               | 4890                    | 2445               | 1222   | 815    | 611    | 489    | 407    | 306    |        |
| E 21                    | 0.20  | 0.15                                  | 80                                    | f <sub>z</sub> (in)       | 0.0002                  | 0.0004             | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |        |
|                         |       |                                       |                                       | v <sub>f</sub> (in/min)   | 2.8                     | 2.8                | 2.8    | 2.8    | 2.8    | 2.8    | 2.8    | 2.8    |        |
| E 22                    | 0.30  | 0.15                                  | 130                                   | n (rev/min)               | 7946                    | 3973               | 1986   | 1324   | 993    | 795    | 662    | 497    |        |
|                         |       |                                       |                                       | f <sub>z</sub> (in)       | 0.0002                  | 0.0004             | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |        |
| E 22                    | 0.30  | 0.15                                  | 70                                    | v <sub>f</sub> (in/min)   | 4.2                     | 4.2                | 4.2    | 4.2    | 4.2    | 4.2    | 4.2    | 4.2    |        |
|                         |       |                                       |                                       | n (rev/min)               | 7946                    | 3973               | 1986   | 1324   | 993    | 795    | 662    | 497    |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## C430 / C430R / CNC430 / CD430 / CSD430 - START VALUES

| SLOTTING  |           |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |        |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |        |        |        |        |        |        |        |
|           |           |                                       |                                       |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P         | E 1 - 2   | 0.50                                  | 1.00                                  | 400                       | n (rev/min)             | 24448              | 12224  | 6112   | 4075   | 3056   | 2445   | 2037   | 1528   |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0005 | 0.0009 | 0.0014 | 0.0018 | 0.0023 | 0.0027 | 0.0036 |
|           |           |                                       |                                       | 340 - 460                 | v <sub>f</sub> (in/min) | 22.0               | 22.0   | 22.0   | 22.0   | 22.0   | 22.0   | 22.0   | 22.0   |
|           | E 3 - 4   | 0.40                                  | 1.00                                  | 200                       | n (rev/min)             | 12224              | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |
|           |           |                                       |                                       | 140 - 260                 | v <sub>f</sub> (in/min) | 6.8                | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    |
|           | E 5 - 6   | 0.30                                  | 1.00                                  | 100                       | n (rev/min)             | 6112               | 3056   | 1528   | 1019   | 764    | 611    | 509    | 382    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0010 | 0.0012 | 0.0014 | 0.0019 |
|           |           |                                       |                                       | 40 - 160                  | v <sub>f</sub> (in/min) | 2.9                | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    |
| M         | E 8 - 9   | 0.50                                  | 1.00                                  | 320                       | n (rev/min)             | 19558              | 9779   | 4890   | 3260   | 2445   | 1956   | 1630   | 1222   |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0007 | 0.0009 | 0.0011 | 0.0013 | 0.0018 |
|           |           |                                       |                                       | 290 - 350                 | v <sub>f</sub> (in/min) | 8.6                | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    |
|           | E 10 - 11 | 0.40                                  | 1.00                                  | 250                       | n (rev/min)             | 15280              | 7640   | 3820   | 2547   | 1910   | 1528   | 1273   | 955    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0016 |
|           |           |                                       |                                       | 220 - 280                 | v <sub>f</sub> (in/min) | 6.1                | 6.1    | 6.1    | 6.1    | 6.1    | 6.1    | 6.1    | 6.1    |
| K         | E 12 - 13 | 0.50                                  | 1.00                                  | 270                       | n (rev/min)             | 16502              | 8251   | 4126   | 2750   | 2063   | 1650   | 1375   | 1031   |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0006 | 0.0012 | 0.0017 | 0.0023 | 0.0029 | 0.0035 | 0.0046 |
|           |           |                                       |                                       | 210 - 330                 | v <sub>f</sub> (in/min) | 19.1               | 19.1   | 19.1   | 19.1   | 19.1   | 19.1   | 19.1   | 19.1   |
|           | E 14 - 15 | 0.30                                  | 1.00                                  | 145                       | n (rev/min)             | 8862               | 4431   | 2216   | 1477   | 1108   | 886    | 739    | 554    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0007 | 0.0010 | 0.0014 | 0.0017 | 0.0020 | 0.0027 |
|           |           |                                       |                                       | 85 - 205                  | v <sub>f</sub> (in/min) | 6.0                | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    |
| S         | E 19      | 0.20                                  | 1.00                                  | 70                        | n (rev/min)             | 4278               | 2139   | 1070   | 713    | 535    | 428    | 357    | 267    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|           |           |                                       |                                       | 40 - 100                  | v <sub>f</sub> (in/min) | 3.2                | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    |
|           | E 20      | 0.20                                  | 1.00                                  | 70                        | n (rev/min)             | 4278               | 2139   | 1070   | 713    | 535    | 428    | 357    | 267    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|           |           |                                       |                                       | 40 - 100                  | v <sub>f</sub> (in/min) | 3.2                | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    |
|           | E 21      | 0.20                                  | 1.00                                  | 70                        | n (rev/min)             | 4278               | 2139   | 1070   | 713    | 535    | 428    | 357    | 267    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|           |           |                                       |                                       | 40 - 100                  | v <sub>f</sub> (in/min) | 3.2                | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    |
|           | E 22      | 0.20                                  | 1.00                                  | 112                       | n (rev/min)             | 6845               | 3423   | 1711   | 1141   | 856    | 685    | 570    | 428    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |
|           |           |                                       |                                       | 52 - 172                  | v <sub>f</sub> (in/min) | 4.8                | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## C430 / C430R / CNC430 / CD430 / CSD430 - START VALUES

| SIDE MILLING - ROUGHING |           |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |        |
|-------------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |        |        |        |        |        |        |        |
|                         |           |                                       |                                       |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E 1 - 2   | 1.00                                  | 0.30                                  | 400                       | n (rev/min)             | 24448              | 12224  | 6112   | 4075   | 3056   | 2445   | 2037   | 1528   |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0006 | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                         |           |                                       |                                       | 340 - 460                 | v <sub>f</sub> (in/min) | 27.5               | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   | 27.5   |
|                         | E 3 - 4   | 1.00                                  | 0.30                                  | 200                       | n (rev/min)             | 12224              | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |
|                         |           |                                       |                                       | 140 - 260                 | v <sub>f</sub> (in/min) | 8.6                | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    |
|                         | E 5 - 6   | 1.00                                  | 0.20                                  | 100                       | n (rev/min)             | 6112               | 3056   | 1528   | 1019   | 764    | 611    | 509    | 382    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                         |           |                                       |                                       | 40 - 160                  | v <sub>f</sub> (in/min) | 3.7                | 3.7    | 3.7    | 3.7    | 3.7    | 3.7    | 3.7    | 3.7    |
| M                       | E 8 - 9   | 0.50                                  | 0.30                                  | 320                       | n (rev/min)             | 19558              | 9779   | 4890   | 3260   | 2445   | 1956   | 1630   | 1222   |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |
|                         |           |                                       |                                       | 290 - 350                 | v <sub>f</sub> (in/min) | 10.8               | 10.8   | 10.8   | 10.8   | 10.8   | 10.8   | 10.8   | 10.8   |
|                         | E 10 - 11 | 0.30                                  | 0.20                                  | 250                       | n (rev/min)             | 15280              | 7640   | 3820   | 2547   | 1910   | 1528   | 1273   | 955    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0005 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |
|                         |           |                                       |                                       | 220 - 280                 | v <sub>f</sub> (in/min) | 7.6                | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    |
| K                       | E 12 - 13 | 1.00                                  | 0.50                                  | 270                       | n (rev/min)             | 16502              | 8251   | 4126   | 2750   | 2063   | 1650   | 1375   | 1031   |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0004             | 0.0007 | 0.0015 | 0.0022 | 0.0029 | 0.0036 | 0.0044 | 0.0058 |
|                         |           |                                       |                                       | 210 - 330                 | v <sub>f</sub> (in/min) | 23.9               | 23.9   | 23.9   | 23.9   | 23.9   | 23.9   | 23.9   | 23.9   |
|                         | E 14 - 15 | 0.50                                  | 0.30                                  | 145                       | n (rev/min)             | 8862               | 4431   | 2216   | 1477   | 1108   | 886    | 739    | 554    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0009 | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 |
|                         |           |                                       |                                       | 85 - 205                  | v <sub>f</sub> (in/min) | 7.5                | 7.5    | 7.5    | 7.5    | 7.5    | 7.5    | 7.5    | 7.5    |
| S                       | E 19      | 0.20                                  | 0.10                                  | 120                       | n (rev/min)             | 7334               | 3667   | 1834   | 1222   | 917    | 733    | 611    | 458    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                         |           |                                       |                                       | 90 - 150                  | v <sub>f</sub> (in/min) | 4.4                | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    |
|                         | E 20      | 0.20                                  | 0.10                                  | 120                       | n (rev/min)             | 7334               | 3667   | 1834   | 1222   | 917    | 733    | 611    | 458    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                         |           |                                       |                                       | 90 - 150                  | v <sub>f</sub> (in/min) | 4.4                | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    |
|                         | E 21      | 0.20                                  | 0.10                                  | 120                       | n (rev/min)             | 7334               | 3667   | 1834   | 1222   | 917    | 733    | 611    | 458    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                         |           |                                       |                                       | 90 - 150                  | v <sub>f</sub> (in/min) | 4.4                | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    | 4.4    |
|                         | E 22      | 0.30                                  | 0.20                                  | 80                        | n (rev/min)             | 4890               | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |
| f <sub>z</sub> (in)     |           |                                       |                                       |                           | 0.0001                  | 0.0003             | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |        |
| 20 - 140                |           |                                       |                                       | v <sub>f</sub> (in/min)   | 2.7                     | 2.7                | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## CB430 / CSDB430 - START VALUES

| SLOTTING            |           |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |        |
|---------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP           | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |        |        |        |        |        |        |        |
|                     |           |                                       |                                       |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                   | E 1 - 2   | 0.50                                  | 1.00                                  | 320                       | n (rev/min)             | 19558              | 9779   | 4890   | 3260   | 2445   | 1956   | 1630   | 1222   |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0005 | 0.0009 | 0.0014 | 0.0018 | 0.0023 | 0.0027 | 0.0036 |
|                     |           |                                       |                                       | 260 - 380                 | v <sub>f</sub> (in/min) | 17.6               | 17.6   | 17.6   | 17.6   | 17.6   | 17.6   | 17.6   | 17.6   |
|                     | E 3 - 4   | 0.40                                  | 1.00                                  | 160                       | n (rev/min)             | 9779               | 4890   | 2445   | 1630   | 1222   | 978    | 815    | 611    |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |
|                     |           |                                       |                                       | 100 - 220                 | v <sub>f</sub> (in/min) | 5.5                | 5.5    | 5.5    | 5.5    | 5.5    | 5.5    | 5.5    | 5.5    |
|                     | E 5 - 6   | 0.30                                  | 1.00                                  | 80                        | n (rev/min)             | 4890               | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0005 | 0.0007 | 0.0010 | 0.0012 | 0.0014 | 0.0019 |
|                     |           |                                       |                                       | 20 - 140                  | v <sub>f</sub> (in/min) | 2.3                | 2.3    | 2.3    | 2.3    | 2.3    | 2.3    | 2.3    | 2.3    |
| M                   | E 8 - 9   | 0.50                                  | 1.00                                  | 256                       | n (rev/min)             | 15647              | 7823   | 3912   | 2608   | 1956   | 1565   | 1304   | 978    |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0007 | 0.0009 | 0.0011 | 0.0013 | 0.0018 |
|                     |           |                                       |                                       | 226 - 286                 | v <sub>f</sub> (in/min) | 6.9                | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    |
|                     | E 10 - 11 | 0.40                                  | 1.00                                  | 200                       | n (rev/min)             | 12224              | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0016 |
|                     |           |                                       |                                       | 170 - 230                 | v <sub>f</sub> (in/min) | 4.9                | 4.9    | 4.9    | 4.9    | 4.9    | 4.9    | 4.9    | 4.9    |
| K                   | E 12 - 13 | 0.50                                  | 1.00                                  | 216                       | n (rev/min)             | 13202              | 6601   | 3300   | 2200   | 1650   | 1320   | 1100   | 825    |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0006 | 0.0012 | 0.0017 | 0.0023 | 0.0029 | 0.0035 | 0.0046 |
|                     |           |                                       |                                       | 156 - 276                 | v <sub>f</sub> (in/min) | 15.3               | 15.3   | 15.3   | 15.3   | 15.3   | 15.3   | 15.3   | 15.3   |
|                     | E 14 - 15 | 0.30                                  | 1.00                                  | 116                       | n (rev/min)             | 7090               | 3545   | 1772   | 1182   | 886    | 709    | 591    | 443    |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0007 | 0.0010 | 0.0014 | 0.0017 | 0.0020 | 0.0027 |
|                     |           |                                       |                                       | 56 - 176                  | v <sub>f</sub> (in/min) | 4.8                | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    |
| S                   | E 19      | 0.10                                  | 1.00                                  | 70                        | n (rev/min)             | 4278               | 2139   | 1070   | 713    | 535    | 428    | 357    | 267    |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|                     |           |                                       |                                       | 40 - 100                  | v <sub>f</sub> (in/min) | 3.2                | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    |
|                     | E 20      | 0.10                                  | 1.00                                  | 70                        | n (rev/min)             | 4278               | 2139   | 1070   | 713    | 535    | 428    | 357    | 267    |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|                     |           |                                       |                                       | 40 - 100                  | v <sub>f</sub> (in/min) | 3.2                | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    |
|                     | E 21      | 0.10                                  | 1.00                                  | 70                        | n (rev/min)             | 4278               | 2139   | 1070   | 713    | 535    | 428    | 357    | 267    |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0008 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 |
|                     |           |                                       |                                       | 40 - 100                  | v <sub>f</sub> (in/min) | 3.2                | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    |
|                     | E 22      | 0.20                                  | 1.00                                  | 112                       | n (rev/min)             | 6845               | 3423   | 1711   | 1141   | 856    | 685    | 570    | 428    |
| f <sub>z</sub> (in) |           |                                       |                                       |                           | 0.0002                  | 0.0004             | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |        |
| 52 - 172            |           |                                       |                                       | v <sub>f</sub> (in/min)   | 4.8                     | 4.8                | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    | 4.8    |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## CB430 / CSDB430 - START VALUES

| SIDE MILLING - ROUGHING |           |                           |                           |                           |                         |                    |        |        |        |        |        |        |        |
|-------------------------|-----------|---------------------------|---------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG       | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |        |        |        |        |        |        |        |
|                         |           |                           |                           |                           |                         | 1/16               | 1/8    | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      |
| P                       | E 1 - 2   | 1.00                      | 0.30                      | 320                       | n (rev/min)             | 19558              | 9779   | 4890   | 3260   | 2445   | 1956   | 1630   | 1222   |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0003             | 0.0006 | 0.0011 | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 |
|                         |           |                           |                           | 260 - 380                 | v <sub>f</sub> (in/min) | 22.0               | 22.0   | 22.0   | 22.0   | 22.0   | 22.0   | 22.0   | 22.0   |
|                         | E 3 - 4   | 1.00                      | 0.30                      | 160                       | n (rev/min)             | 9779               | 4890   | 2445   | 1630   | 1222   | 978    | 815    | 611    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0007 | 0.0011 | 0.0014 | 0.0018 | 0.0021 | 0.0028 |
|                         |           |                           |                           | 100 - 220                 | v <sub>f</sub> (in/min) | 6.8                | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    |
|                         | E 5 - 6   | 1.00                      | 0.20                      | 80                        | n (rev/min)             | 4890               | 2445   | 1222   | 815    | 611    | 489    | 407    | 306    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                         |           |                           |                           | 20 - 140                  | v <sub>f</sub> (in/min) | 2.9                | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    |
| M                       | E 8 - 9   | 0.50                      | 0.30                      | 256                       | n (rev/min)             | 15647              | 7823   | 3912   | 2608   | 1956   | 1565   | 1304   | 978    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |
|                         |           |                           |                           | 226 - 286                 | v <sub>f</sub> (in/min) | 8.6                | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    |
|                         | E 10 - 11 | 0.30                      | 0.20                      | 200                       | n (rev/min)             | 12224              | 6112   | 3056   | 2037   | 1528   | 1222   | 1019   | 764    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0005 | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 |
|                         |           |                           |                           | 170 - 230                 | v <sub>f</sub> (in/min) | 6.1                | 6.1    | 6.1    | 6.1    | 6.1    | 6.1    | 6.1    | 6.1    |
| K                       | E 12 - 13 | 1.00                      | 0.50                      | 216                       | n (rev/min)             | 13202              | 6601   | 3300   | 2200   | 1650   | 1320   | 1100   | 825    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0004             | 0.0007 | 0.0015 | 0.0022 | 0.0029 | 0.0036 | 0.0044 | 0.0058 |
|                         |           |                           |                           | 156 - 276                 | v <sub>f</sub> (in/min) | 19.1               | 19.1   | 19.1   | 19.1   | 19.1   | 19.1   | 19.1   | 19.1   |
|                         | E 14 - 15 | 0.50                      | 0.30                      | 116                       | n (rev/min)             | 7090               | 3545   | 1772   | 1182   | 886    | 709    | 591    | 443    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0004 | 0.0009 | 0.0013 | 0.0017 | 0.0021 | 0.0026 | 0.0034 |
|                         |           |                           |                           | 56 - 176                  | v <sub>f</sub> (in/min) | 6.0                | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    |
| S                       | E 19      | 0.30                      | 0.10                      | 70                        | n (rev/min)             | 4278               | 2139   | 1070   | 713    | 535    | 428    | 357    | 267    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                         |           |                           |                           | 40 - 100                  | v <sub>f</sub> (in/min) | 2.6                | 2.6    | 2.6    | 2.6    | 2.6    | 2.6    | 2.6    | 2.6    |
|                         | E 20      | 0.30                      | 0.10                      | 70                        | n (rev/min)             | 4278               | 2139   | 1070   | 713    | 535    | 428    | 357    | 267    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                         |           |                           |                           | 40 - 100                  | v <sub>f</sub> (in/min) | 2.6                | 2.6    | 2.6    | 2.6    | 2.6    | 2.6    | 2.6    | 2.6    |
|                         | E 21      | 0.30                      | 0.10                      | 70                        | n (rev/min)             | 4278               | 2139   | 1070   | 713    | 535    | 428    | 357    | 267    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0002             | 0.0003 | 0.0006 | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0024 |
|                         |           |                           |                           | 40 - 100                  | v <sub>f</sub> (in/min) | 2.6                | 2.6    | 2.6    | 2.6    | 2.6    | 2.6    | 2.6    | 2.6    |
|                         | E 22      | 0.40                      | 0.20                      | 112                       | n (rev/min)             | 6845               | 3423   | 1711   | 1141   | 856    | 685    | 570    | 428    |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0001             | 0.0003 | 0.0006 | 0.0008 | 0.0011 | 0.0014 | 0.0017 | 0.0022 |
|                         |           |                           |                           | 52 - 172                  | v <sub>f</sub> (in/min) | 3.8                | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## C430M - START VALUES

|           |           | SLOTTING                              |                                       |                           |             |                    |       |       |       |       |       |       |       |       |       |       |       |       |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |             | Z <sub>n</sub> = 4 |       |       |       |       |       |       |       |       |       |       |       |       |
|           |           |                                       |                                       |                           |             | 1                  | 1.5   | 2     | 3     | 3.5   | 4     | 5     | 6     | 8     | 9     | 10    | 11    | 12    |
| P         | E 1 - 2   | 0.50                                  | 1.00                                  | 400                       | n (min-1)   | 38811              | 25874 | 19406 | 12937 | 11089 | 9703  | 7762  | 6469  | 4851  | 4312  | 3881  | 3528  | 3234  |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0002 | .0003 | .0004 | .0005 | .0006 | .0007 | .0009 | .0011 | .0013 | .0014 | .0016 | .0017 |
|           |           |                                       |                                       |                           | vf (in/min) | 22.0               | 22.0  | 22.0  | 22.0  | 22.0  | 22.0  | 22.0  | 22.0  | 22.0  | 22.0  | 22.0  | 22.0  | 22.0  |
|           | E 3 - 4   | 0.40                                  | 1.00                                  | 200                       | n (min-1)   | 19406              | 12937 | 9703  | 6469  | 5544  | 4851  | 3881  | 3234  | 2426  | 2156  | 1941  | 1764  | 1617  |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0001 | .0002 | .0003 | .0003 | .0003 | .0004 | .0005 | .0007 | .0008 | .0009 | .0010 | .0010 |
|           |           |                                       |                                       |                           | vf (in/min) | 6.7                | 6.7   | 6.7   | 6.7   | 6.7   | 6.7   | 6.7   | 6.7   | 6.7   | 6.7   | 6.7   | 6.7   | 6.7   |
|           | E 5 - 6   | 0.30                                  | 1.00                                  | 100                       | n (min-1)   | 9703               | 6469  | 4851  | 3234  | 2772  | 2426  | 1941  | 1617  | 1213  | 1078  | 970   | 882   | 809   |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0001 | .0001 | .0002 | .0003 | .0003 | .0004 | .0004 | .0006 | .0007 | .0007 | .0008 | .0009 |
|           |           |                                       |                                       |                           | vf (in/min) | 2.9                | 2.9   | 2.9   | 2.9   | 2.9   | 2.9   | 2.9   | 2.9   | 2.9   | 2.9   | 2.9   | 2.9   | 2.9   |
| M         | E 8 - 9   | 0.50                                  | 1.00                                  | 320                       | n (min-1)   | 31049              | 20699 | 15524 | 10350 | 8871  | 7762  | 6210  | 5175  | 3881  | 3450  | 3105  | 2823  | 2587  |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0001 | .0001 | .0002 | .0002 | .0003 | .0004 | .0004 | .0006 | .0006 | .0007 | .0008 | .0009 |
|           |           |                                       |                                       |                           | vf (in/min) | 8.8                | 8.8   | 8.8   | 8.8   | 8.8   | 8.8   | 8.8   | 8.8   | 8.8   | 8.8   | 8.8   | 8.8   | 8.8   |
|           | E 10 - 11 | 0.40                                  | 1.00                                  | 250                       | n (min-1)   | 24257              | 16171 | 12129 | 8086  | 6931  | 6064  | 4851  | 4043  | 3032  | 2695  | 2426  | 2205  | 2021  |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0001 | .0001 | .0002 | .0002 | .0003 | .0003 | .0004 | .0005 | .0006 | .0006 | .0007 | .0008 |
|           |           |                                       |                                       |                           | vf (in/min) | 6.1                | 6.1   | 6.1   | 6.1   | 6.1   | 6.1   | 6.1   | 6.1   | 6.1   | 6.1   | 6.1   | 6.1   | 6.1   |
| K         | E 12 - 13 | 0.50                                  | 1.00                                  | 270                       | n (min-1)   | 26198              | 17465 | 13099 | 8733  | 7485  | 6549  | 5240  | 4366  | 3275  | 2911  | 2620  | 2382  | 2183  |
|           |           |                                       |                                       |                           | fz (in)     | .0002              | .0003 | .0004 | .0005 | .0006 | .0007 | .0009 | .0011 | .0014 | .0016 | .0018 | .0020 | .0022 |
|           |           |                                       |                                       |                           | vf (in/min) | 19.0               | 19.0  | 19.0  | 19.0  | 19.0  | 19.0  | 19.0  | 19.0  | 19.0  | 19.0  | 19.0  | 19.0  | 19.0  |
|           | E 14 - 15 | 0.30                                  | 1.00                                  | 145                       | n (min-1)   | 14069              | 9379  | 7035  | 4690  | 4020  | 3517  | 2814  | 2345  | 1759  | 1563  | 1407  | 1279  | 1172  |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0002 | .0002 | .0003 | .0004 | .0004 | .0005 | .0006 | .0009 | .0010 | .0011 | .0012 | .0013 |
|           |           |                                       |                                       |                           | vf (in/min) | 6.0                | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   | 6.0   |
| S         | E 19      | 0.20                                  | 1.00                                  | 70                        | n (min-1)   | 6792               | 4528  | 3396  | 2264  | 1941  | 1698  | 1358  | 1132  | 849   | 755   | 679   | 617   | 566   |
|           |           |                                       |                                       |                           | fz (in)     | .0030              | .0045 | .0060 | .0090 | .0105 | .0120 | .0150 | .0180 | .0240 | .0270 | .0300 | .0330 | .0360 |
|           |           |                                       |                                       |                           | vf (in/min) | 81.5               | 81.5  | 81.5  | 81.5  | 81.5  | 81.5  | 81.5  | 81.5  | 81.5  | 81.5  | 81.5  | 81.5  | 81.5  |
|           | E 20      | 0.20                                  | 1.00                                  | 70                        | n (min-1)   | 6792               | 4528  | 3396  | 2264  | 1941  | 1698  | 1358  | 1132  | 849   | 755   | 679   | 617   | 566   |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0002 | .0002 | .0004 | .0004 | .0005 | .0006 | .0007 | .0009 | .0011 | .0012 | .0013 | .0014 |
|           |           |                                       |                                       |                           | vf (in/min) | 3.2                | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   |
|           | E 21      | 0.20                                  | 1.00                                  | 70                        | n (min-1)   | 6792               | 4528  | 3396  | 2264  | 1941  | 1698  | 1358  | 1132  | 849   | 755   | 679   | 617   | 566   |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0002 | .0002 | .0004 | .0004 | .0005 | .0006 | .0007 | .0009 | .0011 | .0012 | .0013 | .0014 |
|           |           |                                       |                                       |                           | vf (in/min) | 3.2                | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   | 3.2   |
|           | E 22      | 0.20                                  | 1.00                                  | 110                       | n (min-1)   | 10673              | 7115  | 5337  | 3558  | 3049  | 2668  | 2135  | 1779  | 1334  | 1186  | 1067  | 970   | 889   |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0002 | .0002 | .0003 | .0004 | .0004 | .0006 | .0007 | .0009 | .0010 | .0011 | .0012 | .0013 |
|           |           |                                       |                                       |                           | vf (in/min) | 4.7                | 4.7   | 4.7   | 4.7   | 4.7   | 4.7   | 4.7   | 4.7   | 4.7   | 4.7   | 4.7   | 4.7   | 4.7   |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE SOLID CARBIDE



## C430M - START VALUES

|           |           | SIDE MILLING - ROUGHING               |                                       |                           |             |                    |       |       |       |       |       |       |       |       |       |       |       |       |       |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |             | Z <sub>n</sub> = 4 |       |       |       |       |       |       |       |       |       |       |       |       |       |
|           |           |                                       |                                       |                           |             | 1                  | 1.5   | 2     | 3     | 3.5   | 4     | 5     | 6     | 8     | 9     | 10    | 11    | 12    |       |
| P         | E 1 - 2   | 1.00                                  | 0.30                                  | 400                       | n (min-1)   | 38811              | 25874 | 19406 | 12937 | 11089 | 9703  | 7762  | 6469  | 4851  | 4312  | 3881  | 3528  | 3234  |       |
|           |           |                                       |                                       |                           | fz (in)     | .0002              | .0003 | .0004 | .0005 | .0006 | .0007 | .0009 | .0011 | .0014 | .0016 | .0018 | .0019 | .0021 |       |
|           |           |                                       |                                       |                           | vf (in/min) | 27.5               | 27.5  | 27.5  | 27.5  | 27.5  | 27.5  | 27.5  | 27.5  | 27.5  | 27.5  | 27.5  | 27.5  | 27.5  | 27.5  |
|           | E 3 - 4   | 1.00                                  | 0.30                                  | 200                       | n (min-1)   | 19406              | 12937 | 9703  | 6469  | 5544  | 4851  | 3881  | 3234  | 2426  | 2156  | 1941  | 1764  | 1617  |       |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0002 | .0002 | .0003 | .0004 | .0004 | .0006 | .0007 | .0009 | .0010 | .0011 | .0012 | .0013 |       |
|           |           |                                       |                                       |                           | vf (in/min) | 8.6                | 8.6   | 8.6   | 8.6   | 8.6   | 8.6   | 8.6   | 8.6   | 8.6   | 8.6   | 8.6   | 8.6   | 8.6   | 8.6   |
|           | E 5 - 6   | 1.00                                  | 0.20                                  | 100                       | n (min-1)   | 9703               | 6469  | 4851  | 3234  | 2772  | 2426  | 1941  | 1617  | 1213  | 1078  | 970   | 882   | 809   |       |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0001 | .0002 | .0003 | .0003 | .0004 | .0005 | .0006 | .0008 | .0009 | .0009 | .0010 | .0011 |       |
|           |           |                                       |                                       |                           | vf (in/min) | 3.7                | 3.7   | 3.7   | 3.7   | 3.7   | 3.7   | 3.7   | 3.7   | 3.7   | 3.7   | 3.7   | 3.7   | 3.7   | 3.7   |
| M         | E 8 - 9   | 0.50                                  | 0.30                                  | 320                       | n (min-1)   | 31049              | 20699 | 15524 | 10350 | 8871  | 7762  | 6210  | 5175  | 3881  | 3450  | 3105  | 2823  | 2587  |       |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0001 | .0002 | .0003 | .0003 | .0003 | .0004 | .0005 | .0007 | .0008 | .0009 | .0010 | .0010 |       |
|           |           |                                       |                                       |                           | vf (in/min) | 1.8                | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   |
|           | E 10 - 11 | 0.30                                  | 0.20                                  | 250                       | n (min-1)   | 24257              | 16171 | 12129 | 8086  | 6931  | 6064  | 4851  | 4043  | 3032  | 2695  | 2426  | 2205  | 2021  |       |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0001 | .0002 | .0002 | .0003 | .0003 | .0004 | .0005 | .0006 | .0007 | .0008 | .0009 | .0009 |       |
|           |           |                                       |                                       |                           | vf (in/min) | 7.6                | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   |
| K         | E 12 - 13 | 1.00                                  | 0.50                                  | 270                       | n (min-1)   | 26198              | 17465 | 13099 | 8733  | 7485  | 6549  | 5240  | 4366  | 3275  | 2911  | 2620  | 2382  | 2183  |       |
|           |           |                                       |                                       |                           | fz (in)     | .0002              | .0003 | .0005 | .0007 | .0008 | .0009 | .0011 | .0014 | .0018 | .0021 | .0023 | .0025 | .0027 |       |
|           |           |                                       |                                       |                           | vf (in/min) | 23.9               | 23.9  | 23.9  | 23.9  | 23.9  | 23.9  | 23.9  | 23.9  | 23.9  | 23.9  | 23.9  | 23.9  | 23.9  | 23.9  |
|           | E 14 - 15 | 0.50                                  | 0.30                                  | 145                       | n (min-1)   | 14069              | 9379  | 7035  | 4690  | 4020  | 3517  | 2814  | 2345  | 1759  | 1563  | 1407  | 1279  | 1172  |       |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0002 | .0003 | .0004 | .0005 | .0005 | .0007 | .0008 | .0011 | .0012 | .0013 | .0015 | .0016 |       |
|           |           |                                       |                                       |                           | vf (in/min) | 7.5                | 7.5   | 7.5   | 7.5   | 7.5   | 7.5   | 7.5   | 7.5   | 7.5   | 7.5   | 7.5   | 7.5   | 7.5   |       |
| S         | E 19      | 0.20                                  | 0.10                                  | 120                       | n (min-1)   | 11643              | 7762  | 5822  | 3881  | 3327  | 2911  | 2329  | 1941  | 1455  | 1294  | 1164  | 1058  | 970   |       |
|           |           |                                       |                                       |                           | fz (in)     | .0024              | .0036 | .0048 | .0072 | .0084 | .0096 | .0120 | .0144 | .0192 | .0216 | .0240 | .0264 | .0288 |       |
|           |           |                                       |                                       | 90 - 150                  | vf (in/min) | 111.8              | 111.8 | 111.8 | 111.8 | 111.8 | 111.8 | 111.8 | 111.8 | 111.8 | 111.8 | 111.8 | 111.8 | 111.8 | 111.8 |
|           |           |                                       |                                       |                           | n (min-1)   | 11643              | 7762  | 5822  | 3881  | 3327  | 2911  | 2329  | 1941  | 1455  | 1294  | 1164  | 1058  | 970   |       |
|           | E 20      | 0.20                                  | 0.10                                  | 120                       | fz (in)     | .0001              | .0001 | .0002 | .0003 | .0003 | .0004 | .0005 | .0006 | .0008 | .0009 | .0009 | .0010 | .0011 |       |
|           |           |                                       |                                       |                           | vf (in/min) | 4.4                | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   |       |
|           |           |                                       |                                       | 90 - 150                  | n (min-1)   | 11643              | 7762  | 5822  | 3881  | 3327  | 2911  | 2329  | 1941  | 1455  | 1294  | 1164  | 1058  | 970   |       |
|           |           |                                       |                                       |                           | fz (in)     | .0001              | .0001 | .0002 | .0003 | .0003 | .0004 | .0005 | .0006 | .0008 | .0009 | .0009 | .0010 | .0011 |       |
|           | E 21      | 0.20                                  | 0.10                                  | 120                       | vf (in/min) | 4.4                | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   |       |       |
|           |           |                                       |                                       |                           | n (min-1)   | 7762               | 5175  | 3881  | 2587  | 2218  | 1941  | 1552  | 1294  | 970   | 862   | 776   | 706   | 647   |       |
|           |           |                                       |                                       | 90 - 150                  | fz (in)     | .0001              | .0001 | .0002 | .0003 | .0003 | .0003 | .0004 | .0005 | .0007 | .0008 | .0009 | .0010 | .0010 |       |
|           |           |                                       |                                       |                           | vf (in/min) | 2.7                | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   |       |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.



## CB430M - START VALUES

| SLOTTING    |           |                                       |                                       |                           |             |                    |        |        |        |        |        |        |        |        |  |
|-------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--|
| ISO GROUP   | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | V <sub>c</sub> (sf / min) |             | Z <sub>n</sub> = 4 |        |        |        |        |        |        |        |        |  |
|             |           |                                       |                                       |                           |             | 1                  | 2      | 3      | 4      | 5      | 6      | 8      | 10     | 12     |  |
| P           | E 1 - 2   | 0.50                                  | 1.00                                  | 320                       | n (min-1)   | 31049              | 15524  | 10350  | 7762   | 6210   | 5175   | 3881   | 3105   | 2587   |  |
|             |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0003 | 0.0004 | 0.0006 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0017 |  |
|             |           |                                       |                                       |                           | vf (in/min) | 17.6               | 17.6   | 17.6   | 17.6   | 17.6   | 17.6   | 17.6   | 17.6   | 17.6   |  |
|             | E 3 - 4   | 0.40                                  | 1.00                                  | 160                       | n (min-1)   | 15524              | 7762   | 5175   | 3881   | 3105   | 2587   | 1941   | 1552   | 1294   |  |
|             |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0002 | 0.0003 | 0.0003 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0010 |  |
|             |           |                                       |                                       |                           | vf (in/min) | 5.4                | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    | 5.4    |  |
|             | E 5 - 6   | 0.30                                  | 1.00                                  | 80                        | n (min-1)   | 7762               | 3881   | 2587   | 1941   | 1552   | 1294   | 970    | 776    | 647    |  |
|             |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0001 | 0.0002 | 0.0003 | 0.0004 | 0.0004 | 0.0006 | 0.0007 | 0.0009 |  |
|             |           |                                       |                                       |                           | vf (in/min) | 2.3                | 2.3    | 2.3    | 2.3    | 2.3    | 2.3    | 2.3    | 2.3    | 2.3    |  |
| M           | E 8 - 9   | 0.50                                  | 1.00                                  | 255                       | n (min-1)   | 24742              | 12371  | 8247   | 6186   | 4948   | 4124   | 3093   | 2474   | 2062   |  |
|             |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0001 | 0.0002 | 0.0003 | 0.0004 | 0.0004 | 0.0006 | 0.0007 | 0.0009 |  |
|             |           |                                       |                                       |                           | vf (in/min) | 7.0                | 7.0    | 7.0    | 7.0    | 7.0    | 7.0    | 7.0    | 7.0    | 7.0    |  |
|             | E 10 - 11 | 0.40                                  | 1.00                                  | 200                       | n (min-1)   | 19406              | 9703   | 6469   | 4851   | 3881   | 3234   | 2426   | 1941   | 1617   |  |
|             |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0001 | 0.0002 | 0.0003 | 0.0003 | 0.0004 | 0.0005 | 0.0006 | 0.0008 |  |
|             |           |                                       |                                       |                           | vf (in/min) | 4.9                | 4.9    | 4.9    | 4.9    | 4.9    | 4.9    | 4.9    | 4.9    | 4.9    |  |
| K           | E 12 - 13 | 0.50                                  | 1.00                                  | 215                       | n (min-1)   | 20861              | 10431  | 6954   | 5215   | 4172   | 3477   | 2608   | 2086   | 1738   |  |
|             |           |                                       |                                       |                           | fz (in)     | 0.0002             | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0022 |  |
|             |           |                                       |                                       |                           | vf (in/min) | 15.1               | 15.1   | 15.1   | 15.1   | 15.1   | 15.1   | 15.1   | 15.1   | 15.1   |  |
|             | E 14 - 15 | 0.30                                  | 1.00                                  | 115                       | n (min-1)   | 11158              | 5579   | 3719   | 2790   | 2232   | 1860   | 1395   | 1116   | 930    |  |
|             |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0002 | 0.0003 | 0.0004 | 0.0005 | 0.0006 | 0.0009 | 0.0011 | 0.0013 |  |
|             |           |                                       |                                       |                           | vf (in/min) | 4.7                | 4.7    | 4.7    | 4.7    | 4.7    | 4.7    | 4.7    | 4.7    | 4.7    |  |
| S           | E 19      | 0.10                                  | 1.00                                  | 70                        | n (min-1)   | 6792               | 3396   | 2264   | 1698   | 1358   | 1132   | 849    | 679    | 566    |  |
|             |           |                                       |                                       |                           | fz (in)     | 0.0030             | 0.0060 | 0.0090 | 0.0120 | 0.0150 | 0.0180 | 0.0240 | 0.0300 | 0.0360 |  |
|             |           |                                       |                                       |                           | vf (in/min) | 81.5               | 81.5   | 81.5   | 81.5   | 81.5   | 81.5   | 81.5   | 81.5   | 81.5   |  |
|             | E 20      | 0.10                                  | 1.00                                  | 70                        | n (min-1)   | 6792               | 3396   | 2264   | 1698   | 1358   | 1132   | 849    | 679    | 566    |  |
|             |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0006 | 0.0007 | 0.0009 | 0.0012 | 0.0014 |  |
|             |           |                                       |                                       |                           | vf (in/min) | 3.2                | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    |  |
|             | E 21      | 0.10                                  | 1.00                                  | 70                        | n (min-1)   | 6792               | 3396   | 2264   | 1698   | 1358   | 1132   | 849    | 679    | 566    |  |
|             |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0002 | 0.0004 | 0.0005 | 0.0006 | 0.0007 | 0.0009 | 0.0012 | 0.0014 |  |
|             |           |                                       |                                       |                           | vf (in/min) | 3.2                | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    | 3.2    |  |
|             | E 22      | 0.20                                  | 1.00                                  | 110                       | n (min-1)   | 10673              | 5337   | 3558   | 2668   | 2135   | 1779   | 1334   | 1067   | 889    |  |
| fz (in)     |           |                                       |                                       |                           | 0.0001      | 0.0002             | 0.0003 | 0.0004 | 0.0006 | 0.0007 | 0.0009 | 0.0011 | 0.0013 |        |  |
| vf (in/min) |           |                                       |                                       |                           | 4.7         | 4.7                | 4.7    | 4.7    | 4.7    | 4.7    | 4.7    | 4.7    | 4.7    |        |  |

SMG = Seco Material Group  
 n [min-1] = RPM  
 V<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE SOLID CARBIDE

## CB430M - START VALUES

| SIDE MILLING - ROUGHING |           |                                       |                                       |                           |             |                    |        |        |        |        |        |        |        |        |      |
|-------------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| ISO GROUP               | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |             | Z <sub>n</sub> = 4 |        |        |        |        |        |        |        |        |      |
|                         |           |                                       |                                       |                           |             | 1                  | 2      | 3      | 4      | 5      | 6      | 8      | 10     | 12     |      |
| P                       | E 1 - 2   | 1.00                                  | 0.30                                  | 320                       | n (min-1)   | 31049              | 15524  | 10350  | 7762   | 6210   | 5175   | 3881   | 3105   | 2587   |      |
|                         |           |                                       |                                       |                           | fz (in)     | 0.0002             | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021 |      |
|                         |           |                                       |                                       |                           | vf (in/min) | 22.0               | 22.0   | 22.0   | 22.0   | 22.0   | 22.0   | 22.0   | 22.0   | 22.0   | 22.0 |
|                         | E 3 - 4   | 1.00                                  | 0.30                                  | 160                       | n (min-1)   | 15524              | 7762   | 5175   | 3881   | 3105   | 2587   | 1941   | 1552   | 1294   |      |
|                         |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0002 | 0.0003 | 0.0004 | 0.0006 | 0.0007 | 0.0009 | 0.0011 | 0.0013 |      |
|                         |           |                                       |                                       |                           | vf (in/min) | 6.8                | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    | 6.8    | 6.8  |
|                         | E 5 - 6   | 1.00                                  | 0.20                                  | 80                        | n (min-1)   | 7762               | 3881   | 2587   | 1941   | 1552   | 1294   | 970    | 776    | 647    |      |
|                         |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0002 | 0.0003 | 0.0004 | 0.0005 | 0.0006 | 0.0008 | 0.0009 | 0.0011 |      |
|                         |           |                                       |                                       |                           | vf (in/min) | 2.9                | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    | 2.9    | 2.9  |
| M                       | E 8 - 9   | 0.50                                  | 0.30                                  | 255                       | n (min-1)   | 24742              | 12371  | 8247   | 6186   | 4948   | 4124   | 3093   | 2474   | 2062   |      |
|                         |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0002 | 0.0003 | 0.0003 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0010 |      |
|                         |           |                                       |                                       |                           | vf (in/min) | 8.6                | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    | 8.6    |      |
|                         | E 10 - 11 | 0.30                                  | 0.20                                  | 200                       | n (min-1)   | 19406              | 9703   | 6469   | 4851   | 3881   | 3234   | 2426   | 1941   | 1617   |      |
|                         |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0002 | 0.0002 | 0.0003 | 0.0004 | 0.0005 | 0.0006 | 0.0008 | 0.0009 |      |
|                         |           |                                       |                                       |                           | vf (in/min) | 6.1                | 6.1    | 6.1    | 6.1    | 6.1    | 6.1    | 6.1    | 6.1    | 6.1    |      |
| K                       | E 12 - 13 | 1.00                                  | 0.50                                  | 215                       | n (min-1)   | 20861              | 10431  | 6954   | 5215   | 4172   | 3477   | 2608   | 2086   | 1738   |      |
|                         |           |                                       |                                       |                           | fz (in)     | 0.0002             | 0.0005 | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0023 | 0.0027 |      |
|                         |           |                                       |                                       |                           | vf (in/min) | 19.1               | 19.1   | 19.1   | 19.1   | 19.1   | 19.1   | 19.1   | 19.1   | 19.1   |      |
|                         | E 14 - 15 | 0.50                                  | 0.30                                  | 115                       | n (min-1)   | 11158              | 5579   | 3719   | 2790   | 2232   | 1860   | 1395   | 1116   | 930    |      |
|                         |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0003 | 0.0004 | 0.0005 | 0.0007 | 0.0008 | 0.0011 | 0.0013 | 0.0016 |      |
|                         |           |                                       |                                       |                           | vf (in/min) | 6.0                | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    |      |
| S                       | E 19      | 0.30                                  | 0.10                                  | 70                        | n (min-1)   | 6792               | 3396   | 2264   | 1698   | 1358   | 1132   | 849    | 679    | 566    |      |
|                         |           |                                       |                                       |                           | fz (in)     | 0.0024             | 0.0048 | 0.0072 | 0.0096 | 0.0120 | 0.0144 | 0.0192 | 0.0240 | 0.0288 |      |
|                         | E 20      | 0.30                                  | 0.10                                  | 70                        | n (min-1)   | 6792               | 3396   | 2264   | 1698   | 1358   | 1132   | 849    | 679    | 566    |      |
|                         |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0002 | 0.0003 | 0.0004 | 0.0005 | 0.0006 | 0.0008 | 0.0009 | 0.0011 |      |
|                         | E 21      | 0.30                                  | 0.10                                  | 70                        | n (min-1)   | 6792               | 3396   | 2264   | 1698   | 1358   | 1132   | 849    | 679    | 566    |      |
|                         |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0002 | 0.0003 | 0.0004 | 0.0005 | 0.0006 | 0.0008 | 0.0009 | 0.0011 |      |
|                         | E 22      | 0.40                                  | 0.20                                  | 110                       | n (min-1)   | 10673              | 5337   | 3558   | 2668   | 2135   | 1779   | 1334   | 1067   | 889    |      |
|                         |           |                                       |                                       |                           | fz (in)     | 0.0001             | 0.0002 | 0.0003 | 0.0003 | 0.0004 | 0.0005 | 0.0007 | 0.0009 | 0.0010 |      |
|                         |           |                                       |                                       |                           | 50          | vf (in/min)        | 3.7    | 3.7    | 3.7    | 3.7    | 3.7    | 3.7    | 3.7    | 3.7    |      |

SMG = Seco Material Group  
n [min-1] = RPM  
v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
a<sub>p</sub>/D<sub>c</sub> = % of diameter

vf [in/min] = Feed rate  
a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
All cutting data are start values. All cutting data is in inch values.  
Please reference the Workpiece Material Classification chart located on page 15.

## CM260

SOLID CARBIDE



CENTER CUTTING



- Cylindrical Shank
- General Purpose
- Cutting Data - Page 243-244
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | CHAMFER |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|---------|---------|
| <a href="#">N76590</a> | CM260-0.250-D1-C.0-Z2 | 1/4       | 1/4       | 3/16          | 2-1/2          | 2      | TIALN   | 60°     |
| <a href="#">N76591</a> | CM260-0.375-D1-C.0-Z2 | 3/8       | 3/8       | 5/16          | 2-1/2          | 2      | TIALN   | 60°     |
| <a href="#">N76592</a> | CM260-0.500-D1-C.0-Z2 | 1/2       | 1/2       | 7/16          | 3              | 2      | TIALN   | 60°     |

## CM290

SOLID CARBIDE



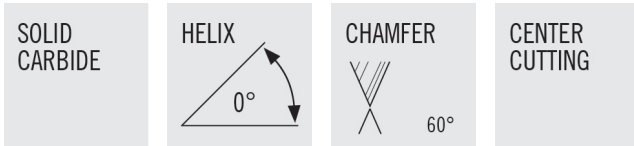
CENTER CUTTING



- Cylindrical Shank
- General Purpose
- Cutting Data - Page 243-244
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | CHAMFER |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|---------|---------|
| <a href="#">N76593</a> | CM290-0.250-D1-C.0-Z2 | 1/4       | 1/4       | 1/8           | 2-1/2          | 2      | TIALN   | 90°     |
| <a href="#">N76594</a> | CM290-0.375-D1-C.0-Z2 | 3/8       | 3/8       | 3/16          | 2-1/2          | 2      | TIALN   | 90°     |
| <a href="#">N76595</a> | CM290-0.500-D1-C.0-Z2 | 1/2       | 1/2       | 1/4           | 3              | 2      | TIALN   | 90°     |

## CM460

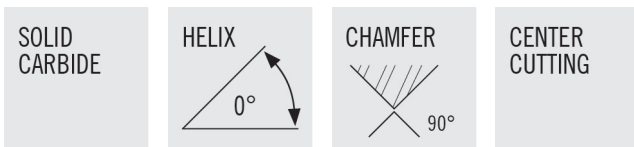


- Cylindrical Shank
- General Purpose

- Cutting Data - Page 245-246
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | CHAMFER |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|---------|---------|
| <a href="#">N76596</a> | CM460-0.250-D1-C.0-Z4 | 1/4       | 1/4       | 3/16          | 2-1/2          | 4      | TIALN   | 60°     |
| <a href="#">N76597</a> | CM460-0.375-D1-C.0-Z4 | 3/8       | 3/8       | 5/16          | 2-1/2          | 4      | TIALN   | 60°     |
| <a href="#">N76598</a> | CM460-0.500-D1-C.0-Z4 | 1/2       | 1/2       | 7/16          | 3              | 4      | TIALN   | 60°     |
| <a href="#">N76599</a> | CM460-0.750-D1-C.0-Z4 | 3/4       | 3/4       | 5/8           | 3              | 4      | TIALN   | 60°     |

## CM490



- Cylindrical Shank
- General Purpose

- Cutting Data - Page 245-246
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | CHAMFER |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|---------|---------|
| <a href="#">N76600</a> | CM490-0.250-D1-C.0-Z4 | 1/4       | 1/4       | 1/8           | 2-1/2          | 4      | TIALN   | 90°     |
| <a href="#">N76601</a> | CM490-0.375-D1-C.0-Z4 | 3/8       | 3/8       | 3/16          | 2-1/2          | 4      | TIALN   | 90°     |
| <a href="#">N76602</a> | CM490-0.500-D1-C.0-Z4 | 1/2       | 1/2       | 1/4           | 3              | 4      | TIALN   | 90°     |
| <a href="#">N76603</a> | CM490-0.750-D1-C.0-Z4 | 3/4       | 3/4       | 3/8           | 3              | 4      | TIALN   | 90°     |

## CM260 / CM290 - START VALUES

| SLOTTING  |                               |                                       |                                       |                           |   |     |                         |         |         |         |         |         |
|-----------|-------------------------------|---------------------------------------|---------------------------------------|---------------------------|---|-----|-------------------------|---------|---------|---------|---------|---------|
| ISO GROUP | SMG                           | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |   |     | Z <sub>n</sub> = 2      |         |         |         |         |         |
|           |                               |                                       |                                       |                           |   |     | 1/4                     | 3/8     | 1/2     | 5/8     | 3/4     |         |
| P         | E<br>1 - 2                    | 0.30                                  | 1.00                                  | 400                       | - | 460 | n (rev/min)             | 6112    | 4075    | 3056    | 2445    | 2037    |
|           |                               |                                       |                                       |                           |   |     | f <sub>z</sub> (in)     | 0.00050 | 0.00075 | 0.00100 | 0.00125 | 0.00150 |
|           |                               |                                       |                                       | 340                       | - | 460 | v <sub>f</sub> (in/min) | 6.1     | 6.1     | 6.1     | 6.1     | 6.1     |
|           | E<br>3 - 4                    | 0.20                                  | 1.00                                  | 200                       | - | 260 | n (rev/min)             | 3056    | 2037    | 1528    | 1222    | 1019    |
|           |                               |                                       |                                       |                           |   |     | f <sub>z</sub> (in)     | 0.00028 | 0.00042 | 0.00056 | 0.00070 | 0.00084 |
|           |                               |                                       |                                       | 140                       | - | 260 | v <sub>f</sub> (in/min) | 1.7     | 1.7     | 1.7     | 1.7     | 1.7     |
|           | E<br>5 - 6                    | 0.20                                  | 1.00                                  | 100                       | - | 160 | n (rev/min)             | 1528    | 1019    | 764     | 611     | 509     |
|           |                               |                                       |                                       |                           |   |     | f <sub>z</sub> (in)     | 0.00240 | 0.00360 | 0.00480 | 0.00600 | 0.00720 |
|           |                               |                                       |                                       | 40                        | - | 160 | v <sub>f</sub> (in/min) | 7.3     | 7.3     | 7.3     | 7.3     | 7.3     |
| H         | M / A / D<br>7a<br>(48-52HRc) | 0.20                                  | 1.00                                  | 70                        | - | 85  | n (rev/min)             | 1070    | 713     | 535     | 428     | 357     |
|           |                               |                                       |                                       |                           |   |     | f <sub>z</sub> (in)     | 0.00016 | 0.00024 | 0.00032 | 0.00040 | 0.00048 |
|           |                               |                                       |                                       | 55                        | - | 85  | v <sub>f</sub> (in/min) | 0.3     | 0.3     | 0.3     | 0.3     | 0.3     |
| M         | E<br>8 - 9                    | 0.50                                  | 1.00                                  | 320                       | - | 350 | n (rev/min)             | 4890    | 3260    | 2445    | 1956    | 1630    |
|           |                               |                                       |                                       |                           |   |     | f <sub>z</sub> (in)     | 0.00024 | 0.00036 | 0.00048 | 0.00060 | 0.00072 |
|           |                               |                                       |                                       | 290                       | - | 350 | v <sub>f</sub> (in/min) | 2.3     | 2.3     | 2.3     | 2.3     | 2.3     |
|           | E<br>10 - 11                  | 0.30                                  | 1.00                                  | 250                       | - | 280 | n (rev/min)             | 3820    | 2547    | 1910    | 1528    | 1273    |
|           |                               |                                       |                                       |                           |   |     | f <sub>z</sub> (in)     | 0.00020 | 0.00030 | 0.00040 | 0.00050 | 0.00060 |
|           |                               |                                       |                                       | 220                       | - | 280 | v <sub>f</sub> (in/min) | 1.5     | 1.5     | 1.5     | 1.5     | 1.5     |
| K         | E<br>12 - 13                  | 0.30                                  | 1.00                                  | 270                       | - | 330 | n (rev/min)             | 4126    | 2750    | 2063    | 1650    | 1375    |
|           |                               |                                       |                                       |                           |   |     | f <sub>z</sub> (in)     | 0.00058 | 0.00087 | 0.00116 | 0.00145 | 0.00174 |
|           |                               |                                       |                                       | 210                       | - | 330 | v <sub>f</sub> (in/min) | 4.8     | 4.8     | 4.8     | 4.8     | 4.8     |
|           | E<br>14 - 15                  | 0.20                                  | 1.00                                  | 145                       | - | 205 | n (rev/min)             | 2216    | 1477    | 1108    | 886     | 739     |
|           |                               |                                       |                                       |                           |   |     | f <sub>z</sub> (in)     | 0.00034 | 0.00051 | 0.00068 | 0.00085 | 0.00102 |
|           |                               |                                       |                                       | 85                        | - | 205 | v <sub>f</sub> (in/min) | 1.5     | 1.5     | 1.5     | 1.5     | 1.5     |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## CM260 / CM290 - START VALUES

| SIDE MILLING - ROUGHING |                               |  |  |                              |     |                    |                     |         |         |         |         |         |
|-------------------------|-------------------------------|--|--|------------------------------|-----|--------------------|---------------------|---------|---------|---------|---------|---------|
| ISO GROUP               | SMG                           | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |     | Z <sub>n</sub> = 2 |                     |         |         |         |         |         |
|                         |                               |  |  |                              |     | 1/4                | 3/8                 | 1/2     | 5/8     | 3/4     |         |         |
| P                       | E<br>1 - 2                    | 1.00                                     | 0.50                                     | 400                          | -   | 460                | n (rev/min)         | 6112    | 4075    | 3056    | 2445    | 2037    |
|                         |                               |  |  |                              |     |                    | f <sub>z</sub> (in) | 0.00063 | 0.00094 | 0.00125 | 0.00156 | 0.00188 |
|                         |                               |  |  | v <sub>f</sub> (in/min)      | 7.6 | 7.6                | 7.6                 | 7.6     | 7.6     |         |         |         |
|                         | E<br>3 - 4                    | 1.00                                     | 0.50                                     | 200                          | -   | 260                | n (rev/min)         | 3056    | 2037    | 1528    | 1222    | 1019    |
|                         |                               |  |  |                              |     |                    | f <sub>z</sub> (in) | 0.00035 | 0.00053 | 0.00070 | 0.00088 | 0.00105 |
|                         |                               |  |  | v <sub>f</sub> (in/min)      | 2.1 | 2.1                | 2.1                 | 2.1     | 2.1     |         |         |         |
|                         | E<br>5 - 6                    | 1.00                                     | 0.50                                     | 100                          | -   | 160                | n (rev/min)         | 1528    | 1019    | 764     | 611     | 509     |
|                         |                               |  |  |                              |     |                    | f <sub>z</sub> (in) | 0.00030 | 0.00045 | 0.00060 | 0.00075 | 0.00090 |
|                         |                               |  |  | v <sub>f</sub> (in/min)      | 0.9 | 0.9                | 0.9                 | 0.9     | 0.9     |         |         |         |
| H                       | M / A / D<br>7a<br>(48-52HRc) | 0.30                                     | 0.20                                     | 70                           | -   | 85                 | n (rev/min)         | 1070    | 713     | 535     | 428     | 357     |
|                         |                               |  |  |                              |     |                    | f <sub>z</sub> (in) | 0.00020 | 0.00030 | 0.00040 | 0.00050 | 0.00060 |
|                         |                               |  |  | v <sub>f</sub> (in/min)      | 0.4 | 0.4                | 0.4                 | 0.4     | 0.4     |         |         |         |
| M                       | E<br>8 - 9                    | 1.00                                     | 0.50                                     | 320                          | -   | 350                | n (rev/min)         | 4890    | 3260    | 2445    | 1956    | 1630    |
|                         |                               |  |  |                              |     |                    | f <sub>z</sub> (in) | 0.00030 | 0.00045 | 0.00060 | 0.00075 | 0.00090 |
|                         |                               |  |  | v <sub>f</sub> (in/min)      | 2.9 | 2.9                | 2.9                 | 2.9     | 2.9     |         |         |         |
|                         | E<br>10 - 11                  | 1.00                                     | 0.50                                     | 250                          | -   | 280                | n (rev/min)         | 3820    | 2547    | 1910    | 1528    | 1273    |
|                         |                               |  |  |                              |     |                    | f <sub>z</sub> (in) | 0.00025 | 0.00038 | 0.00050 | 0.00063 | 0.00075 |
|                         |                               |  |  | v <sub>f</sub> (in/min)      | 1.9 | 1.9                | 1.9                 | 1.9     | 1.9     |         |         |         |
| K                       | E<br>12 - 13                  | 1.00                                     | 0.50                                     | 270                          | -   | 330                | n (rev/min)         | 4126    | 2750    | 2063    | 1650    | 1375    |
|                         |                               |  |  |                              |     |                    | f <sub>z</sub> (in) | 0.00073 | 0.00109 | 0.00145 | 0.00181 | 0.00218 |
|                         |                               |  |  | v <sub>f</sub> (in/min)      | 6.0 | 6.0                | 6.0                 | 6.0     | 6.0     |         |         |         |
|                         | E<br>14 - 15                  | 1.00                                     | 0.50                                     | 145                          | -   | 205                | n (rev/min)         | 2216    | 1477    | 1108    | 886     | 739     |
|                         |                               |  |  |                              |     |                    | f <sub>z</sub> (in) | 0.00043 | 0.00064 | 0.00085 | 0.00106 | 0.00128 |
|                         |                               |  |  | v <sub>f</sub> (in/min)      | 1.9 | 1.9                | 1.9                 | 1.9     | 1.9     |         |         |         |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## CM460 / CM490 - START VALUES

| SLOTTING  |                               |                                       |                                       |                           |      |      |                     |         |         |         |         |         |
|-----------|-------------------------------|---------------------------------------|---------------------------------------|---------------------------|------|------|---------------------|---------|---------|---------|---------|---------|
| ISO GROUP | SMG                           | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |      |      | Z <sub>n</sub> = 4  |         |         |         |         |         |
|           |                               |                                       |                                       |                           |      |      | 1/4                 | 3/8     | 1/2     | 5/8     | 3/4     |         |
| P         | E 1 - 2                       | 0.30                                  | 1.00                                  | 400                       | -    | 460  | n (rev/min)         | 6112    | 4075    | 3056    | 2445    | 2037    |
|           |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00050 | 0.00075 | 0.00100 | 0.00125 | 0.00150 |
|           |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 12.2 | 12.2 | 12.2                | 12.2    | 12.2    |         |         |         |
|           | E 3 - 4                       | 0.20                                  | 1.00                                  | 200                       | -    | 260  | n (rev/min)         | 3056    | 2037    | 1528    | 1222    | 1019    |
|           |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00028 | 0.00042 | 0.00056 | 0.00070 | 0.00084 |
|           |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 3.4  | 3.4  | 3.4                 | 3.4     | 3.4     |         |         |         |
|           | E 5 - 6                       | 0.20                                  | 1.00                                  | 100                       | -    | 160  | n (rev/min)         | 1528    | 1019    | 764     | 611     | 509     |
|           |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00240 | 0.00360 | 0.00480 | 0.00600 | 0.00720 |
|           |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 14.7 | 14.7 | 14.7                | 14.7    | 14.7    |         |         |         |
| H         | M / A / D<br>7a<br>(48-52HRc) | 0.20                                  | 1.00                                  | 70                        | -    | 85   | n (rev/min)         | 1070    | 713     | 535     | 428     | 357     |
|           |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00016 | 0.00024 | 0.00032 | 0.00040 | 0.00048 |
|           |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 0.7  | 0.7  | 0.7                 | 0.7     | 0.7     |         |         |         |
| M         | E 8 - 9                       | 0.50                                  | 1.00                                  | 320                       | -    | 350  | n (rev/min)         | 4890    | 3260    | 2445    | 1956    | 1630    |
|           |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00024 | 0.00036 | 0.00048 | 0.00060 | 0.00072 |
|           |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 4.7  | 4.7  | 4.7                 | 4.7     | 4.7     |         |         |         |
|           | E 10 - 11                     | 0.30                                  | 1.00                                  | 250                       | -    | 280  | n (rev/min)         | 3820    | 2547    | 1910    | 1528    | 1273    |
|           |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00020 | 0.00030 | 0.00040 | 0.00050 | 0.00060 |
|           |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 3.1  | 3.1  | 3.1                 | 3.1     | 3.1     |         |         |         |
| K         | E 12 - 13                     | 0.30                                  | 1.00                                  | 270                       | -    | 330  | n (rev/min)         | 4126    | 2750    | 2063    | 1650    | 1375    |
|           |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00058 | 0.00087 | 0.00116 | 0.00145 | 0.00174 |
|           |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 9.6  | 9.6  | 9.6                 | 9.6     | 9.6     |         |         |         |
|           | E 14 - 15                     | 0.20                                  | 1.00                                  | 145                       | -    | 205  | n (rev/min)         | 2216    | 1477    | 1108    | 886     | 739     |
|           |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00034 | 0.00051 | 0.00068 | 0.00085 | 0.00102 |
|           |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 3.0  | 3.0  | 3.0                 | 3.0     | 3.0     |         |         |         |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## CM460 / CM490 - START VALUES

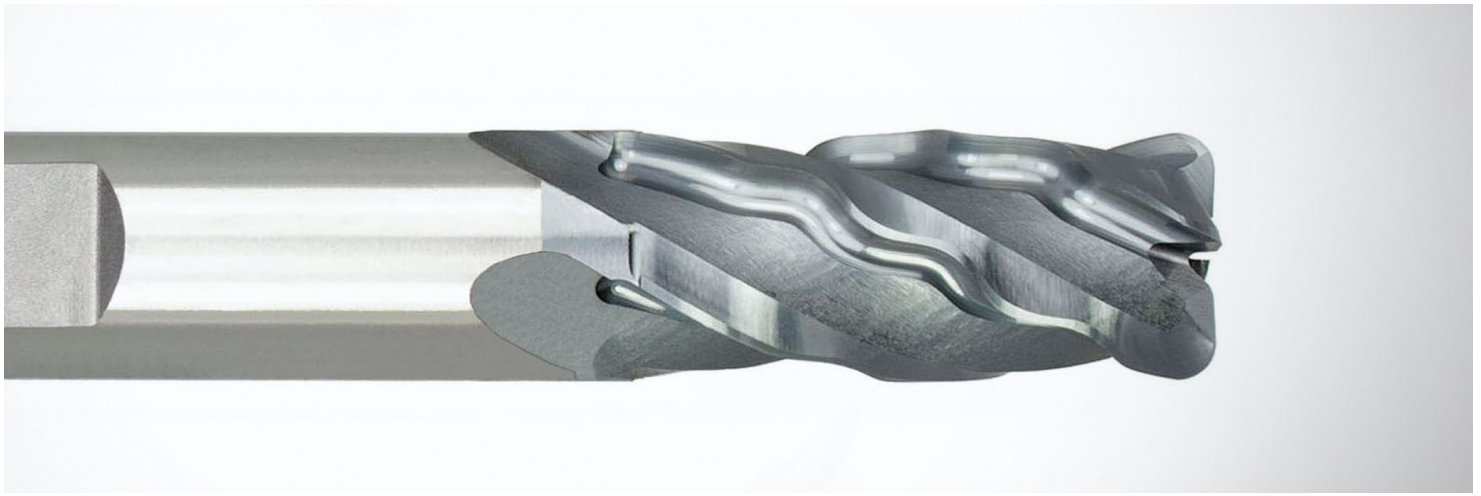
| SIDE MILLING - ROUGHING |                               |                                       |                                       |                           |      |      |                     |         |         |         |         |         |
|-------------------------|-------------------------------|---------------------------------------|---------------------------------------|---------------------------|------|------|---------------------|---------|---------|---------|---------|---------|
| ISO GROUP               | SMG                           | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |      |      | Z <sub>n</sub> = 4  |         |         |         |         |         |
|                         |                               |                                       |                                       |                           |      |      | 1/4                 | 3/8     | 1/2     | 5/8     | 3/4     |         |
| P                       | E<br>1 - 2                    | 1.00                                  | 0.50                                  | 400                       | -    | 460  | n (rev/min)         | 6112    | 4075    | 3056    | 2445    | 2037    |
|                         |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00063 | 0.00094 | 0.00125 | 0.00156 | 0.00188 |
|                         |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 15.3 | 15.3 | 15.3                | 15.3    | 15.3    |         |         |         |
|                         | E<br>3 - 4                    | 1.00                                  | 0.50                                  | 200                       | -    | 260  | n (rev/min)         | 3056    | 2037    | 1528    | 1222    | 1019    |
|                         |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00035 | 0.00053 | 0.00070 | 0.00088 | 0.00105 |
|                         |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 4.3  | 4.3  | 4.3                 | 4.3     | 4.3     |         |         |         |
|                         | E<br>5 - 6                    | 1.00                                  | 0.50                                  | 100                       | -    | 160  | n (rev/min)         | 1528    | 1019    | 764     | 611     | 509     |
|                         |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00030 | 0.00045 | 0.00060 | 0.00075 | 0.00090 |
|                         |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 1.8  | 1.8  | 1.8                 | 1.8     | 1.8     |         |         |         |
| H                       | M / A / D<br>7a<br>(48-52HRc) | 0.30                                  | 0.20                                  | 70                        | -    | 85   | n (rev/min)         | 1070    | 713     | 535     | 428     | 357     |
|                         |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00020 | 0.00030 | 0.00040 | 0.00050 | 0.00060 |
|                         |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 0.9  | 0.9  | 0.9                 | 0.9     | 0.9     |         |         |         |
| M                       | E<br>8 - 9                    | 1.00                                  | 0.50                                  | 320                       | -    | 350  | n (rev/min)         | 4890    | 3260    | 2445    | 1956    | 1630    |
|                         |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00030 | 0.00045 | 0.00060 | 0.00075 | 0.00090 |
|                         |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 5.9  | 5.9  | 5.9                 | 5.9     | 5.9     |         |         |         |
|                         | E<br>10 - 11                  | 1.00                                  | 0.50                                  | 250                       | -    | 280  | n (rev/min)         | 3820    | 2547    | 1910    | 1528    | 1273    |
|                         |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00025 | 0.00038 | 0.00050 | 0.00063 | 0.00075 |
|                         |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 3.8  | 3.8  | 3.8                 | 3.8     | 3.8     |         |         |         |
| K                       | E<br>12 - 13                  | 1.00                                  | 0.50                                  | 270                       | -    | 330  | n (rev/min)         | 4126    | 2750    | 2063    | 1650    | 1375    |
|                         |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00073 | 0.00109 | 0.00145 | 0.00181 | 0.00218 |
|                         |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 12.0 | 12.0 | 12.0                | 12.0    | 12.0    |         |         |         |
|                         | E<br>14 - 15                  | 1.00                                  | 0.50                                  | 145                       | -    | 205  | n (rev/min)         | 2216    | 1477    | 1108    | 886     | 739     |
|                         |                               |                                       |                                       |                           |      |      | f <sub>z</sub> (in) | 0.00043 | 0.00064 | 0.00085 | 0.00106 | 0.00128 |
|                         |                               |                                       |                                       | v <sub>f</sub> (in/min)   | 3.8  | 3.8  | 3.8                 | 3.8     | 3.8     |         |         |         |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.





# SHEAR MORE METAL

## VFP

The VFP (Variable Face Profile) product family has been specifically engineered for milling titanium. The variable helix and polished rake face provide increased material shearing capability, yielding excellent chip formation and evacuation. The VFP's unique geometry and superior cutting edge result in reduced heat generation and excellent workpiece surface finish. While this product family is specifically designed for application in titanium we also recommend using it for similar applications in ISO-M materials.

The new aero radii additions add commonly produced specials to this product family and also come standard with AlCrN coating.

### YOUR BENEFITS

- AlCrN coating for heat and abrasion resistance
- Extended tool life
- Increased metal shearing
- Improved surface finish
- Polished rake face
- Weldon flat standard
- M42 Cobalt
- Reduced horsepower requirements compared to standard end mills

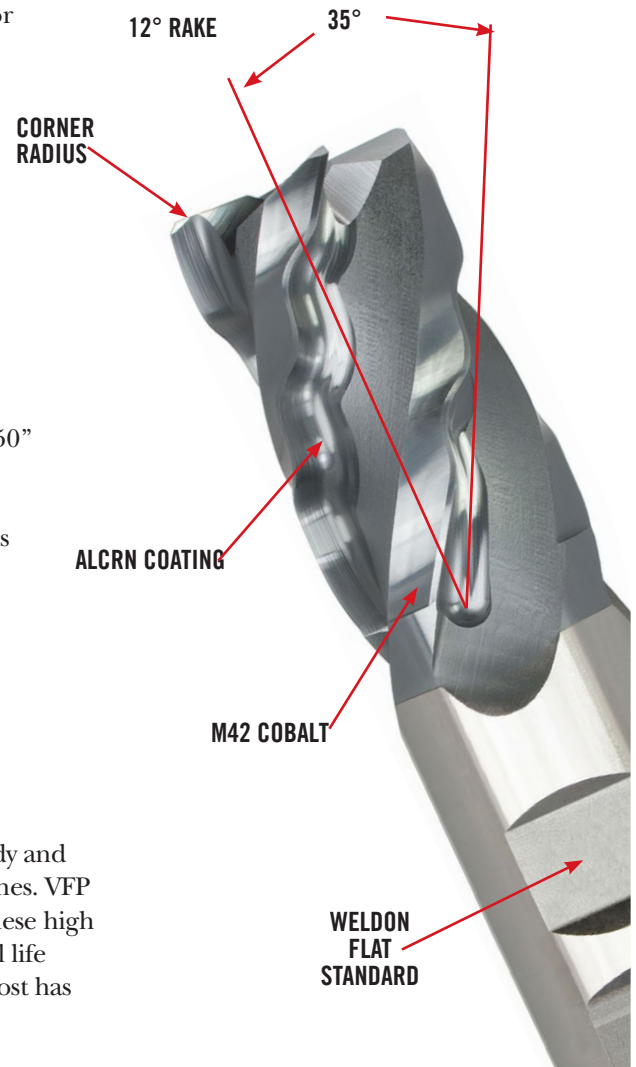
### RANGE OVERVIEW

- Chamfer and standard 0.120", 0.156" and 0.250" corner radii
- 4- and 6-flutes
- 1.125" and 2" diameters
- Variable helix

### INDUSTRY APPLICATIONS

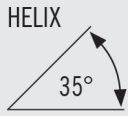
- **Aerospace:** Many large titanium aerospace components, such as side-a-body and wing spars are produced on large triple-spindle gantry-style milling machines. VFP style cutters, designed for taking large depths of cut, are a perfect fit for these high horsepower machines. The new VFP coated series offer an increase in tool life of over 50% when compared to an uncoated end mill. Reducing tooling cost has never been easier when machining large titanium aerospace components.

| MATERIAL GROUPS |
|-----------------|
| Stainless 8-11  |
| Titanium 22     |



## VFP435 / VFP635

M42  
8% COBALT



CENTER  
CUTTING



- Optimal chip formation and evacuation
- Polished rake face
- Weldon flat standard
- Up to .156" Corner Radius through modification
- Designed for stainless steel and titanium
- Cutting Data - Page 300
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|---------|
| <a href="#">N68948</a> | VFP435-0.750-D2-C030.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | 0.030   |
| <a href="#">N68949</a> | VFP435-0.750-D3-C030.3-Z4 | 3/4       | 3/4       | 2-1/4         | 4-1/2          | 4      | 0.030   |
| <a href="#">N68950</a> | VFP435-0.750-D4-C030.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | 0.030   |
| <a href="#">N68952</a> | VFP435-1.000-D2-C030.3-Z4 | 1         | 1         | 2             | 4-1/2          | 4      | 0.030   |
| <a href="#">N68953</a> | VFP635-1.000-D2-C030.3-Z6 | 1         | 1         | 2             | 4-1/2          | 6      | 0.030   |
| <a href="#">N68954</a> | VFP435-1.000-D3-C030.3-Z4 | 1         | 1         | 3             | 5-1/2          | 4      | 0.030   |
| <a href="#">N68955</a> | VFP635-1.000-D3-C030.3-Z6 | 1         | 1         | 3             | 5-1/2          | 6      | 0.030   |
| <a href="#">N68956</a> | VFP435-1.000-D4-C030.3-Z4 | 1         | 1         | 4             | 6-1/2          | 4      | 0.030   |
| <a href="#">N68957</a> | VFP635-1.000-D4-C030.3-Z6 | 1         | 1         | 4             | 6-1/2          | 6      | 0.030   |
| <a href="#">N68958</a> | VFP435-1.250-D2-C040.3-Z4 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 4      | 0.040   |
| <a href="#">N68959</a> | VFP635-1.250-D2-C040.3-Z6 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 6      | 0.040   |
| <a href="#">N68960</a> | VFP435-1.250-D3-C040.3-Z4 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 4      | 0.040   |
| <a href="#">N68961</a> | VFP635-1.250-D3-C040.3-Z6 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 6      | 0.040   |
| <a href="#">N68962</a> | VFP435-1.250-D4-C040.3-Z4 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 4      | 0.040   |
| <a href="#">N68963</a> | VFP635-1.250-D4-C040.3-Z6 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 6      | 0.040   |
| <a href="#">N68965</a> | VFP635-1.500-P1-C040.3-Z6 | 1-1/2     | 1-1/4     | 2             | 4-1/2          | 6      | 0.040   |
| <a href="#">N68966</a> | VFP635-1.500-P2-C040.3-Z6 | 1-1/2     | 1-1/4     | 3             | 5-1/2          | 6      | 0.040   |
| <a href="#">N68967</a> | VFP635-1.500-P3-C040.3-Z6 | 1-1/2     | 1-1/4     | 4             | 6-1/2          | 6      | 0.040   |
| <a href="#">N68968</a> | VFP635-1.500-P4-C040.3-Z6 | 1-1/2     | 1-1/4     | 6             | 8-1/2          | 6      | 0.040   |
| <a href="#">N68969</a> | VFP635-2.000-D1-C040.3-Z6 | 2         | 2         | 2             | 5-3/4          | 6      | 0.040   |
| <a href="#">N68970</a> | VFP635-2.000-D2-C040.3-Z6 | 2         | 2         | 3             | 6-3/4          | 6      | 0.040   |
| <a href="#">N68971</a> | VFP635-2.000-D3-C040.3-Z6 | 2         | 2         | 4             | 7-3/4          | 6      | 0.040   |
| <a href="#">N68972</a> | VFP635-2.000-D4-C040.3-Z6 | 2         | 2         | 6             | 9-3/4          | 6      | 0.040   |

## SHORT BLOCK-VFP435SB / VFP635SB

M42  
8% COBALT



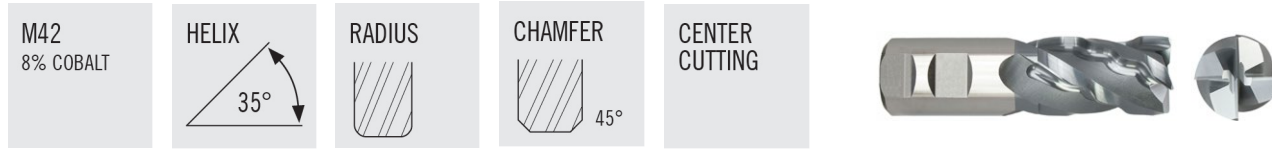
CENTER  
CUTTING



- Optimal chip formation and evacuation
- Polished rake face
- Weldon flat standard
- Up to .250" corner radius through modification
- Designed for stainless steel and titanium
- Cutting Data - Page 300
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION                 | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | CHAMFER |
|------------------------|-----------------------------|-----------|-----------|---------------|----------------|--------|---------|
| <a href="#">N69387</a> | VFP435SB-1.250-D2-C040.3-Z4 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 4      | 0.040   |
| <a href="#">N69388</a> | VFP635SB-1.250-D1-C040.3-Z6 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 6      | 0.040   |
| <a href="#">N69389</a> | VFP435SB-1.250-D3-C040.3-Z4 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 4      | 0.040   |
| <a href="#">N69390</a> | VFP635SB-1.250-D2-C040.3-Z6 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 6      | 0.040   |
| <a href="#">N69391</a> | VFP435SB-1.250-D4-C040.3-Z4 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 4      | 0.040   |
| <a href="#">N69392</a> | VFP635SB-1.250-D3-C040.3-Z6 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 6      | 0.040   |
| <a href="#">N69393</a> | VFP635SB-1.250-D5-C040.3-Z6 | 1-1/4     | 1-1/4     | 6             | 8-1/2          | 6      | 0.040   |
| <a href="#">N69394</a> | VFP635SB-2.000-D1-C040.3-Z6 | 2         | 2         | 2             | 5-3/4          | 6      | 0.040   |
| <a href="#">N69395</a> | VFP635SB-2.000-D2-C040.3-Z6 | 2         | 2         | 3             | 6-3/4          | 6      | 0.040   |
| <a href="#">N69396</a> | VFP635SB-2.000-D3-C040.3-Z6 | 2         | 2         | 4             | 7-3/4          | 6      | 0.040   |
| <a href="#">N69397</a> | VFP635SB-2.000-D4-C040.3-Z6 | 2         | 2         | 6             | 9-3/4          | 6      | 0.040   |
| <a href="#">N69398</a> | VFP635SB-2.000-D5-C040.3-Z6 | 2         | 2         | 8             | 11-3/4         | 6      | 0.040   |

## ALCRN COATED - VFP435SB / VFP435SBR / VFP635SB / VFP635SBR



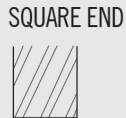
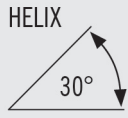
- Optimal chip formation and evacuation
- Polished rake face
- Weldon flat standard
- AlCrN coated for increased performance and tool life
- Specifically engineered for titanium and stainless steel
- Available with chamfer or corner radius
- Cutting Data - Page 300
- Tolerance Specs - Page 324

| PRODUCT NUMBER           | DESCRIPTION                  | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING | RADIUS | CHAMFER |
|--------------------------|------------------------------|-----------|-----------|---------------|----------------|--------|---------|--------|---------|
| <a href="#">03136025</a> | VFP435SBR-1.250-D2-R120.3-Z4 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 4      | AlCrN   | 0.120  | -       |
| <a href="#">03136026</a> | VFP635SBR-1.250-D2-R120.3-Z6 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 6      | AlCrN   | 0.120  | -       |
| <a href="#">03136027</a> | VFP435SB-1.250-D3-C040.3-Z4  | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 4      | AlCrN   | -      | 0.040   |
| <a href="#">03136028</a> | VFP635SB-1.250-D3-C040.3-Z6  | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 6      | AlCrN   | -      | 0.040   |
| <a href="#">03136029</a> | VFP635SBR-1.250-D3-R120.3-Z6 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 6      | AlCrN   | 0.120  | -       |
| <a href="#">03136030</a> | VFP635SBR-1.250-D3-R156.3-Z6 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 6      | AlCrN   | 0.156  | -       |
| <a href="#">03136031</a> | VFP435SBR-1.250-D4-R120.3-Z4 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 4      | AlCrN   | 0.120  | -       |
| <a href="#">03136032</a> | VFP635SB-1.250-D4-C040.3-Z6  | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 6      | AlCrN   | -      | 0.040   |
| <a href="#">03136033</a> | VFP635SBR-1.250-D4-R120.3-Z6 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 6      | AlCrN   | 0.120  | -       |
| <a href="#">03136034</a> | VFP635SBR-1.250-D4-R156.3-Z6 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 6      | AlCrN   | 0.156  | -       |
| <a href="#">03136035</a> | VFP635SBR-1.250-D6-R120.3-Z6 | 1-1/4     | 1-1/4     | 6             | 8-1/2          | 6      | AlCrN   | 0.120  | -       |
| <a href="#">03136036</a> | VFP635SB-2.000-D1-C040.3-Z6  | 2         | 2         | 2             | 5-3/4          | 6      | AlCrN   | -      | 0.040   |
| <a href="#">03136037</a> | VFP635SBR-2.000-D1-R120.3-Z6 | 2         | 2         | 2             | 5-3/4          | 6      | AlCrN   | 0.120  | -       |
| <a href="#">03136038</a> | VFP635SBR-2.000-D1-R250.3-Z6 | 2         | 2         | 2             | 5-3/4          | 6      | AlCrN   | 0.250  | -       |
| <a href="#">03136039</a> | VFP635SB-2.000-D2-C040.3-Z6  | 2         | 2         | 3             | 6-3/4          | 6      | AlCrN   | -      | 0.040   |
| <a href="#">03136040</a> | VFP635SBR-2.000-D2-R120.3-Z6 | 2         | 2         | 3             | 6-3/4          | 6      | AlCrN   | 0.120  | -       |
| <a href="#">03136041</a> | VFP635SBR-2.000-D2-R250.3-Z6 | 2         | 2         | 3             | 6-3/4          | 6      | AlCrN   | 0.250  | -       |
| <a href="#">03136042</a> | VFP635SB-2.000-D3-C040.3-Z6  | 2         | 2         | 4             | 7-3/4          | 6      | AlCrN   | -      | 0.040   |
| <a href="#">03136043</a> | VFP635SBR-2.000-D3-R120.3-Z6 | 2         | 2         | 4             | 7-3/4          | 6      | AlCrN   | 0.120  | -       |
| <a href="#">03136044</a> | VFP635SBR-2.000-D3-R250.3-Z6 | 2         | 2         | 4             | 7-3/4          | 6      | AlCrN   | 0.250  | -       |
| <a href="#">03136045</a> | VFP635SB-2.000-D4-C040.3-Z6  | 2         | 2         | 6             | 9-3/4          | 6      | AlCrN   | -      | 0.040   |
| <a href="#">03136046</a> | VFP635SBR-2.000-D4-R120.3-Z6 | 2         | 2         | 6             | 9-3/4          | 6      | AlCrN   | 0.120  | -       |
| <a href="#">03136047</a> | VFP635SBR-2.000-D4-R250.3-Z6 | 2         | 2         | 6             | 9-3/4          | 6      | AlCrN   | 0.250  | -       |

DISCOUNT CODE D41

## SP205

M42  
8% COBALT



CENTER CUTTING



- Weldon flat standard
- Designed for pocketing and slotting in all materials including high temperature alloys
- Cutting Data - Page 277-278
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N50041</a> | SP205-0.125-F3-S.3-Z2 | 1/8       | 3/8       | 3/8           | 2-5/16         | 2      | UNCOATED |
| <a href="#">N88565</a> | SP205-0.125-F3-S.3-Z2 | 1/8       | 3/8       | 3/8           | 2-5/16         | 2      | TICN     |
| <a href="#">N50051</a> | SP205-0.156-F3-S.3-Z2 | 5/32      | 3/8       | 7/16          | 2-5/16         | 2      | UNCOATED |
| <a href="#">N88566</a> | SP205-0.156-F3-S.3-Z2 | 5/32      | 3/8       | 7/16          | 2-5/16         | 2      | TICN     |
| <a href="#">N50061</a> | SP205-0.188-F2-S.3-Z2 | 3/16      | 3/8       | 7/16          | 2-5/16         | 2      | UNCOATED |
| <a href="#">N88567</a> | SP205-0.188-F2-S.3-Z2 | 3/16      | 3/8       | 7/16          | 2-5/16         | 2      | TICN     |
| <a href="#">N50071</a> | SP205-0.219-F2-S.3-Z2 | 7/32      | 3/8       | 1/2           | 2-5/16         | 2      | UNCOATED |
| <a href="#">N88568</a> | SP205-0.219-F2-S.3-Z2 | 7/32      | 3/8       | 1/2           | 2-5/16         | 2      | TICN     |
| <a href="#">N50081</a> | SP205-0.250-F2-S.3-Z2 | 1/4       | 3/8       | 1/2           | 2-5/16         | 2      | UNCOATED |
| <a href="#">N88569</a> | SP205-0.250-F2-S.3-Z2 | 1/4       | 3/8       | 1/2           | 2-5/16         | 2      | TICN     |
| <a href="#">N50091</a> | SP205-0.281-F2-S.3-Z2 | 9/32      | 3/8       | 9/16          | 2-5/16         | 2      | UNCOATED |
| <a href="#">N88570</a> | SP205-0.281-F2-S.3-Z2 | 9/32      | 3/8       | 9/16          | 2-5/16         | 2      | TICN     |
| <a href="#">N50101</a> | SP205-0.313-F2-S.3-Z2 | 5/16      | 3/8       | 9/16          | 2-5/16         | 2      | UNCOATED |
| <a href="#">N88571</a> | SP205-0.313-F2-S.3-Z2 | 5/16      | 3/8       | 9/16          | 2-5/16         | 2      | TICN     |
| <a href="#">N50121</a> | SP205-0.375-D2-S.3-Z2 | 3/8       | 3/8       | 9/16          | 2-5/16         | 2      | UNCOATED |
| <a href="#">N88573</a> | SP205-0.375-D2-S.3-Z2 | 3/8       | 3/8       | 9/16          | 2-5/16         | 2      | TICN     |
| <a href="#">N50141</a> | SP205-0.438-P2-S.3-Z2 | 7/16      | 3/8       | 13/16         | 2-1/2          | 2      | UNCOATED |
| <a href="#">N88574</a> | SP205-0.438-P2-S.3-Z2 | 7/16      | 3/8       | 13/16         | 2-1/2          | 2      | TICN     |
| <a href="#">N50161</a> | SP205-0.500-P2-S.3-Z2 | 1/2       | 3/8       | 13/16         | 2-1/2          | 2      | UNCOATED |
| <a href="#">N88575</a> | SP205-0.500-P2-S.3-Z2 | 1/2       | 3/8       | 13/16         | 2-1/2          | 2      | TICN     |
| <a href="#">N50162</a> | SP205-0.500-D2-S.3-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | UNCOATED |
| <a href="#">N88576</a> | SP205-0.500-D2-S.3-Z2 | 1/2       | 1/2       | 1             | 3              | 2      | TICN     |
| <a href="#">N50182</a> | SP205-0.563-P2-S.3-Z2 | 9/16      | 1/2       | 1-1/8         | 3-1/8          | 2      | UNCOATED |
| <a href="#">N88577</a> | SP205-0.563-P2-S.3-Z2 | 9/16      | 1/2       | 1-1/8         | 3-1/8          | 2      | TICN     |
| <a href="#">N50203</a> | SP205-0.625-D2-S.3-Z2 | 5/8       | 5/8       | 1-5/16        | 3-7/16         | 2      | UNCOATED |
| <a href="#">N88578</a> | SP205-0.625-D2-S.3-Z2 | 5/8       | 5/8       | 1-5/16        | 3-7/16         | 2      | TICN     |
| <a href="#">N50242</a> | SP205-0.750-P2-S.3-Z2 | 3/4       | 1/2       | 1-5/16        | 3-5/16         | 2      | UNCOATED |
| <a href="#">N88579</a> | SP205-0.750-P2-S.3-Z2 | 3/4       | 1/2       | 1-5/16        | 3-5/16         | 2      | TICN     |
| <a href="#">N50244</a> | SP205-0.750-D2-S.3-Z2 | 3/4       | 3/4       | 1-5/16        | 3-9/16         | 2      | UNCOATED |
| <a href="#">N88580</a> | SP205-0.750-D2-S.3-Z2 | 3/4       | 3/4       | 1-5/16        | 3-9/16         | 2      | TICN     |
| <a href="#">N50285</a> | SP205-0.875-D2-S.3-Z2 | 7/8       | 7/8       | 1-1/2         | 3-3/4          | 2      | UNCOATED |
| <a href="#">N88581</a> | SP205-0.875-D2-S.3-Z2 | 7/8       | 7/8       | 1-1/2         | 3-3/4          | 2      | TICN     |
| <a href="#">N50324</a> | SP205-1.000-P2-S.3-Z2 | 1         | 3/4       | 1-1/2         | 3-3/4          | 2      | UNCOATED |
| <a href="#">N88582</a> | SP205-1.000-P2-S.3-Z2 | 1         | 3/4       | 1-1/2         | 3-3/4          | 2      | TICN     |

## SP205 (CONT'D)

|                  |           |                |                |
|------------------|-----------|----------------|----------------|
| M42<br>8% COBALT | HELIX<br> | SQUARE END<br> | CENTER CUTTING |
|------------------|-----------|----------------|----------------|

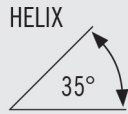


- Weldon flat standard
- Designed for pocketing and slotting in all materials including high temperature alloys
- Cutting Data - Page 277-278
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N50326</a> | SP205-1.000-D2-S.3-Z2 | 1         | 1         | 1-5/8         | 4-1/8          | 2      | UNCOATED |
| <a href="#">N88583</a> | SP205-1.000-D2-S.3-Z2 | 1         | 1         | 1-5/8         | 4-1/8          | 2      | TICN     |
| <a href="#">N50366</a> | SP205-1.125-P1-S.3-Z2 | 1-1/8     | 1         | 1-5/8         | 4-1/8          | 2      | UNCOATED |
| <a href="#">N88584</a> | SP205-1.125-P1-S.3-Z2 | 1-1/8     | 1         | 1-5/8         | 4-1/8          | 2      | TICN     |
| <a href="#">N50407</a> | SP205-1.250-D1-S.3-Z2 | 1-1/4     | 1-1/4     | 1-5/8         | 4-1/8          | 2      | UNCOATED |
| <a href="#">N88586</a> | SP205-1.250-D1-S.3-Z2 | 1-1/4     | 1-1/4     | 1-5/8         | 4-1/8          | 2      | TICN     |
| <a href="#">N50487</a> | SP205-1.500-P1-S.3-Z2 | 1-1/2     | 1-1/4     | 1-5/8         | 4-1/8          | 2      | UNCOATED |
| <a href="#">N88587</a> | SP205-1.500-P1-S.3-Z2 | 1-1/2     | 1-1/4     | 1-5/8         | 4-1/8          | 2      | TICN     |
| <a href="#">N50647</a> | SP205-2.000-P1-S.3-Z2 | 2         | 1-1/4     | 1-5/8         | 4-1/8          | 2      | UNCOATED |
| <a href="#">N88588</a> | SP205-2.000-P1-S.3-Z2 | 2         | 1-1/4     | 1-5/8         | 4-1/8          | 2      | TICN     |

## EXCEL SERIES-EX350

PREMIUM  
PARTICLE  
METAL  
8.5% COBALT



CENTER  
CUTTING

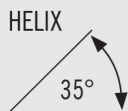


- Weldon flat standard
- Form ground flutes
- Cutting Data - Page 279-280
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N53342</a> | EX350-0.375-D7-S.3-Z4 | 3/8       | 3/8       | 2-1/2         | 4-1/4          | 4      | UNCOATED |
| <a href="#">N53458</a> | EX350-0.375-D7-S.3-Z4 | 3/8       | 3/8       | 2-1/2         | 4-1/4          | 4      | TICN     |
| <a href="#">N53343</a> | EX350-0.500-D1-S.3-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | UNCOATED |
| <a href="#">N53459</a> | EX350-0.500-D1-S.3-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | TICN     |
| <a href="#">N53344</a> | EX350-0.500-D3-S.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | UNCOATED |
| <a href="#">N53460</a> | EX350-0.500-D3-S.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | TICN     |
| <a href="#">N53346</a> | EX350-0.500-D8-S.3-Z4 | 1/2       | 1/2       | 4             | 6              | 4      | UNCOATED |
| <a href="#">N53462</a> | EX350-0.500-D8-S.3-Z4 | 1/2       | 1/2       | 4             | 6              | 4      | TICN     |
| <a href="#">N53347</a> | EX350-0.625-D1-S.3-Z4 | 5/8       | 5/8       | 5/8           | 2-3/4          | 4      | UNCOATED |
| <a href="#">N53463</a> | EX350-0.625-D1-S.3-Z4 | 5/8       | 5/8       | 5/8           | 2-3/4          | 4      | TICN     |
| <a href="#">N53348</a> | EX350-0.625-D3-S.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED |
| <a href="#">N53464</a> | EX350-0.625-D3-S.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | TICN     |
| <a href="#">N53352</a> | EX350-0.750-D1-S.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | UNCOATED |
| <a href="#">N53468</a> | EX350-0.750-D1-S.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | TICN     |
| <a href="#">N53353</a> | EX350-0.750-D2-S.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | UNCOATED |
| <a href="#">N53469</a> | EX350-0.750-D2-S.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | TICN     |
| <a href="#">N53355</a> | EX350-0.750-D3-S.3-Z4 | 3/4       | 3/4       | 2             | 4-1/4          | 4      | UNCOATED |
| <a href="#">N53471</a> | EX350-0.750-D3-S.3-Z4 | 3/4       | 3/4       | 2             | 4-1/4          | 4      | TICN     |
| <a href="#">N53357</a> | EX350-0.750-D4-S.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | UNCOATED |
| <a href="#">N53473</a> | EX350-0.750-D4-S.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | TICN     |
| <a href="#">N53359</a> | EX350-0.750-D5-S.3-Z4 | 3/4       | 3/4       | 4             | 6-1/4          | 4      | UNCOATED |
| <a href="#">N53475</a> | EX350-0.750-D5-S.3-Z4 | 3/4       | 3/4       | 4             | 6-1/4          | 4      | TICN     |
| <a href="#">N53363</a> | EX350-1.000-D1-S.3-Z4 | 1         | 1         | 1             | 3-1/2          | 4      | UNCOATED |
| <a href="#">N53479</a> | EX350-1.000-D1-S.3-Z4 | 1         | 1         | 1             | 3-1/2          | 4      | TICN     |
| <a href="#">N53364</a> | EX350-1.000-D2-S.3-Z4 | 1         | 1         | 2             | 4-1/2          | 4      | UNCOATED |
| <a href="#">N53480</a> | EX350-1.000-D2-S.3-Z4 | 1         | 1         | 2             | 4-1/2          | 4      | TICN     |
| <a href="#">N53366</a> | EX350-1.000-D3-S.3-Z4 | 1         | 1         | 3             | 5-1/2          | 4      | UNCOATED |
| <a href="#">N53482</a> | EX350-1.000-D3-S.3-Z4 | 1         | 1         | 3             | 5-1/2          | 4      | TICN     |
| <a href="#">N53368</a> | EX350-1.000-D4-S.3-Z4 | 1         | 1         | 4             | 6-1/2          | 4      | UNCOATED |
| <a href="#">N53484</a> | EX350-1.000-D4-S.3-Z4 | 1         | 1         | 4             | 6-1/2          | 4      | TICN     |
| <a href="#">N53370</a> | EX350-1.000-D6-S.3-Z4 | 1         | 1         | 6             | 8-1/2          | 4      | UNCOATED |
| <a href="#">N53486</a> | EX350-1.000-D6-S.3-Z4 | 1         | 1         | 6             | 8-1/2          | 4      | TICN     |
| <a href="#">N53374</a> | EX350-1.250-D3-S.3-Z4 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 4      | UNCOATED |
| <a href="#">N53490</a> | EX350-1.250-D3-S.3-Z4 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 4      | TICN     |
| <a href="#">N53375</a> | EX350-1.250-D3-S.3-Z6 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 6      | UNCOATED |

## EXCEL SERIES-EX350 (CONT'D)

PREMIUM  
PARTICLE  
METAL  
8.5% COBALT



CENTER  
CUTTING



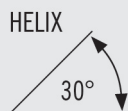
- Weldon flat standard
- Form ground flutes

- Cutting Data - Page 279-280
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION           | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|-----------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N53491</a> | EX350-1.250-D3-S.3-Z6 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 6      | TICN     |
| <a href="#">N53379</a> | EX350-1.250-D5-S.3-Z6 | 1-1/4     | 1-1/4     | 6             | 8-1/2          | 6      | UNCOATED |
| <a href="#">N53495</a> | EX350-1.250-D5-S.3-Z6 | 1-1/4     | 1-1/4     | 6             | 8-1/2          | 6      | TICN     |
| <a href="#">N53385</a> | EX350-1.500-P3-S.3-Z6 | 1-1/2     | 1-1/4     | 4             | 6-1/2          | 6      | UNCOATED |
| <a href="#">N53501</a> | EX350-1.500-P3-S.3-Z6 | 1-1/2     | 1-1/4     | 4             | 6-1/2          | 6      | TICN     |
| <a href="#">N53395</a> | EX350-2.000-D4-S.7-Z6 | 2         | 2         | 6             | 9-3/4          | 6      | UNCOATED |
| <a href="#">N53511</a> | EX350-2.000-D4-S.7-Z6 | 2         | 2         | 6             | 9-3/4          | 6      | TICN     |

## SPC408

M42  
8% COBALT



CENTER  
CUTTING



- Weldon flat standard
- Designed for profiling in all materials

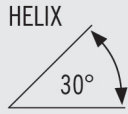
- Cutting Data - Page 281-283
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N52041</a> | SPC408-0.125-F3-S.3-Z4 | 1/8       | 3/8       | 3/8           | 2-5/16         | 4      | UNCOATED |
| <a href="#">N88604</a> | SPC408-0.125-F3-S.3-Z4 | 1/8       | 3/8       | 3/8           | 2-5/16         | 4      | TICN     |
| <a href="#">N52051</a> | SPC408-0.156-F3-S.3-Z4 | 5/32      | 3/8       | 1/2           | 2-3/8          | 4      | UNCOATED |
| <a href="#">N88605</a> | SPC408-0.156-F3-S.3-Z4 | 5/32      | 3/8       | 1/2           | 2-3/8          | 4      | TICN     |
| <a href="#">N52049</a> | SPC408-0.188-F1-S.3-Z4 | 3/16      | 3/8       | 3/16          | 2-1/16         | 4      | UNCOATED |
| <a href="#">N89446</a> | SPC408-0.188-F1-S.3-Z4 | 3/16      | 3/8       | 3/16          | 2-1/16         | 4      | TICN     |
| <a href="#">N52061</a> | SPC408-0.188-F3-S.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | UNCOATED |
| <a href="#">N88606</a> | SPC408-0.188-F3-S.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | TICN     |
| <a href="#">N52071</a> | SPC408-0.219-F3-S.3-Z4 | 7/32      | 3/8       | 5/8           | 2-7/16         | 4      | UNCOATED |
| <a href="#">N88607</a> | SPC408-0.219-F3-S.3-Z4 | 7/32      | 3/8       | 5/8           | 2-7/16         | 4      | TICN     |
| <a href="#">N52069</a> | SPC408-0.250-F1-S.3-Z4 | 1/4       | 3/8       | 1/4           | 2-1/16         | 4      | UNCOATED |
| <a href="#">N89447</a> | SPC408-0.250-F1-S.3-Z4 | 1/4       | 3/8       | 1/4           | 2-1/16         | 4      | TICN     |
| <a href="#">N52081</a> | SPC408-0.250-F3-S.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | UNCOATED |
| <a href="#">N88608</a> | SPC408-0.250-F3-S.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | TICN     |
| <a href="#">N52082</a> | SPC408-0.250-F5-S.3-Z4 | 1/4       | 3/8       | 1-1/4         | 3-1/16         | 4      | UNCOATED |
| <a href="#">N88609</a> | SPC408-0.250-F5-S.3-Z4 | 1/4       | 3/8       | 1-1/4         | 3-1/16         | 4      | TICN     |



## SPC408 (CONT'D)

M42  
8% COBALT



CENTER  
CUTTING

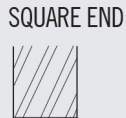
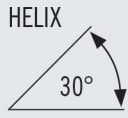


- Weldon flat standard
- Designed for profiling in all materials
- Cutting Data - Page 281-283
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N52083</a> | SPC408-0.250-F7-S.3-Z4 | 1/4       | 3/8       | 1-3/4         | 3-9/16         | 4      | UNCOATED |
| <a href="#">N88610</a> | SPC408-0.250-F7-S.3-Z4 | 1/4       | 3/8       | 1-3/4         | 3-9/16         | 4      | TICN     |
| <a href="#">N52091</a> | SPC408-0.281-F2-S.3-Z4 | 9/32      | 3/8       | 5/8           | 2-7/16         | 4      | UNCOATED |
| <a href="#">N88611</a> | SPC408-0.281-F2-S.3-Z4 | 9/32      | 3/8       | 5/8           | 2-7/16         | 4      | TICN     |
| <a href="#">N52109</a> | SPC408-0.313-F1-S.3-Z4 | 5/16      | 3/8       | 5/16          | 2-1/16         | 4      | UNCOATED |
| <a href="#">N89448</a> | SPC408-0.313-F1-S.3-Z4 | 5/16      | 3/8       | 5/16          | 2-1/16         | 4      | TICN     |
| <a href="#">N52101</a> | SPC408-0.313-F2-S.3-Z4 | 5/16      | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED |
| <a href="#">N88612</a> | SPC408-0.313-F2-S.3-Z4 | 5/16      | 3/8       | 3/4           | 2-1/2          | 4      | TICN     |
| <a href="#">N52102</a> | SPC408-0.313-F4-S.3-Z4 | 5/16      | 3/8       | 1-3/8         | 3-1/8          | 4      | UNCOATED |
| <a href="#">N88613</a> | SPC408-0.313-F4-S.3-Z4 | 5/16      | 3/8       | 1-3/8         | 3-1/8          | 4      | TICN     |
| <a href="#">N52103</a> | SPC408-0.313-F6-S.3-Z4 | 5/16      | 3/8       | 2             | 3-3/4          | 4      | UNCOATED |
| <a href="#">N88614</a> | SPC408-0.313-F6-S.3-Z4 | 5/16      | 3/8       | 2             | 3-3/4          | 4      | TICN     |
| <a href="#">N52129</a> | SPC408-0.375-D1-S.3-Z4 | 3/8       | 3/8       | 3/8           | 2-1/8          | 4      | UNCOATED |
| <a href="#">N89449</a> | SPC408-0.375-D1-S.3-Z4 | 3/8       | 3/8       | 3/8           | 2-1/8          | 4      | TICN     |
| <a href="#">N52121</a> | SPC408-0.375-D2-S.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED |
| <a href="#">N88616</a> | SPC408-0.375-D2-S.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | TICN     |
| <a href="#">N52122</a> | SPC408-0.375-D4-S.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | UNCOATED |
| <a href="#">N88617</a> | SPC408-0.375-D4-S.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | TICN     |
| <a href="#">N52123</a> | SPC408-0.375-D7-S.3-Z4 | 3/8       | 3/8       | 2-1/2         | 4-1/4          | 4      | UNCOATED |
| <a href="#">N88618</a> | SPC408-0.375-D7-S.3-Z4 | 3/8       | 3/8       | 2-1/2         | 4-1/4          | 4      | TICN     |
| <a href="#">N52141</a> | SPC408-0.438-P2-S.3-Z4 | 7/16      | 3/8       | 1             | 2-11/16        | 4      | UNCOATED |
| <a href="#">N88619</a> | SPC408-0.438-P2-S.3-Z4 | 7/16      | 3/8       | 1             | 2-11/16        | 4      | TICN     |
| <a href="#">N52142</a> | SPC408-0.438-P5-S.3-Z4 | 7/16      | 3/8       | 2             | 3-11/16        | 4      | UNCOATED |
| <a href="#">N88620</a> | SPC408-0.438-P5-S.3-Z4 | 7/16      | 3/8       | 2             | 3-11/16        | 4      | TICN     |
| <a href="#">N52166</a> | SPC408-0.500-P2-S.3-Z4 | 1/2       | 3/8       | 1             | 2-11/16        | 4      | UNCOATED |
| <a href="#">N88625</a> | SPC408-0.500-P2-S.3-Z4 | 1/2       | 3/8       | 1             | 2-11/16        | 4      | TICN     |
| <a href="#">N52160</a> | SPC408-0.500-D3-S.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | UNCOATED |
| <a href="#">N88621</a> | SPC408-0.500-D3-S.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | TICN     |
| <a href="#">N52162</a> | SPC408-0.500-D3-S.3-Z6 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 6      | UNCOATED |
| <a href="#">N88622</a> | SPC408-0.500-D3-S.3-Z6 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 6      | TICN     |
| <a href="#">N52163</a> | SPC408-0.500-D4-S.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | UNCOATED |
| <a href="#">N88623</a> | SPC408-0.500-D4-S.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | TICN     |
| <a href="#">N52164</a> | SPC408-0.500-D6-S.3-Z4 | 1/2       | 1/2       | 3             | 5              | 4      | UNCOATED |
| <a href="#">N88624</a> | SPC408-0.500-D6-S.3-Z4 | 1/2       | 1/2       | 3             | 5              | 4      | TICN     |
| <a href="#">N52167</a> | SPC408-0.500-D8-S.3-Z4 | 1/2       | 1/2       | 4             | 6              | 4      | UNCOATED |

## SPC408 (CONT'D)

M42  
8% COBALT



CENTER  
CUTTING

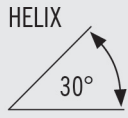


- Weldon flat standard
- Designed for profiling in all materials
- Cutting Data - Page 281-283
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N88626</a> | SPC408-0.500-D8-S.3-Z4 | 1/2       | 1/2       | 4             | 6              | 4      | TICN     |
| <a href="#">N52182</a> | SPC408-0.563-P2-S.3-Z4 | 9/16      | 1/2       | 1-3/8         | 3-3/8          | 4      | UNCOATED |
| <a href="#">N88627</a> | SPC408-0.563-P2-S.3-Z4 | 9/16      | 1/2       | 1-3/8         | 3-3/8          | 4      | TICN     |
| <a href="#">N52200</a> | SPC408-0.625-D3-S.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED |
| <a href="#">N88628</a> | SPC408-0.625-D3-S.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | TICN     |
| <a href="#">N52203</a> | SPC408-0.625-D3-S.3-Z6 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 6      | UNCOATED |
| <a href="#">N88631</a> | SPC408-0.625-D3-S.3-Z6 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 6      | TICN     |
| <a href="#">N52201</a> | SPC408-0.625-D4-S.3-Z4 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 4      | UNCOATED |
| <a href="#">N88629</a> | SPC408-0.625-D4-S.3-Z4 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 4      | TICN     |
| <a href="#">N52202</a> | SPC408-0.625-D5-S.3-Z4 | 5/8       | 5/8       | 3             | 5-1/8          | 4      | UNCOATED |
| <a href="#">N88630</a> | SPC408-0.625-D5-S.3-Z4 | 5/8       | 5/8       | 3             | 5-1/8          | 4      | TICN     |
| <a href="#">N52204</a> | SPC408-0.625-D6-S.3-Z4 | 5/8       | 5/8       | 4             | 6-1/8          | 4      | UNCOATED |
| <a href="#">N88632</a> | SPC408-0.625-D6-S.3-Z4 | 5/8       | 5/8       | 4             | 6-1/8          | 4      | TICN     |
| <a href="#">N52206</a> | SPC408-0.750-P2-S.3-Z4 | 3/4       | 1/2       | 1-5/8         | 3-5/8          | 4      | UNCOATED |
| <a href="#">N88633</a> | SPC408-0.750-P2-S.3-Z4 | 3/4       | 1/2       | 1-5/8         | 3-5/8          | 4      | TICN     |
| <a href="#">N52240</a> | SPC408-0.750-D2-S.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | UNCOATED |
| <a href="#">N88634</a> | SPC408-0.750-D2-S.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | TICN     |
| <a href="#">N52244</a> | SPC408-0.750-D2-S.3-Z6 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 6      | UNCOATED |
| <a href="#">N88638</a> | SPC408-0.750-D2-S.3-Z6 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 6      | TICN     |
| <a href="#">N52241</a> | SPC408-0.750-D3-S.3-Z4 | 3/4       | 3/4       | 2             | 4-1/4          | 4      | UNCOATED |
| <a href="#">N88635</a> | SPC408-0.750-D3-S.3-Z4 | 3/4       | 3/4       | 2             | 4-1/4          | 4      | TICN     |
| <a href="#">N52242</a> | SPC408-0.750-D4-S.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | UNCOATED |
| <a href="#">N88636</a> | SPC408-0.750-D4-S.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | TICN     |
| <a href="#">N52243</a> | SPC408-0.750-D5-S.3-Z4 | 3/4       | 3/4       | 4             | 6-1/4          | 4      | UNCOATED |
| <a href="#">N88637</a> | SPC408-0.750-D5-S.3-Z4 | 3/4       | 3/4       | 4             | 6-1/4          | 4      | TICN     |
| <a href="#">N52247</a> | SPC408-0.750-D5-S.3-Z6 | 3/4       | 3/4       | 4             | 6-1/4          | 6      | UNCOATED |
| <a href="#">N88640</a> | SPC408-0.750-D5-S.3-Z6 | 3/4       | 3/4       | 4             | 6-1/4          | 6      | TICN     |
| <a href="#">N52285</a> | SPC408-0.875-D2-S.3-Z4 | 7/8       | 7/8       | 1-7/8         | 4-1/8          | 4      | UNCOATED |
| <a href="#">N88642</a> | SPC408-0.875-D2-S.3-Z4 | 7/8       | 7/8       | 1-7/8         | 4-1/8          | 4      | TICN     |
| <a href="#">N52286</a> | SPC408-0.875-D4-S.3-Z4 | 7/8       | 7/8       | 3-1/2         | 5-3/4          | 4      | UNCOATED |
| <a href="#">N88643</a> | SPC408-0.875-D4-S.3-Z4 | 7/8       | 7/8       | 3-1/2         | 5-3/4          | 4      | TICN     |
| <a href="#">N52334</a> | SPC408-1.000-P2-S.3-Z4 | 1         | 3/4       | 1-7/8         | 4-1/8          | 4      | UNCOATED |
| <a href="#">N88652</a> | SPC408-1.000-P2-S.3-Z4 | 1         | 3/4       | 1-7/8         | 4-1/8          | 4      | TICN     |
| <a href="#">N52320</a> | SPC408-1.000-D2-S.3-Z4 | 1         | 1         | 2             | 4-1/2          | 4      | UNCOATED |
| <a href="#">N88644</a> | SPC408-1.000-D2-S.3-Z4 | 1         | 1         | 2             | 4-1/2          | 4      | TICN     |

## SPC408 (CONT'D)

M42  
8% COBALT



CENTER  
CUTTING

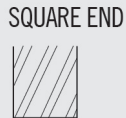


- Weldon flat standard
- Designed for profiling in all materials
- Cutting Data - Page 281-283
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N52326</a> | SPC408-1.000-D2-S.3-Z6 | 1         | 1         | 2             | 4-1/2          | 6      | UNCOATED |
| <a href="#">N88649</a> | SPC408-1.000-D2-S.3-Z6 | 1         | 1         | 2             | 4-1/2          | 6      | TICN     |
| <a href="#">N52321</a> | SPC408-1.000-D3-S.3-Z4 | 1         | 1         | 3             | 5-1/2          | 4      | UNCOATED |
| <a href="#">N88645</a> | SPC408-1.000-D3-S.3-Z4 | 1         | 1         | 3             | 5-1/2          | 4      | TICN     |
| <a href="#">N52327</a> | SPC408-1.000-D3-S.3-Z6 | 1         | 1         | 3             | 5-1/2          | 6      | UNCOATED |
| <a href="#">N88650</a> | SPC408-1.000-D3-S.3-Z6 | 1         | 1         | 3             | 5-1/2          | 6      | TICN     |
| <a href="#">N52322</a> | SPC408-1.000-D4-S.3-Z4 | 1         | 1         | 4             | 6-1/2          | 4      | UNCOATED |
| <a href="#">N88646</a> | SPC408-1.000-D4-S.3-Z4 | 1         | 1         | 4             | 6-1/2          | 4      | TICN     |
| <a href="#">N52324</a> | SPC408-1.000-D4-S.3-Z6 | 1         | 1         | 4             | 6-1/2          | 6      | UNCOATED |
| <a href="#">N88648</a> | SPC408-1.000-D4-S.3-Z6 | 1         | 1         | 4             | 6-1/2          | 6      | TICN     |
| <a href="#">N52323</a> | SPC408-1.000-D6-S.3-Z4 | 1         | 1         | 6             | 8-1/2          | 4      | UNCOATED |
| <a href="#">N88647</a> | SPC408-1.000-D6-S.3-Z4 | 1         | 1         | 6             | 8-1/2          | 4      | TICN     |
| <a href="#">N52329</a> | SPC408-1.000-D6-S.3-Z6 | 1         | 1         | 6             | 8-1/2          | 6      | UNCOATED |
| <a href="#">N88651</a> | SPC408-1.000-D6-S.3-Z6 | 1         | 1         | 6             | 8-1/2          | 6      | TICN     |
| <a href="#">N52366</a> | SPC408-1.125-P2-S.3-Z6 | 1-1/8     | 1         | 2             | 4-1/2          | 6      | UNCOATED |
| <a href="#">N88653</a> | SPC408-1.125-P2-S.3-Z6 | 1-1/8     | 1         | 2             | 4-1/2          | 6      | TICN     |
| <a href="#">N52367</a> | SPC408-1.125-P4-S.3-Z6 | 1-1/8     | 1         | 4             | 6-1/2          | 6      | UNCOATED |
| <a href="#">N88654</a> | SPC408-1.125-P4-S.3-Z6 | 1-1/8     | 1         | 4             | 6-1/2          | 6      | TICN     |
| <a href="#">N52414</a> | SPC408-1.250-P2-S.3-Z4 | 1-1/4     | 1         | 2             | 4-1/2          | 4      | UNCOATED |
| <a href="#">N88663</a> | SPC408-1.250-P2-S.3-Z4 | 1-1/4     | 1         | 2             | 4-1/2          | 4      | TICN     |
| <a href="#">N52416</a> | SPC408-1.250-P2-S.3-Z6 | 1-1/4     | 1         | 2             | 4-1/2          | 6      | UNCOATED |
| <a href="#">N88664</a> | SPC408-1.250-P2-S.3-Z6 | 1-1/4     | 1         | 2             | 4-1/2          | 6      | TICN     |
| <a href="#">N52400</a> | SPC408-1.250-D1-S.3-Z4 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 4      | UNCOATED |
| <a href="#">N88655</a> | SPC408-1.250-D1-S.3-Z4 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 4      | TICN     |
| <a href="#">N52407</a> | SPC408-1.250-D1-S.3-Z6 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 6      | UNCOATED |
| <a href="#">N88660</a> | SPC408-1.250-D1-S.3-Z6 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 6      | TICN     |
| <a href="#">N52401</a> | SPC408-1.250-D2-S.3-Z4 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 4      | UNCOATED |
| <a href="#">N88656</a> | SPC408-1.250-D2-S.3-Z4 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 4      | TICN     |
| <a href="#">N52406</a> | SPC408-1.250-D2-S.3-Z6 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 6      | UNCOATED |
| <a href="#">N88659</a> | SPC408-1.250-D2-S.3-Z6 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 6      | TICN     |
| <a href="#">N52402</a> | SPC408-1.250-D3-S.3-Z4 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 4      | UNCOATED |
| <a href="#">N88657</a> | SPC408-1.250-D3-S.3-Z4 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 4      | TICN     |
| <a href="#">N52409</a> | SPC408-1.250-D3-S.3-Z6 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 6      | UNCOATED |
| <a href="#">N88661</a> | SPC408-1.250-D3-S.3-Z6 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 6      | TICN     |

## SPC408 (CONT'D)

M42  
8% COBALT



CENTER  
CUTTING

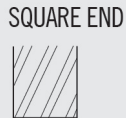
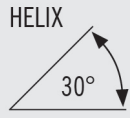


- Weldon flat standard
- Designed for profiling in all materials
- Cutting Data - Page 281-283
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N52403</a> | SPC408-1.250-D5-S.3-Z4 | 1-1/4     | 1-1/4     | 6             | 8-1/2          | 4      | UNCOATED |
| <a href="#">N88658</a> | SPC408-1.250-D5-S.3-Z4 | 1-1/4     | 1-1/4     | 6             | 8-1/2          | 4      | TICN     |
| <a href="#">N52410</a> | SPC408-1.250-D5-S.3-Z6 | 1-1/4     | 1-1/4     | 6             | 8-1/2          | 6      | UNCOATED |
| <a href="#">N88662</a> | SPC408-1.250-D5-S.3-Z6 | 1-1/4     | 1-1/4     | 6             | 8-1/2          | 6      | TICN     |
| <a href="#">N52480</a> | SPC408-1.500-P1-S.3-Z4 | 1-1/2     | 1-1/4     | 2             | 4-1/2          | 4      | UNCOATED |
| <a href="#">N88665</a> | SPC408-1.500-P1-S.3-Z4 | 1-1/2     | 1-1/4     | 2             | 4-1/2          | 4      | TICN     |
| <a href="#">N52487</a> | SPC408-1.500-P1-S.3-Z6 | 1-1/2     | 1-1/4     | 2             | 4-1/2          | 6      | UNCOATED |
| <a href="#">N88667</a> | SPC408-1.500-P1-S.3-Z6 | 1-1/2     | 1-1/4     | 2             | 4-1/2          | 6      | TICN     |
| <a href="#">N52486</a> | SPC408-1.500-P4-S.3-Z6 | 1-1/2     | 1-1/4     | 4             | 6-1/2          | 6      | UNCOATED |
| <a href="#">N88666</a> | SPC408-1.500-P4-S.3-Z6 | 1-1/2     | 1-1/4     | 4             | 6-1/2          | 6      | TICN     |
| <a href="#">N52499</a> | SPC408-1.500-P5-S.3-Z6 | 1-1/2     | 1-1/4     | 8             | 10-1/2         | 6      | UNCOATED |
| <a href="#">N88669</a> | SPC408-1.500-P5-S.3-Z6 | 1-1/2     | 1-1/4     | 8             | 10-1/2         | 6      | TICN     |
| <a href="#">N52644</a> | SPC408-2.000-P1-S.3-Z6 | 2         | 1-1/4     | 2             | 4-1/2          | 6      | UNCOATED |
| <a href="#">N88670</a> | SPC408-2.000-P1-S.3-Z6 | 2         | 1-1/4     | 2             | 4-1/2          | 6      | TICN     |
| <a href="#">N52646</a> | SPC408-2.000-P2-S.3-Z6 | 2         | 1-1/4     | 4             | 6-1/2          | 6      | UNCOATED |
| <a href="#">N88671</a> | SPC408-2.000-P2-S.3-Z6 | 2         | 1-1/4     | 4             | 6-1/2          | 6      | TICN     |

## SMM845

M42  
8% COBALT



CENTER  
CUTTING

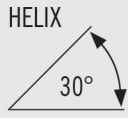


- Weldon flat standard
- Metric flute
- Inch shank
- Designed for profiling in all materials
- Cutting Data - Page 284-285
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N72861</a> | SMM845-0.118-F3-S.3-Z4 | 3mm       | 3/8       | 3/8           | 2-5/16         | 4      | UNCOATED |
| <a href="#">N88949</a> | SMM845-0.118-F3-S.3-Z4 | 3mm       | 3/8       | 3/8           | 2-5/16         | 4      | TICN     |
| <a href="#">N72862</a> | SMM845-0.157-F3-S.3-Z4 | 4mm       | 3/8       | 1/2           | 2-5/16         | 4      | UNCOATED |
| <a href="#">N88950</a> | SMM845-0.157-F3-S.3-Z4 | 4mm       | 3/8       | 1/2           | 2-5/16         | 4      | TICN     |
| <a href="#">N72863</a> | SMM845-0.197-F3-S.3-Z4 | 5mm       | 3/8       | 9/16          | 2-1/2          | 4      | UNCOATED |
| <a href="#">N88951</a> | SMM845-0.197-F3-S.3-Z4 | 5mm       | 3/8       | 9/16          | 2-1/2          | 4      | TICN     |
| <a href="#">N72864</a> | SMM845-0.236-F3-S.3-Z4 | 6mm       | 3/8       | 5/8           | 2-1/2          | 4      | UNCOATED |
| <a href="#">N88952</a> | SMM845-0.236-F3-S.3-Z4 | 6mm       | 3/8       | 5/8           | 2-1/2          | 4      | TICN     |
| <a href="#">N72866</a> | SMM845-0.315-F2-S.3-Z4 | 8mm       | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED |
| <a href="#">N88954</a> | SMM845-0.315-F2-S.3-Z4 | 8mm       | 3/8       | 3/4           | 2-1/2          | 4      | TICN     |
| <a href="#">N72867</a> | SMM845-0.394-P3-S.3-Z4 | 10mm      | 3/8       | 1             | 2-11/16        | 4      | UNCOATED |
| <a href="#">N88955</a> | SMM845-0.394-P3-S.3-Z4 | 10mm      | 3/8       | 1             | 2-11/16        | 4      | TICN     |
| <a href="#">N72868</a> | SMM845-0.472-F2-S.3-Z4 | 12mm      | 1/2       | 1             | 3              | 4      | UNCOATED |
| <a href="#">N88956</a> | SMM845-0.472-F2-S.3-Z4 | 12mm      | 1/2       | 1             | 3              | 4      | TICN     |
| <a href="#">N72869</a> | SMM845-0.551-P2-S.3-Z4 | 14mm      | 1/2       | 1-3/8         | 3-3/8          | 4      | UNCOATED |
| <a href="#">N88957</a> | SMM845-0.551-P2-S.3-Z4 | 14mm      | 1/2       | 1-3/8         | 3-3/8          | 4      | TICN     |
| <a href="#">N72870</a> | SMM845-0.630-P3-S.3-Z4 | 16mm      | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED |
| <a href="#">N88958</a> | SMM845-0.630-P3-S.3-Z4 | 16mm      | 5/8       | 1-5/8         | 3-3/4          | 4      | TICN     |
| <a href="#">N72871</a> | SMM845-0.709-P2-S.3-Z4 | 18mm      | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED |
| <a href="#">N88959</a> | SMM845-0.709-P2-S.3-Z4 | 18mm      | 5/8       | 1-5/8         | 3-3/4          | 4      | TICN     |
| <a href="#">N72872</a> | SMM845-0.787-P2-S.3-Z4 | 20mm      | 3/4       | 1-7/8         | 4-1/8          | 4      | UNCOATED |
| <a href="#">N88960</a> | SMM845-0.787-P2-S.3-Z4 | 20mm      | 3/4       | 1-7/8         | 4-1/8          | 4      | TICN     |

## SPB540

M42  
8% COBALT



CENTER  
CUTTING

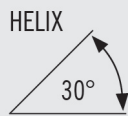


- Weldon flat standard
- Designed for profiling and contouring in all materials
- Cutting Data - Page 281-283
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N54041</a> | SPB540-0.125-F3-B.3-Z4 | 1/8       | 3/8       | 3/8           | 2-5/16         | 4      | UNCOATED |
| <a href="#">N88688</a> | SPB540-0.125-F3-B.3-Z4 | 1/8       | 3/8       | 3/8           | 2-5/16         | 4      | TICN     |
| <a href="#">N54061</a> | SPB540-0.188-F3-B.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | UNCOATED |
| <a href="#">N88689</a> | SPB540-0.188-F3-B.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | TICN     |
| <a href="#">N54081</a> | SPB540-0.250-F3-B.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | UNCOATED |
| <a href="#">N88690</a> | SPB540-0.250-F3-B.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | TICN     |
| <a href="#">N54121</a> | SPB540-0.375-D2-B.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED |
| <a href="#">N88692</a> | SPB540-0.375-D2-B.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | TICN     |
| <a href="#">N67272</a> | SPB540-0.375-D4-B.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | UNCOATED |
| <a href="#">N67342</a> | SPB540-0.375-D4-B.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | TICN     |
| <a href="#">N67275</a> | SPB540-0.500-D2-B.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | UNCOATED |
| <a href="#">N67345</a> | SPB540-0.500-D2-B.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | TICN     |
| <a href="#">N54160</a> | SPB540-0.500-D3-B.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | UNCOATED |
| <a href="#">N88693</a> | SPB540-0.500-D3-B.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | TICN     |
| <a href="#">N67276</a> | SPB540-0.500-D4-B.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | UNCOATED |
| <a href="#">N67346</a> | SPB540-0.500-D4-B.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | TICN     |
| <a href="#">N67277</a> | SPB540-0.500-D5-B.3-Z4 | 1/2       | 1/2       | 2-1/2         | 4-1/2          | 4      | UNCOATED |
| <a href="#">N67347</a> | SPB540-0.500-D5-B.3-Z4 | 1/2       | 1/2       | 2-1/2         | 4-1/2          | 4      | TICN     |
| <a href="#">N54200</a> | SPB540-0.625-D3-B.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED |
| <a href="#">N88694</a> | SPB540-0.625-D3-B.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | TICN     |
| <a href="#">N54240</a> | SPB540-0.750-D2-B.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | UNCOATED |
| <a href="#">N88695</a> | SPB540-0.750-D2-B.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | TICN     |
| <a href="#">N67283</a> | SPB540-0.750-D3-B.3-Z4 | 3/4       | 3/4       | 2-1/4         | 4-1/2          | 4      | UNCOATED |
| <a href="#">N67353</a> | SPB540-0.750-D3-B.3-Z4 | 3/4       | 3/4       | 2-1/4         | 4-1/2          | 4      | TICN     |
| <a href="#">N54280</a> | SPB540-0.875-D2-B.3-Z4 | 7/8       | 7/8       | 1-7/8         | 4-1/8          | 4      | UNCOATED |
| <a href="#">N88696</a> | SPB540-0.875-D2-B.3-Z4 | 7/8       | 7/8       | 1-7/8         | 4-1/8          | 4      | TICN     |
| <a href="#">N54320</a> | SPB540-1.000-D2-B.3-Z4 | 1         | 1         | 2             | 4-1/2          | 4      | UNCOATED |
| <a href="#">N88697</a> | SPB540-1.000-D2-B.3-Z4 | 1         | 1         | 2             | 4-1/2          | 4      | TICN     |
| <a href="#">N67287</a> | SPB540-1.000-D3-B.3-Z4 | 1         | 1         | 3             | 5-1/2          | 4      | UNCOATED |
| <a href="#">N67357</a> | SPB540-1.000-D3-B.3-Z4 | 1         | 1         | 3             | 5-1/2          | 4      | TICN     |
| <a href="#">N67288</a> | SPB540-1.000-D4-B.3-Z4 | 1         | 1         | 4             | 6-1/2          | 4      | UNCOATED |
| <a href="#">N67358</a> | SPB540-1.000-D4-B.3-Z4 | 1         | 1         | 4             | 6-1/2          | 4      | TICN     |
| <a href="#">N67290</a> | SPB540-1.000-D6-B.3-Z4 | 1         | 1         | 6             | 8-1/2          | 4      | UNCOATED |
| <a href="#">N67360</a> | SPB540-1.000-D6-B.3-Z4 | 1         | 1         | 6             | 8-1/2          | 4      | TICN     |
| <a href="#">N54407</a> | SPB540-1.250-D1-B.3-Z6 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 6      | UNCOATED |
| <a href="#">N88698</a> | SPB540-1.250-D1-B.3-Z6 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 6      | TICN     |

## SPB540 (CONT'D)

M42  
8% COBALT



CENTER  
CUTTING

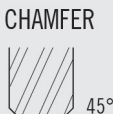
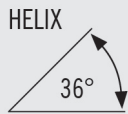


- Weldon flat standard
- Designed for profiling and contouring in all materials
- Cutting Data - Page 281-283
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N54487</a> | SPB540-1.500-P1-B.3-Z6 | 1-1/2     | 1-1/4     | 2             | 4-1/2          | 6      | UNCOATED |
| <a href="#">N88699</a> | SPB540-1.500-P1-B.3-Z6 | 1-1/2     | 1-1/4     | 2             | 4-1/2          | 6      | TICN     |
| <a href="#">N67297</a> | SPB540-2.000-D1-B.7-Z6 | 2         | 2         | 2             | 5-3/4          | 6      | UNCOATED |
| <a href="#">N67367</a> | SPB540-2.000-D1-B.7-Z6 | 2         | 2         | 2             | 5-3/4          | 6      | TICN     |
| <a href="#">N67299</a> | SPB540-2.000-D3-B.7-Z6 | 2         | 2         | 4             | 7-3/4          | 6      | UNCOATED |
| <a href="#">N67369</a> | SPB540-2.000-D3-B.7-Z6 | 2         | 2         | 4             | 7-3/4          | 6      | TICN     |
| <a href="#">N67300</a> | SPB540-2.000-D4-B.7-Z6 | 2         | 2         | 6             | 9-3/4          | 6      | UNCOATED |
| <a href="#">N67370</a> | SPB540-2.000-D4-B.7-Z6 | 2         | 2         | 6             | 9-3/4          | 6      | TICN     |

## RTM713

M42  
8% COBALT



CENTER  
CUTTING

COARSE  
PITCH

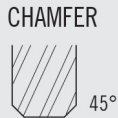
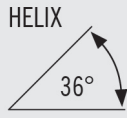


- Weldon flat standard
- Designed for profiling and slotting in all materials
- Cutting Data - Page 286
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N73081</a> | RTM713-0.250-F3-C020.3-Z3 | 1/4       | 3/8       | 5/8           | 2-1/2          | 3      | UNCOATED | 0.020   |
| <a href="#">N89019</a> | RTM713-0.250-F3-C020.3-Z3 | 1/4       | 3/8       | 5/8           | 2-1/2          | 3      | TICN     | 0.020   |
| <a href="#">N73121</a> | RTM713-0.375-D2-C020.3-Z3 | 3/8       | 3/8       | 7/8           | 2-3/4          | 3      | UNCOATED | 0.020   |
| <a href="#">N89022</a> | RTM713-0.375-D2-C020.3-Z3 | 3/8       | 3/8       | 7/8           | 2-3/4          | 3      | TICN     | 0.020   |
| <a href="#">N73162</a> | RTM713-0.500-D2-C025.3-Z3 | 1/2       | 1/2       | 1             | 3-1/16         | 3      | UNCOATED | 0.025   |
| <a href="#">N89025</a> | RTM713-0.500-D2-C025.3-Z3 | 1/2       | 1/2       | 1             | 3-1/16         | 3      | TICN     | 0.025   |
| <a href="#">N73203</a> | RTM713-0.625-D2-C025.3-Z3 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 3      | UNCOATED | 0.025   |
| <a href="#">N89027</a> | RTM713-0.625-D2-C025.3-Z3 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 3      | TICN     | 0.025   |
| <a href="#">N73249</a> | RTM713-0.750-D1-C025.3-Z3 | 3/4       | 3/4       | 3/4           | 3              | 3      | UNCOATED | 0.025   |
| <a href="#">N89030</a> | RTM713-0.750-D1-C025.3-Z3 | 3/4       | 3/4       | 3/4           | 3              | 3      | TICN     | 0.025   |
| <a href="#">N73244</a> | RTM713-0.750-D2-C025.3-Z3 | 3/4       | 3/4       | 1-1/2         | 3-3/4          | 3      | UNCOATED | 0.025   |
| <a href="#">N89029</a> | RTM713-0.750-D2-C025.3-Z3 | 3/4       | 3/4       | 1-1/2         | 3-3/4          | 3      | TICN     | 0.025   |
| <a href="#">N73327</a> | RTM713-1.000-P1-C030.3-Z3 | 1         | 3/4       | 1             | 3-1/4          | 3      | UNCOATED | 0.030   |
| <a href="#">N89035</a> | RTM713-1.000-P1-C030.3-Z3 | 1         | 3/4       | 1             | 3-1/4          | 3      | TICN     | 0.030   |
| <a href="#">N73326</a> | RTM713-1.000-D2-C030.3-Z3 | 1         | 1         | 1-3/4         | 4-5/8          | 3      | UNCOATED | 0.030   |
| <a href="#">N89034</a> | RTM713-1.000-D2-C030.3-Z3 | 1         | 1         | 1-3/4         | 4-5/8          | 3      | TICN     | 0.030   |

## RTM447

M42  
8% COBALT



CENTER  
CUTTING

FINE PITCH



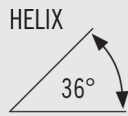
- Weldon flat standard
- Designed for profiling and slotting in steel, stainless steel and high temperature alloys
- Cutting Data - Page 288-289
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N44701</a> | RTM447-0.250-F1-C020.3-Z3 | 1/4       | 3/8       | 1/4           | 2-1/8          | 3      | UNCOATED | 0.020   |
| <a href="#">N88456</a> | RTM447-0.250-F1-C020.3-Z3 | 1/4       | 3/8       | 1/4           | 2-1/8          | 3      | TICN     | 0.020   |
| <a href="#">N44703</a> | RTM447-0.250-F3-C020.3-Z3 | 1/4       | 3/8       | 5/8           | 2-1/2          | 3      | UNCOATED | 0.020   |
| <a href="#">N88457</a> | RTM447-0.250-F3-C020.3-Z3 | 1/4       | 3/8       | 5/8           | 2-1/2          | 3      | TICN     | 0.020   |
| <a href="#">N44705</a> | RTM447-0.375-D1-C020.3-Z3 | 3/8       | 3/8       | 3/8           | 2-1/4          | 3      | UNCOATED | 0.020   |
| <a href="#">N88458</a> | RTM447-0.375-D1-C020.3-Z3 | 3/8       | 3/8       | 3/8           | 2-1/4          | 3      | TICN     | 0.020   |
| <a href="#">N44707</a> | RTM447-0.375-D2-C020.3-Z3 | 3/8       | 3/8       | 7/8           | 2-3/4          | 3      | UNCOATED | 0.020   |
| <a href="#">N88459</a> | RTM447-0.375-D2-C020.3-Z3 | 3/8       | 3/8       | 7/8           | 2-3/4          | 3      | TICN     | 0.020   |
| <a href="#">N44709</a> | RTM447-0.500-D1-C025.3-Z3 | 1/2       | 1/2       | 1/2           | 2-9/16         | 3      | UNCOATED | 0.025   |
| <a href="#">N88460</a> | RTM447-0.500-D1-C025.3-Z3 | 1/2       | 1/2       | 1/2           | 2-9/16         | 3      | TICN     | 0.025   |
| <a href="#">N44711</a> | RTM447-0.500-D2-C025.3-Z3 | 1/2       | 1/2       | 1             | 3-1/16         | 3      | UNCOATED | 0.025   |
| <a href="#">N88461</a> | RTM447-0.500-D2-C025.3-Z3 | 1/2       | 1/2       | 1             | 3-1/16         | 3      | TICN     | 0.025   |
| <a href="#">N44713</a> | RTM447-0.625-D1-C025.3-Z3 | 5/8       | 5/8       | 5/8           | 2-7/8          | 3      | UNCOATED | 0.025   |
| <a href="#">N88462</a> | RTM447-0.625-D1-C025.3-Z3 | 5/8       | 5/8       | 5/8           | 2-7/8          | 3      | TICN     | 0.025   |
| <a href="#">N44715</a> | RTM447-0.625-D2-C025.3-Z3 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 3      | UNCOATED | 0.025   |
| <a href="#">N88463</a> | RTM447-0.625-D2-C025.3-Z3 | 5/8       | 5/8       | 1-1/4         | 3-1/2          | 3      | TICN     | 0.025   |
| <a href="#">N44719</a> | RTM447-0.750-D2-C025.3-Z3 | 3/4       | 3/4       | 1-1/2         | 3-3/4          | 3      | UNCOATED | 0.025   |
| <a href="#">N88465</a> | RTM447-0.750-D2-C025.3-Z3 | 3/4       | 3/4       | 1-1/2         | 3-3/4          | 3      | TICN     | 0.025   |
| <a href="#">N44731</a> | RTM447-1.000-D2-C030.3-Z3 | 1         | 1         | 1-3/4         | 4-5/8          | 3      | UNCOATED | 0.030   |
| <a href="#">N88471</a> | RTM447-1.000-D2-C030.3-Z3 | 1         | 1         | 1-3/4         | 4-5/8          | 3      | TICN     | 0.030   |



## RHC752

M42  
8% COBALT



CENTER  
CUTTING

COARSE  
PITCH

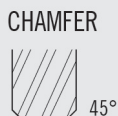
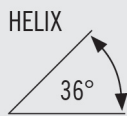


- Weldon flat standard
- Designed for profiling and slotting in aluminum and non-ferrous materials
- Cutting Data - Page 287
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N75215</a> | RHC752-0.250-F3-C020.3-Z3 | 1/4       | 3/8       | 5/8           | 2-7/16         | 3      | UNCOATED | 0.020   |
| <a href="#">N79460</a> | RHC752-0.250-F3-C020.3-Z3 | 1/4       | 3/8       | 5/8           | 2-7/16         | 3      | TICN     | 0.020   |
| <a href="#">N75201</a> | RHC752-0.375-D2-C025.3-Z3 | 3/8       | 3/8       | 3/4           | 2-1/2          | 3      | UNCOATED | 0.025   |
| <a href="#">N69360</a> | RHC752-0.375-D2-C025.3-Z3 | 3/8       | 3/8       | 3/4           | 2-1/2          | 3      | TICN     | 0.025   |
| <a href="#">N75203</a> | RHC752-0.375-D4-C025.3-Z3 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 3      | UNCOATED | 0.025   |
| <a href="#">N79464</a> | RHC752-0.375-D4-C025.3-Z3 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 3      | TICN     | 0.025   |
| <a href="#">N75205</a> | RHC752-0.500-D2-C030.3-Z3 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 3      | UNCOATED | 0.030   |
| <a href="#">N69361</a> | RHC752-0.500-D2-C030.3-Z3 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 3      | TICN     | 0.030   |
| <a href="#">N75209</a> | RHC752-0.500-D4-C030.3-Z3 | 1/2       | 1/2       | 2             | 4              | 3      | UNCOATED | 0.030   |
| <a href="#">N69362</a> | RHC752-0.500-D4-C030.3-Z3 | 1/2       | 1/2       | 2             | 4              | 3      | TICN     | 0.030   |
| <a href="#">N75213</a> | RHC752-0.625-D3-C040.3-Z3 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 3      | UNCOATED | 0.040   |
| <a href="#">N69363</a> | RHC752-0.625-D3-C040.3-Z3 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 3      | TICN     | 0.040   |
| <a href="#">N75217</a> | RHC752-0.625-D5-C040.3-Z3 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 3      | UNCOATED | 0.040   |
| <a href="#">N69364</a> | RHC752-0.625-D5-C040.3-Z3 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 3      | TICN     | 0.040   |
| <a href="#">N75233</a> | RHC752-0.750-D1-C040.3-Z3 | 3/4       | 3/4       | 3/4           | 3              | 3      | UNCOATED | 0.040   |
| <a href="#">N69368</a> | RHC752-0.750-D1-C040.3-Z3 | 3/4       | 3/4       | 3/4           | 3              | 3      | TICN     | 0.040   |
| <a href="#">N75229</a> | RHC752-0.750-D3-C040.3-Z3 | 3/4       | 3/4       | 1-1/2         | 3-3/4          | 3      | UNCOATED | 0.040   |
| <a href="#">N69367</a> | RHC752-0.750-D3-C040.3-Z3 | 3/4       | 3/4       | 1-1/2         | 3-3/4          | 3      | TICN     | 0.040   |
| <a href="#">N75221</a> | RHC752-0.750-D4-C040.3-Z3 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 3      | UNCOATED | 0.040   |
| <a href="#">N69365</a> | RHC752-0.750-D4-C040.3-Z3 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 3      | TICN     | 0.040   |
| <a href="#">N75225</a> | RHC752-0.750-D5-C040.3-Z3 | 3/4       | 3/4       | 2             | 4-1/4          | 3      | UNCOATED | 0.040   |
| <a href="#">N69366</a> | RHC752-0.750-D5-C040.3-Z3 | 3/4       | 3/4       | 2             | 4-1/4          | 3      | TICN     | 0.040   |
| <a href="#">N75223</a> | RHC752-0.750-D6-C040.3-Z3 | 3/4       | 3/4       | 2-1/2         | 4-3/4          | 3      | UNCOATED | 0.040   |
| <a href="#">N79478</a> | RHC752-0.750-D6-C040.3-Z3 | 3/4       | 3/4       | 2-1/2         | 4-3/4          | 3      | TICN     | 0.040   |
| <a href="#">N75235</a> | RHC752-0.750-D7-C040.3-Z3 | 3/4       | 3/4       | 3             | 5-1/4          | 3      | UNCOATED | 0.040   |
| <a href="#">N79479</a> | RHC752-0.750-D7-C040.3-Z3 | 3/4       | 3/4       | 3             | 5-1/4          | 3      | TICN     | 0.040   |
| <a href="#">N75253</a> | RHC752-1.000-P3-C040.3-Z3 | 1         | 3/4       | 1-1/2         | 3-3/4          | 3      | UNCOATED | 0.040   |
| <a href="#">N69373</a> | RHC752-1.000-P3-C040.3-Z3 | 1         | 3/4       | 1-1/2         | 3-3/4          | 3      | TICN     | 0.040   |
| <a href="#">N75245</a> | RHC752-1.000-D3-C040.3-Z3 | 1         | 1         | 2             | 4-1/2          | 3      | UNCOATED | 0.040   |
| <a href="#">N69371</a> | RHC752-1.000-D3-C040.3-Z3 | 1         | 1         | 2             | 4-1/2          | 3      | TICN     | 0.040   |
| <a href="#">N75249</a> | RHC752-1.000-D4-C040.3-Z3 | 1         | 1         | 3             | 5-1/2          | 3      | UNCOATED | 0.040   |
| <a href="#">N69372</a> | RHC752-1.000-D4-C040.3-Z3 | 1         | 1         | 3             | 5-1/2          | 3      | TICN     | 0.040   |
| <a href="#">N75351</a> | RHC752-1.000-D5-C040.3-Z3 | 1         | 1         | 4             | 6-1/2          | 3      | UNCOATED | 0.040   |
| <a href="#">N79493</a> | RHC752-1.000-D5-C040.3-Z3 | 1         | 1         | 4             | 6-1/2          | 3      | TICN     | 0.040   |
| <a href="#">N75261</a> | RHC752-1.250-D2-C045.3-Z3 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 3      | UNCOATED | 0.045   |
| <a href="#">N69375</a> | RHC752-1.250-D2-C045.3-Z3 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 3      | TICN     | 0.045   |
| <a href="#">N75265</a> | RHC752-1.250-D3-C045.3-Z3 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 3      | UNCOATED | 0.045   |
| <a href="#">N69376</a> | RHC752-1.250-D3-C045.3-Z3 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 3      | TICN     | 0.045   |
| <a href="#">N75283</a> | RHC752-1.500-P7-C045.3-Z3 | 1-1/2     | 1-1/4     | 4             | 6-1/2          | 3      | UNCOATED | 0.045   |
| <a href="#">N79508</a> | RHC752-1.500-P7-C045.3-Z3 | 1-1/2     | 1-1/4     | 4             | 6-1/2          | 3      | TICN     | 0.045   |

## RHLC754

M42  
8% COBALT



CENTER  
CUTTING

COARSE  
PITCH



- Weldon flat standard
- Designed for profiling and slotting in aluminum and non-ferrous materials
- Cutting Data - Page 287
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION                | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING  | CHAMFER |
|------------------------|----------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|----------|---------|
| <a href="#">N75421</a> | RHLC754-1.000-E2-C040.3-Z3 | 1         | 1         | 2-1/2         | 6-1/2          | 0.850    | 4     | 3      | UNCOATED | 0.040   |
| <a href="#">N89112</a> | RHLC754-1.000-E2-C040.3-Z3 | 1         | 1         | 2-1/2         | 6-1/2          | 0.850    | 4     | 3      | TICN     | 0.040   |
| <a href="#">N75425</a> | RHLC754-1.000-E3-C040.3-Z3 | 1         | 1         | 2-1/2         | 8-1/2          | 0.850    | 6     | 3      | UNCOATED | 0.040   |
| <a href="#">N89113</a> | RHLC754-1.000-E3-C040.3-Z3 | 1         | 1         | 2-1/2         | 8-1/2          | 0.850    | 6     | 3      | TICN     | 0.040   |
| <a href="#">N75441</a> | RHLC754-1.250-E3-C045.3-Z3 | 1-1/4     | 1-1/4     | 2-1/2         | 8-1/2          | 1.050    | 6     | 3      | UNCOATED | 0.045   |
| <a href="#">N89115</a> | RHLC754-1.250-E3-C045.3-Z3 | 1-1/4     | 1-1/4     | 2-1/2         | 8-1/2          | 1.050    | 6     | 3      | TICN     | 0.045   |
| <a href="#">N75459</a> | RHLC754-1.500-P6-C045.3-Z3 | 1-1/2     | 1-1/4     | 2-1/2         | 10-1/2         | 1.050    | 6     | 3      | UNCOATED | 0.045   |
| <a href="#">N89118</a> | RHLC754-1.500-P6-C045.3-Z3 | 1-1/2     | 1-1/4     | 2-1/2         | 10-1/2         | 1.050    | 6     | 3      | TICN     | 0.045   |

## REM710

M42  
8% COBALT



NON  
CENTER  
CUTTING

COARSE  
PITCH



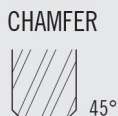
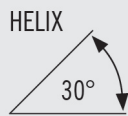
- Weldon flat standard
- Designed for profiling and slotting in all materials
- Cutting Data - Page 290-291
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N71061</a> | REM710-0.188-F3-C020.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | UNCOATED | 0.020   |
| <a href="#">N69290</a> | REM710-0.188-F3-C020.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | TICN     | 0.020   |
| <a href="#">N71081</a> | REM710-0.250-F2-C020.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | UNCOATED | 0.020   |
| <a href="#">N71084</a> | REM710-0.250-F2-C020.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | TICN     | 0.020   |
| <a href="#">N71082</a> | REM710-0.250-F4-C020.3-Z4 | 1/4       | 3/8       | 1-1/4         | 3-1/16         | 4      | UNCOATED | 0.020   |
| <a href="#">N69291</a> | REM710-0.250-F4-C020.3-Z4 | 1/4       | 3/8       | 1-1/4         | 3-1/16         | 4      | TICN     | 0.020   |
| <a href="#">N71101</a> | REM710-0.313-F2-C025.3-Z4 | 5/16      | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N71104</a> | REM710-0.313-F2-C025.3-Z4 | 5/16      | 3/8       | 3/4           | 2-1/2          | 4      | TICN     | 0.025   |
| <a href="#">N71102</a> | REM710-0.313-F4-C025.3-Z4 | 5/16      | 3/8       | 1-3/8         | 3-1/8          | 4      | UNCOATED | 0.025   |
| <a href="#">N69293</a> | REM710-0.313-F4-C025.3-Z4 | 5/16      | 3/8       | 1-3/8         | 3-1/8          | 4      | TICN     | 0.025   |
| <a href="#">N71121</a> | REM710-0.375-D2-C025.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N71124</a> | REM710-0.375-D2-C025.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | TICN     | 0.025   |
| <a href="#">N71126</a> | REM710-0.375-D3-C025.3-Z4 | 3/8       | 3/8       | 1-3/8         | 3-1/8          | 4      | UNCOATED | 0.025   |
| <a href="#">N70940</a> | REM710-0.375-D3-C025.3-Z4 | 3/8       | 3/8       | 1-3/8         | 3-1/8          | 4      | TICN     | 0.025   |
| <a href="#">N71122</a> | REM710-0.375-D4-C025.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | UNCOATED | 0.025   |
| <a href="#">N69294</a> | REM710-0.375-D4-C025.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | TICN     | 0.025   |

DISCOUNT CODE D41

## REM710 - (CONT'D)

M42  
8% COBALT



NON  
CENTER  
CUTTING

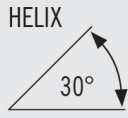


- Weldon flat standard
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- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N71141</a> | REM710-0.438-P2-C025.3-Z4 | 7/16      | 3/8       | 1             | 2-11/16        | 4      | UNCOATED | 0.025   |
| <a href="#">N69295</a> | REM710-0.438-P2-C025.3-Z4 | 7/16      | 3/8       | 1             | 2-11/16        | 4      | TICN     | 0.025   |
| <a href="#">N71161</a> | REM710-0.500-D1-C025.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | UNCOATED | 0.025   |
| <a href="#">N79420</a> | REM710-0.500-D1-C025.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | TICN     | 0.025   |
| <a href="#">N71162</a> | REM710-0.500-D2-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | UNCOATED | 0.025   |
| <a href="#">N71165</a> | REM710-0.500-D2-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | TICN     | 0.025   |
| <a href="#">N72162</a> | REM710-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-5/8         | 3-5/8          | 4      | UNCOATED | 0.025   |
| <a href="#">N79421</a> | REM710-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-5/8         | 3-5/8          | 4      | TICN     | 0.025   |
| <a href="#">N71163</a> | REM710-0.500-D4-C025.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | UNCOATED | 0.025   |
| <a href="#">N69296</a> | REM710-0.500-D4-C025.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | TICN     | 0.025   |
| <a href="#">N72163</a> | REM710-0.500-D5-C025.3-Z4 | 1/2       | 1/2       | 2-1/2         | 4-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N79422</a> | REM710-0.500-D5-C025.3-Z4 | 1/2       | 1/2       | 2-1/2         | 4-1/2          | 4      | TICN     | 0.025   |
| <a href="#">N72167</a> | REM710-0.500-D6-C025.3-Z4 | 1/2       | 1/2       | 3             | 5              | 4      | UNCOATED | 0.025   |
| <a href="#">N79423</a> | REM710-0.500-D6-C025.3-Z4 | 1/2       | 1/2       | 3             | 5              | 4      | TICN     | 0.025   |
| <a href="#">N71182</a> | REM710-0.563-P2-C025.3-Z4 | 9/16      | 1/2       | 1-3/8         | 3-3/8          | 4      | UNCOATED | 0.025   |
| <a href="#">N69297</a> | REM710-0.563-P2-C025.3-Z4 | 9/16      | 1/2       | 1-3/8         | 3-3/8          | 4      | TICN     | 0.025   |
| <a href="#">N71206</a> | REM710-0.625-D1-C030.3-Z4 | 5/8       | 5/8       | 3/4           | 2-7/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N79424</a> | REM710-0.625-D1-C030.3-Z4 | 5/8       | 5/8       | 3/4           | 2-7/8          | 4      | TICN     | 0.030   |
| <a href="#">N71202</a> | REM710-0.625-D2-C030.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-3/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N79425</a> | REM710-0.625-D2-C030.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-3/8          | 4      | TICN     | 0.030   |
| <a href="#">N71203</a> | REM710-0.625-D3-C030.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N71208</a> | REM710-0.625-D3-C030.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | TICN     | 0.030   |
| <a href="#">N71204</a> | REM710-0.625-D5-C030.3-Z4 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N69298</a> | REM710-0.625-D5-C030.3-Z4 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 4      | TICN     | 0.030   |
| <a href="#">N72204</a> | REM710-0.625-D6-C030.3-Z4 | 5/8       | 5/8       | 3-1/8         | 5-1/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N79427</a> | REM710-0.625-D6-C030.3-Z4 | 5/8       | 5/8       | 3-1/8         | 5-1/4          | 4      | TICN     | 0.030   |
| <a href="#">N71243</a> | REM710-0.750-P2-C030.3-Z4 | 3/4       | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N69301</a> | REM710-0.750-P2-C030.3-Z4 | 3/4       | 5/8       | 1-5/8         | 3-3/4          | 4      | TICN     | 0.030   |
| <a href="#">N72243</a> | REM710-0.750-D1-C030.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | UNCOATED | 0.030   |
| <a href="#">N69300</a> | REM710-0.750-D1-C030.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | TICN     | 0.030   |
| <a href="#">N71241</a> | REM710-0.750-D2-C030.3-Z4 | 3/4       | 3/4       | 1-1/4         | 3-1/2          | 4      | UNCOATED | 0.030   |
| <a href="#">N79429</a> | REM710-0.750-D2-C030.3-Z4 | 3/4       | 3/4       | 1-1/4         | 3-1/2          | 4      | TICN     | 0.030   |
| <a href="#">N72241</a> | REM710-0.750-D3-C030.3-Z4 | 3/4       | 3/4       | 1-1/2         | 3-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N79430</a> | REM710-0.750-D3-C030.3-Z4 | 3/4       | 3/4       | 1-1/2         | 3-3/4          | 4      | TICN     | 0.030   |
| <a href="#">N71244</a> | REM710-0.750-D4-C030.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N71245</a> | REM710-0.750-D4-C030.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | TICN     | 0.030   |
| <a href="#">N71247</a> | REM710-0.750-D5-C030.3-Z4 | 3/4       | 3/4       | 2             | 4-1/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N79431</a> | REM710-0.750-D5-C030.3-Z4 | 3/4       | 3/4       | 2             | 4-1/4          | 4      | TICN     | 0.030   |
| <a href="#">N72245</a> | REM710-0.750-D6-C030.3-Z4 | 3/4       | 3/4       | 2-1/2         | 4-3/4          | 4      | UNCOATED | 0.030   |

## REM710 (CONT'D)

M42  
8% COBALT



NON  
CENTER  
CUTTING

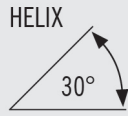


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- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N79432</a> | REM710-0.750-D6-C030.3-Z4 | 3/4       | 3/4       | 2-1/2         | 4-3/4          | 4      | TICN     | 0.030   |
| <a href="#">N72244</a> | REM710-0.750-D7-C030.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N69299</a> | REM710-0.750-D7-C030.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | TICN     | 0.030   |
| <a href="#">N72248</a> | REM710-0.750-D8-C030.3-Z4 | 3/4       | 3/4       | 4-1/8         | 6-3/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N79433</a> | REM710-0.750-D8-C030.3-Z4 | 3/4       | 3/4       | 4-1/8         | 6-3/8          | 4      | TICN     | 0.030   |
| <a href="#">N72284</a> | REM710-0.875-P3-C030.3-Z5 | 7/8       | 3/4       | 1-7/8         | 4-1/8          | 5      | UNCOATED | 0.030   |
| <a href="#">N69302</a> | REM710-0.875-P3-C030.3-Z5 | 7/8       | 3/4       | 1-7/8         | 4-1/8          | 5      | TICN     | 0.030   |
| <a href="#">N71283</a> | REM710-0.875-P4-C030.3-Z5 | 7/8       | 3/4       | 3-1/2         | 5-3/4          | 5      | UNCOATED | 0.030   |
| <a href="#">N69303</a> | REM710-0.875-P4-C030.3-Z5 | 7/8       | 3/4       | 3-1/2         | 5-3/4          | 5      | TICN     | 0.030   |
| <a href="#">N71284</a> | REM710-0.875-D2-C030.3-Z5 | 7/8       | 7/8       | 1-7/8         | 4-1/8          | 5      | UNCOATED | 0.030   |
| <a href="#">N69304</a> | REM710-0.875-D2-C030.3-Z5 | 7/8       | 7/8       | 1-7/8         | 4-1/8          | 5      | TICN     | 0.030   |
| <a href="#">N71285</a> | REM710-0.875-D4-C030.3-Z5 | 7/8       | 7/8       | 3-1/2         | 5-3/4          | 5      | UNCOATED | 0.030   |
| <a href="#">N69305</a> | REM710-0.875-D4-C030.3-Z5 | 7/8       | 7/8       | 3-1/2         | 5-3/4          | 5      | TICN     | 0.030   |
| <a href="#">N71324</a> | REM710-1.000-P1-C030.3-Z5 | 1         | 3/4       | 3/4           | 3              | 5      | UNCOATED | 0.030   |
| <a href="#">N69310</a> | REM710-1.000-P1-C030.3-Z5 | 1         | 3/4       | 3/4           | 3              | 5      | TICN     | 0.030   |
| <a href="#">N72324</a> | REM710-1.000-P3-C030.3-Z5 | 1         | 3/4       | 1-1/2         | 3-3/4          | 5      | UNCOATED | 0.030   |
| <a href="#">N69309</a> | REM710-1.000-P3-C030.3-Z5 | 1         | 3/4       | 1-1/2         | 3-3/4          | 5      | TICN     | 0.030   |
| <a href="#">N71330</a> | REM710-1.000-P4-C030.3-Z5 | 1         | 3/4       | 2             | 4-1/4          | 5      | UNCOATED | 0.030   |
| <a href="#">N79439</a> | REM710-1.000-P4-C030.3-Z5 | 1         | 3/4       | 2             | 4-1/4          | 5      | TICN     | 0.030   |
| <a href="#">N71326</a> | REM710-1.000-D3-C030.3-Z5 | 1         | 1         | 2             | 4-1/2          | 5      | UNCOATED | 0.030   |
| <a href="#">N71329</a> | REM710-1.000-D3-C030.3-Z5 | 1         | 1         | 2             | 4-1/2          | 5      | TICN     | 0.030   |
| <a href="#">N71327</a> | REM710-1.000-D4-C030.3-Z5 | 1         | 1         | 3             | 5-1/2          | 5      | UNCOATED | 0.030   |
| <a href="#">N69306</a> | REM710-1.000-D4-C030.3-Z5 | 1         | 1         | 3             | 5-1/2          | 5      | TICN     | 0.030   |
| <a href="#">N72326</a> | REM710-1.000-D5-C030.3-Z5 | 1         | 1         | 4             | 6-1/2          | 5      | UNCOATED | 0.030   |
| <a href="#">N69307</a> | REM710-1.000-D5-C030.3-Z5 | 1         | 1         | 4             | 6-1/2          | 5      | TICN     | 0.030   |
| <a href="#">N72327</a> | REM710-1.000-D6-C030.3-Z5 | 1         | 1         | 6             | 8-1/2          | 5      | UNCOATED | 0.030   |
| <a href="#">N69308</a> | REM710-1.000-D6-C030.3-Z5 | 1         | 1         | 6             | 8-1/2          | 5      | TICN     | 0.030   |
| <a href="#">N71366</a> | REM710-1.125-P3-C040.3-Z6 | 1-1/8     | 1         | 2             | 4-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N69311</a> | REM710-1.125-P3-C040.3-Z6 | 1-1/8     | 1         | 2             | 4-1/2          | 6      | TICN     | 0.040   |
| <a href="#">N71367</a> | REM710-1.125-P4-C040.3-Z6 | 1-1/8     | 1         | 3-1/2         | 6              | 6      | UNCOATED | 0.040   |
| <a href="#">N79446</a> | REM710-1.125-P4-C040.3-Z6 | 1-1/8     | 1         | 3-1/2         | 6              | 6      | TICN     | 0.040   |
| <a href="#">N71404</a> | REM710-1.250-P1-C040.3-Z6 | 1-1/4     | 3/4       | 3/4           | 3              | 6      | UNCOATED | 0.040   |
| <a href="#">N69317</a> | REM710-1.250-P1-C040.3-Z6 | 1-1/4     | 3/4       | 3/4           | 3              | 6      | TICN     | 0.040   |
| <a href="#">N72404</a> | REM710-1.250-P3-C040.3-Z6 | 1-1/4     | 3/4       | 1-1/2         | 3-3/4          | 6      | UNCOATED | 0.040   |
| <a href="#">N69316</a> | REM710-1.250-P3-C040.3-Z6 | 1-1/4     | 3/4       | 1-1/2         | 3-3/4          | 6      | TICN     | 0.040   |
| <a href="#">N71406</a> | REM710-1.250-P4-C040.3-Z6 | 1-1/4     | 3/4       | 2             | 4-1/4          | 6      | UNCOATED | 0.040   |
| <a href="#">N79448</a> | REM710-1.250-P4-C040.3-Z6 | 1-1/4     | 3/4       | 2             | 4-1/4          | 6      | TICN     | 0.040   |
| <a href="#">N71407</a> | REM710-1.250-D2-C040.3-Z6 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 6      | UNCOATED | 0.040   |

## REM710 (CONT'D)

M42  
8% COBALT



NON  
CENTER  
CUTTING

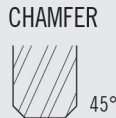
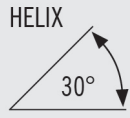


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| PRODUCT NUMBER         | DESCRIPTION                | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|----------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N69312</a> | REM710-1.250-D2-C040.3-Z6  | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 6      | TICN     | 0.040   |
| <a href="#">N71408</a> | REM710-1.250-D3-C040.3-Z6  | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N69313</a> | REM710-1.250-D3-C040.3-Z6  | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 6      | TICN     | 0.040   |
| <a href="#">N72407</a> | REM710-1.250-D4-C040.3-Z6  | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N69314</a> | REM710-1.250-D4-C040.3-Z6  | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 6      | TICN     | 0.040   |
| <a href="#">N72408</a> | REM710-1.250-D5-C040.3-Z6  | 1-1/4     | 1-1/4     | 6             | 8-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N69315</a> | REM710-1.250-D5-C040.3-Z6  | 1-1/4     | 1-1/4     | 6             | 8-1/2          | 6      | TICN     | 0.040   |
| <a href="#">N72484</a> | REM710-1.500-P3-C040.3-Z6  | 1-1/2     | 3/4       | 1-1/2         | 3-3/4          | 6      | UNCOATED | 0.040   |
| <a href="#">N69324</a> | REM710-1.500-P3-C040.3-Z6  | 1-1/2     | 3/4       | 1-1/2         | 3-3/4          | 6      | TICN     | 0.040   |
| <a href="#">N72485</a> | REM710-1.500-P4-C040.3-Z6  | 1-1/2     | 3/4       | 2             | 4-1/4          | 6      | UNCOATED | 0.040   |
| <a href="#">N79453</a> | REM710-1.500-P4-C040.3-Z6  | 1-1/2     | 3/4       | 2             | 4-1/4          | 6      | TICN     | 0.040   |
| <a href="#">N71487</a> | REM710-1.500-P5-C040.3-Z6  | 1-1/2     | 1-1/4     | 2             | 4-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N69318</a> | REM710-1.500-P5-C040.3-Z6  | 1-1/2     | 1-1/4     | 2             | 4-1/2          | 6      | TICN     | 0.040   |
| <a href="#">N71488</a> | REM710-1.500-P6-C040.3-Z6  | 1-1/2     | 1-1/4     | 3             | 5-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N69319</a> | REM710-1.500-P6-C040.3-Z6  | 1-1/2     | 1-1/4     | 3             | 5-1/2          | 6      | TICN     | 0.040   |
| <a href="#">N72487</a> | REM710-1.500-P7-C040.3-Z6  | 1-1/2     | 1-1/4     | 4             | 6-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N69320</a> | REM710-1.500-P7-C040.3-Z6  | 1-1/2     | 1-1/4     | 4             | 6-1/2          | 6      | TICN     | 0.040   |
| <a href="#">N72488</a> | REM710-1.500-P8-C040.3-Z6  | 1-1/2     | 1-1/4     | 5             | 7-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N69321</a> | REM710-1.500-P8-C040.3-Z6  | 1-1/2     | 1-1/4     | 5             | 7-1/2          | 6      | TICN     | 0.040   |
| <a href="#">N71489</a> | REM710-1.500-P9-C040.3-Z6  | 1-1/2     | 1-1/4     | 6             | 8-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N69322</a> | REM710-1.500-P9-C040.3-Z6  | 1-1/2     | 1-1/4     | 6             | 8-1/2          | 6      | TICN     | 0.040   |
| <a href="#">N72489</a> | REM710-1.500-P10-C040.3-Z6 | 1-1/2     | 1-1/4     | 8             | 10-1/2         | 6      | UNCOATED | 0.040   |
| <a href="#">N69323</a> | REM710-1.500-P10-C040.3-Z6 | 1-1/2     | 1-1/4     | 8             | 10-1/2         | 6      | TICN     | 0.040   |
| <a href="#">N72574</a> | REM710-1.750-P5-C040.3-Z6  | 1-3/4     | 1-1/4     | 4             | 6-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N69328</a> | REM710-1.750-P5-C040.3-Z6  | 1-3/4     | 1-1/4     | 4             | 6-1/2          | 6      | TICN     | 0.040   |
| <a href="#">N71640</a> | REM710-2.000-P2-C040.3-Z8  | 2         | 3/4       | 1-1/8         | 3-3/8          | 8      | UNCOATED | 0.040   |
| <a href="#">N79456</a> | REM710-2.000-P2-C040.3-Z8  | 2         | 3/4       | 1-1/8         | 3-3/8          | 8      | TICN     | 0.040   |
| <a href="#">N71645</a> | REM710-2.000-P4-C040.3-Z8  | 2         | 1-1/4     | 2             | 4-1/2          | 8      | UNCOATED | 0.040   |
| <a href="#">N69331</a> | REM710-2.000-P4-C040.3-Z8  | 2         | 1-1/4     | 2             | 4-1/2          | 8      | TICN     | 0.040   |
| <a href="#">N71648</a> | REM710-2.000-P5-C040.3-Z8  | 2         | 1-1/4     | 4             | 6-1/2          | 8      | UNCOATED | 0.040   |
| <a href="#">N69332</a> | REM710-2.000-P5-C040.3-Z8  | 2         | 1-1/4     | 4             | 6-1/2          | 8      | TICN     | 0.040   |
| <a href="#">N71343</a> | REM710-2.000-D3-C040.7-Z8  | 2         | 2         | 4             | 7-3/4          | 8      | UNCOATED | 0.040   |
| <a href="#">N69335</a> | REM710-2.000-D3-C040.7-Z8  | 2         | 2         | 4             | 7-3/4          | 8      | TICN     | 0.040   |
| <a href="#">N71353</a> | REM710-2.000-D4-C040.7-Z8  | 2         | 2         | 5             | 8-3/4          | 8      | UNCOATED | 0.040   |
| <a href="#">N69336</a> | REM710-2.000-D4-C040.7-Z8  | 2         | 2         | 5             | 8-3/4          | 8      | TICN     | 0.040   |
| <a href="#">N71363</a> | REM710-2.000-D5-C040.7-Z8  | 2         | 2         | 6             | 9-3/4          | 8      | UNCOATED | 0.040   |
| <a href="#">N69337</a> | REM710-2.000-D5-C040.7-Z8  | 2         | 2         | 6             | 9-3/4          | 8      | TICN     | 0.040   |
| <a href="#">N71383</a> | REM710-2.000-D7-C040.7-Z8  | 2         | 2         | 8             | 11-3/4         | 8      | UNCOATED | 0.040   |
| <a href="#">N69339</a> | REM710-2.000-D7-C040.7-Z8  | 2         | 2         | 8             | 11-3/4         | 8      | TICN     | 0.040   |

## REC700

M42  
8% COBALT



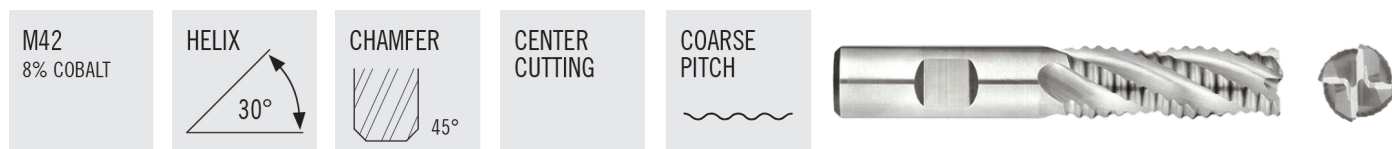
CENTER  
CUTTING



- Weldon flat standard
- Designed for profiling and slotting in all materials
- Cutting Data - Page 290-291
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N70013</a> | REC700-0.188-F3-C020.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | UNCOATED | 0.020   |
| <a href="#">N88861</a> | REC700-0.188-F3-C020.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | TICN     | 0.020   |
| <a href="#">N70210</a> | REC700-0.250-F2-C020.3-Z4 | 1/4       | 3/8       | 3/8           | 2-3/16         | 4      | UNCOATED | 0.020   |
| <a href="#">N70212</a> | REC700-0.250-F2-C020.3-Z4 | 1/4       | 3/8       | 3/8           | 2-3/16         | 4      | TICN     | 0.020   |
| <a href="#">N70015</a> | REC700-0.250-F3-C020.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | UNCOATED | 0.020   |
| <a href="#">N88862</a> | REC700-0.250-F3-C020.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | TICN     | 0.020   |
| <a href="#">N70017</a> | REC700-0.250-F5-C020.3-Z4 | 1/4       | 3/8       | 1-1/4         | 3-1/16         | 4      | UNCOATED | 0.020   |
| <a href="#">N88863</a> | REC700-0.250-F5-C020.3-Z4 | 1/4       | 3/8       | 1-1/4         | 3-1/16         | 4      | TICN     | 0.020   |
| <a href="#">N70019</a> | REC700-0.313-F2-C025.3-Z4 | 5/16      | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N88864</a> | REC700-0.313-F2-C025.3-Z4 | 5/16      | 3/8       | 3/4           | 2-1/2          | 4      | TICN     | 0.025   |
| <a href="#">N70023</a> | REC700-0.375-D2-C025.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N88866</a> | REC700-0.375-D2-C025.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | TICN     | 0.025   |
| <a href="#">N70025</a> | REC700-0.375-D4-C025.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | UNCOATED | 0.025   |
| <a href="#">N88867</a> | REC700-0.375-D4-C025.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | TICN     | 0.025   |
| <a href="#">N70027</a> | REC700-0.438-P2-C025.3-Z4 | 7/16      | 3/8       | 1             | 2-11/16        | 4      | UNCOATED | 0.025   |
| <a href="#">N88868</a> | REC700-0.438-P2-C025.3-Z4 | 7/16      | 3/8       | 1             | 2-11/16        | 4      | TICN     | 0.025   |
| <a href="#">N70216</a> | REC700-0.500-D1-C025.3-Z4 | 1/2       | 1/2       | 5/8           | 2-5/8          | 4      | UNCOATED | 0.025   |
| <a href="#">N70218</a> | REC700-0.500-D1-C025.3-Z4 | 1/2       | 1/2       | 5/8           | 2-5/8          | 4      | TICN     | 0.025   |
| <a href="#">N70129</a> | REC700-0.500-D2-C025.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | UNCOATED | 0.025   |
| <a href="#">N88869</a> | REC700-0.500-D2-C025.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | TICN     | 0.025   |
| <a href="#">N70031</a> | REC700-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | UNCOATED | 0.025   |
| <a href="#">N88870</a> | REC700-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | TICN     | 0.025   |
| <a href="#">N70033</a> | REC700-0.500-D4-C025.3-Z4 | 1/2       | 1/2       | 1-5/8         | 3-5/8          | 4      | UNCOATED | 0.025   |
| <a href="#">N79526</a> | REC700-0.500-D4-C025.3-Z4 | 1/2       | 1/2       | 1-5/8         | 3-5/8          | 4      | TICN     | 0.025   |
| <a href="#">N70035</a> | REC700-0.500-D5-C025.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | UNCOATED | 0.025   |
| <a href="#">N88871</a> | REC700-0.500-D5-C025.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | TICN     | 0.025   |
| <a href="#">N70137</a> | REC700-0.500-D6-C025.3-Z4 | 1/2       | 1/2       | 2-1/2         | 4-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N79527</a> | REC700-0.500-D6-C025.3-Z4 | 1/2       | 1/2       | 2-1/2         | 4-1/2          | 4      | TICN     | 0.025   |
| <a href="#">N70139</a> | REC700-0.500-D7-C025.3-Z4 | 1/2       | 1/2       | 3             | 5              | 4      | UNCOATED | 0.025   |
| <a href="#">N79528</a> | REC700-0.500-D7-C025.3-Z4 | 1/2       | 1/2       | 3             | 5              | 4      | TICN     | 0.025   |
| <a href="#">N70037</a> | REC700-0.563-P2-C025.3-Z4 | 9/16      | 1/2       | 1-3/8         | 3-3/8          | 4      | UNCOATED | 0.025   |
| <a href="#">N88872</a> | REC700-0.563-P2-C025.3-Z4 | 9/16      | 1/2       | 1-3/8         | 3-3/8          | 4      | TICN     | 0.025   |
| <a href="#">N70029</a> | REC700-0.625-D3-C030.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-3/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N79530</a> | REC700-0.625-D3-C030.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-3/8          | 4      | TICN     | 0.030   |
| <a href="#">N70039</a> | REC700-0.625-D4-C030.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N88873</a> | REC700-0.625-D4-C030.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | TICN     | 0.030   |
| <a href="#">N70043</a> | REC700-0.625-D6-C030.3-Z4 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N88874</a> | REC700-0.625-D6-C030.3-Z4 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 4      | TICN     | 0.030   |
| <a href="#">N70045</a> | REC700-0.625-D7-C030.3-Z4 | 5/8       | 5/8       | 3-1/8         | 5-1/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N79532</a> | REC700-0.625-D7-C030.3-Z4 | 5/8       | 5/8       | 3-1/8         | 5-1/4          | 4      | TICN     | 0.030   |

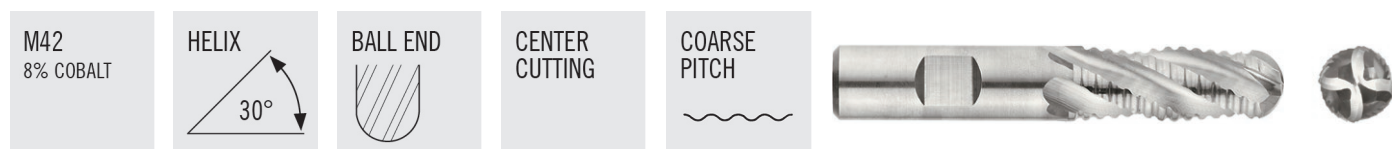
## REC700 (CONT'D)



- Weldon flat standard
- Designed for profiling and slotting in all materials
- Cutting Data - Page 290-291
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N70049</a> | REC700-0.750-D1-C030.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | UNCOATED | 0.030   |
| <a href="#">N88876</a> | REC700-0.750-D1-C030.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | TICN     | 0.030   |
| <a href="#">N70151</a> | REC700-0.750-D2-C030.3-Z4 | 3/4       | 3/4       | 1-1/4         | 3-1/2          | 4      | UNCOATED | 0.030   |
| <a href="#">N79534</a> | REC700-0.750-D2-C030.3-Z4 | 3/4       | 3/4       | 1-1/4         | 3-1/2          | 4      | TICN     | 0.030   |
| <a href="#">N70153</a> | REC700-0.750-D3-C030.3-Z4 | 3/4       | 3/4       | 1-1/2         | 3-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N79535</a> | REC700-0.750-D3-C030.3-Z4 | 3/4       | 3/4       | 1-1/2         | 3-3/4          | 4      | TICN     | 0.030   |
| <a href="#">N70047</a> | REC700-0.750-D4-C030.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N88875</a> | REC700-0.750-D4-C030.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | TICN     | 0.030   |
| <a href="#">N70149</a> | REC700-0.750-D5-C030.3-Z4 | 3/4       | 3/4       | 2             | 4-1/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N79536</a> | REC700-0.750-D5-C030.3-Z4 | 3/4       | 3/4       | 2             | 4-1/4          | 4      | TICN     | 0.030   |
| <a href="#">N70155</a> | REC700-0.750-D6-C030.3-Z4 | 3/4       | 3/4       | 2-1/2         | 4-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N79537</a> | REC700-0.750-D6-C030.3-Z4 | 3/4       | 3/4       | 2-1/2         | 4-3/4          | 4      | TICN     | 0.030   |
| <a href="#">N70051</a> | REC700-0.750-D7-C030.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N88877</a> | REC700-0.750-D7-C030.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | TICN     | 0.030   |
| <a href="#">N70157</a> | REC700-0.750-D8-C030.3-Z4 | 3/4       | 3/4       | 4-1/8         | 6-3/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N79538</a> | REC700-0.750-D8-C030.3-Z4 | 3/4       | 3/4       | 4-1/8         | 6-3/8          | 4      | TICN     | 0.030   |
| <a href="#">N70055</a> | REC700-0.875-P3-C030.3-Z5 | 7/8       | 3/4       | 1-7/8         | 4-1/8          | 5      | UNCOATED | 0.030   |
| <a href="#">N88879</a> | REC700-0.875-P3-C030.3-Z5 | 7/8       | 3/4       | 1-7/8         | 4-1/8          | 5      | TICN     | 0.030   |
| <a href="#">N70059</a> | REC700-0.875-P4-C030.3-Z5 | 7/8       | 3/4       | 3-1/2         | 5-3/4          | 5      | UNCOATED | 0.030   |
| <a href="#">N88880</a> | REC700-0.875-P4-C030.3-Z5 | 7/8       | 3/4       | 3-1/2         | 5-3/4          | 5      | TICN     | 0.030   |

## RMB700



- Weldon flat standard
- Designed for profiling, slotting and contouring in all materials
- Cutting Data - Page 290-291
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N70162</a> | RMB700-0.500-D3-B.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | UNCOATED |
| <a href="#">N88897</a> | RMB700-0.500-D3-B.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | TICN     |
| <a href="#">N70203</a> | RMB700-0.625-D3-B.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED |
| <a href="#">N88898</a> | RMB700-0.625-D3-B.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | TICN     |
| <a href="#">N70244</a> | RMB700-0.750-D2-B.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | UNCOATED |
| <a href="#">N88899</a> | RMB700-0.750-D2-B.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | TICN     |
| <a href="#">N70326</a> | RMB700-1.000-D2-B.3-Z5 | 1         | 1         | 2             | 4-1/2          | 5      | UNCOATED |
| <a href="#">N88900</a> | RMB700-1.000-D2-B.3-Z5 | 1         | 1         | 2             | 4-1/2          | 5      | TICN     |

DISCOUNT CODE D41

## RXC753

|                  |           |             |                |                  |  |  |
|------------------|-----------|-------------|----------------|------------------|--|--|
| M42<br>8% COBALT | HELIX<br> | CHAMFER<br> | CENTER CUTTING | COARSE PITCH<br> |  |  |
|------------------|-----------|-------------|----------------|------------------|--|--|

- Weldon flat standard
- Designed for profiling and slotting in all materials
- Cutting Data - Page 292
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | NECK DIA | REACH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|----------|-------|--------|----------|---------|
| <a href="#">N75341</a> | RXC753-1.000-E2-C030.3-Z5 | 1         | 1         | 2-1/2         | 6-1/2          | 0.850    | 4     | 5      | UNCOATED | 0.030   |
| <a href="#">N89100</a> | RXC753-1.000-E2-C030.3-Z5 | 1         | 1         | 2-1/2         | 6-1/2          | 0.850    | 4     | 5      | TICN     | 0.030   |
| <a href="#">N75345</a> | RXC753-1.000-E3-C030.3-Z5 | 1         | 1         | 2-1/2         | 8-1/2          | 0.850    | 6     | 5      | UNCOATED | 0.030   |
| <a href="#">N89101</a> | RXC753-1.000-E3-C030.3-Z5 | 1         | 1         | 2-1/2         | 8-1/2          | 0.850    | 6     | 5      | TICN     | 0.030   |
| <a href="#">N75353</a> | RXC753-1.250-E3-C040.3-Z6 | 1-1/4     | 1-1/4     | 2-1/2         | 8-1/2          | 1.050    | 6     | 6      | UNCOATED | 0.040   |
| <a href="#">N89103</a> | RXC753-1.250-E3-C040.3-Z6 | 1-1/4     | 1-1/4     | 2-1/2         | 8-1/2          | 1.050    | 6     | 6      | TICN     | 0.040   |
| <a href="#">N75365</a> | RXC753-1.500-P4-C040.3-Z6 | 1-1/2     | 1-1/4     | 2-1/2         | 10-1/2         | 1.050    | 8     | 6      | UNCOATED | 0.040   |
| <a href="#">N89106</a> | RXC753-1.500-P4-C040.3-Z6 | 1-1/2     | 1-1/4     | 2-1/2         | 10-1/2         | 1.050    | 8     | 6      | TICN     | 0.040   |

## EXCEL SERIES-EXR350

|                                       |           |             |                |                |  |  |
|---------------------------------------|-----------|-------------|----------------|----------------|--|--|
| PREMIUM PARTICLE METAL<br>8.5% COBALT | HELIX<br> | CHAMFER<br> | CENTER CUTTING | FINE PITCH<br> |  |  |
|---------------------------------------|-----------|-------------|----------------|----------------|--|--|

- Weldon flat standard
- Designed for pocketing, profiling and slotting applications
- Cutting Data - Page 293-294
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N53809</a> | EXR350-0.375-D2-C025.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N53911</a> | EXR350-0.375-D2-C025.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | TIALN    | 0.025   |
| <a href="#">N53810</a> | EXR350-0.375-D4-C025.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | UNCOATED | 0.025   |
| <a href="#">N53912</a> | EXR350-0.375-D4-C025.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | TIALN    | 0.025   |
| <a href="#">N53811</a> | EXR350-0.500-D1-C025.3-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N53913</a> | EXR350-0.500-D1-C025.3-Z4 | 1/2       | 1/2       | 1/2           | 2-1/2          | 4      | TIALN    | 0.025   |
| <a href="#">N53812</a> | EXR350-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | UNCOATED | 0.025   |
| <a href="#">N53914</a> | EXR350-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | TIALN    | 0.025   |
| <a href="#">N53813</a> | EXR350-0.500-D4-C025.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | UNCOATED | 0.025   |
| <a href="#">N53915</a> | EXR350-0.500-D4-C025.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | TIALN    | 0.025   |
| <a href="#">N53815</a> | EXR350-0.625-D3-C030.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N53917</a> | EXR350-0.625-D3-C030.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | TIALN    | 0.030   |
| <a href="#">N53818</a> | EXR350-0.750-D2-C030.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N53920</a> | EXR350-0.750-D2-C030.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-1/2          | 4      | TIALN    | 0.030   |
| <a href="#">N53819</a> | EXR350-0.750-D4-C030.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N53921</a> | EXR350-0.750-D4-C030.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | TIALN    | 0.030   |
| <a href="#">N53820</a> | EXR350-1.000-D1-C030.3-Z5 | 1         | 1         | 1             | 3-1/2          | 5      | UNCOATED | 0.030   |



## EXCEL SERIES-EXR350 (CONT'D)

|  |                     |                       |                       |                       |  |  |
|--|---------------------|-----------------------|-----------------------|-----------------------|--|--|
| <b>PREMIUM PARTICLE METAL</b><br>8.5% COBALT | <b>HELIX</b><br>35° | <b>CHAMFER</b><br>45° | <b>CENTER CUTTING</b> | <b>FINE PITCH</b><br> |  |  |
|--|---------------------|-----------------------|-----------------------|-----------------------|--|--|

- Weldon flat standard
- Designed for pocketing, profiling and slotting applications
- Cutting Data - Page 293-294
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N53922</a> | EXR350-1.000-D1-C030.3-Z5 | 1         | 1         | 1             | 3-1/2          | 5      | TIALN    | 0.030   |
| <a href="#">N53821</a> | EXR350-1.000-D2-C030.3-Z5 | 1         | 1         | 2             | 4-1/2          | 5      | UNCOATED | 0.030   |
| <a href="#">N53923</a> | EXR350-1.000-D2-C030.3-Z5 | 1         | 1         | 2             | 4-1/2          | 5      | TIALN    | 0.030   |
| <a href="#">N53822</a> | EXR350-1.000-D3-C030.3-Z5 | 1         | 1         | 3             | 5-1/2          | 5      | UNCOATED | 0.030   |
| <a href="#">N53924</a> | EXR350-1.000-D3-C030.3-Z5 | 1         | 1         | 3             | 5-1/2          | 5      | TIALN    | 0.030   |
| <a href="#">N53823</a> | EXR350-1.000-D4-C030.3-Z5 | 1         | 1         | 4             | 6-1/2          | 5      | UNCOATED | 0.030   |
| <a href="#">N53925</a> | EXR350-1.000-D4-C030.3-Z5 | 1         | 1         | 4             | 6-1/2          | 5      | TIALN    | 0.030   |
| <a href="#">N53826</a> | EXR350-1.250-D2-C040.3-Z6 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N53928</a> | EXR350-1.250-D2-C040.3-Z6 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 6      | TIALN    | 0.040   |
| <a href="#">N53828</a> | EXR350-1.250-D4-C040.3-Z6 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N53930</a> | EXR350-1.250-D4-C040.3-Z6 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 6      | TIALN    | 0.040   |

## REM445

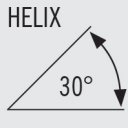
|                         |                     |                       |                           |                       |  |  |
|-------------------------|---------------------|-----------------------|---------------------------|-----------------------|--|--|
| <b>M42</b><br>8% COBALT | <b>HELIX</b><br>30° | <b>CHAMFER</b><br>45° | <b>NON CENTER CUTTING</b> | <b>FINE PITCH</b><br> |  |  |
|-------------------------|---------------------|-----------------------|---------------------------|-----------------------|--|--|

- Weldon flat standard
- Designed for profiling and slotting in all materials including high temperature alloys
- Cutting Data - Page 295-296
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N44501</a> | REM445-0.188-F3-C020.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | UNCOATED | 0.020   |
| <a href="#">N75655</a> | REM445-0.188-F3-C020.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | TIALN    | 0.020   |
| <a href="#">N44503</a> | REM445-0.250-F3-C020.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | UNCOATED | 0.020   |
| <a href="#">N75656</a> | REM445-0.250-F3-C020.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | TIALN    | 0.020   |
| <a href="#">N44505</a> | REM445-0.250-F5-C020.3-Z4 | 1/4       | 3/8       | 1-1/4         | 3-1/16         | 4      | UNCOATED | 0.020   |
| <a href="#">N75657</a> | REM445-0.250-F5-C020.3-Z4 | 1/4       | 3/8       | 1-1/4         | 3-1/16         | 4      | TIALN    | 0.020   |
| <a href="#">N44507</a> | REM445-0.313-F2-C025.3-Z4 | 5/16      | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N75658</a> | REM445-0.313-F2-C025.3-Z4 | 5/16      | 3/8       | 3/4           | 2-1/2          | 4      | TIALN    | 0.025   |
| <a href="#">N44509</a> | REM445-0.313-F4-C025.3-Z4 | 5/16      | 3/8       | 1-3/8         | 3-1/8          | 4      | UNCOATED | 0.025   |
| <a href="#">N75659</a> | REM445-0.313-F4-C025.3-Z4 | 5/16      | 3/8       | 1-3/8         | 3-1/8          | 4      | TIALN    | 0.025   |
| <a href="#">N44511</a> | REM445-0.375-D2-C025.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N75660</a> | REM445-0.375-D2-C025.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | TIALN    | 0.025   |
| <a href="#">N44513</a> | REM445-0.375-D4-C025.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | UNCOATED | 0.025   |

## REM445 (CONT'D)

M42  
8% COBALT



NON  
CENTER  
CUTTING

FINE PITCH

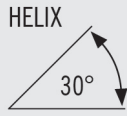


- Weldon flat standard
- Designed for profiling and slotting in all materials including high temperature alloys
- Cutting Data - Page 295-296
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N75661</a> | REM445-0.375-D4-C025.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | TIALN    | 0.025   |
| <a href="#">N44515</a> | REM445-0.438-P2-C025.3-Z4 | 7/16      | 3/8       | 1             | 2-11/16        | 4      | UNCOATED | 0.025   |
| <a href="#">N75662</a> | REM445-0.438-P2-C025.3-Z4 | 7/16      | 3/8       | 1             | 2-11/16        | 4      | TIALN    | 0.025   |
| <a href="#">N45415</a> | REM445-0.500-D2-C025.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | UNCOATED | 0.025   |
| <a href="#">N75663</a> | REM445-0.500-D2-C025.3-Z4 | 1/2       | 1/2       | 1             | 3              | 4      | TIALN    | 0.025   |
| <a href="#">N44517</a> | REM445-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | UNCOATED | 0.025   |
| <a href="#">N75664</a> | REM445-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | TIALN    | 0.025   |
| <a href="#">N45417</a> | REM445-0.500-D5-C025.3-Z4 | 1/2       | 1/2       | 1-5/8         | 3-5/8          | 4      | UNCOATED | 0.025   |
| <a href="#">N75665</a> | REM445-0.500-D5-C025.3-Z4 | 1/2       | 1/2       | 1-5/8         | 3-5/8          | 4      | TIALN    | 0.025   |
| <a href="#">N44519</a> | REM445-0.500-D4-C025.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | UNCOATED | 0.025   |
| <a href="#">N75666</a> | REM445-0.500-D4-C025.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | TIALN    | 0.025   |
| <a href="#">N45419</a> | REM445-0.500-D6-C025.3-Z4 | 1/2       | 1/2       | 2-1/2         | 4-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N75667</a> | REM445-0.500-D6-C025.3-Z4 | 1/2       | 1/2       | 2-1/2         | 4-1/2          | 4      | TIALN    | 0.025   |
| <a href="#">N45421</a> | REM445-0.500-D7-C025.3-Z4 | 1/2       | 1/2       | 3             | 5              | 4      | UNCOATED | 0.025   |
| <a href="#">N75668</a> | REM445-0.500-D7-C025.3-Z4 | 1/2       | 1/2       | 3             | 5              | 4      | TIALN    | 0.025   |
| <a href="#">N45423</a> | REM445-0.625-D1-C030.3-Z4 | 5/8       | 5/8       | 3/4           | 2-7/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N75670</a> | REM445-0.625-D1-C030.3-Z4 | 5/8       | 5/8       | 3/4           | 2-7/8          | 4      | TIALN    | 0.030   |
| <a href="#">N45425</a> | REM445-0.625-D2-C030.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-3/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N75671</a> | REM445-0.625-D2-C030.3-Z4 | 5/8       | 5/8       | 1-1/4         | 3-3/8          | 4      | TIALN    | 0.030   |
| <a href="#">N44523</a> | REM445-0.625-D3-C030.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N75672</a> | REM445-0.625-D3-C030.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | TIALN    | 0.030   |
| <a href="#">N45427</a> | REM445-0.625-D5-C030.3-Z4 | 5/8       | 5/8       | 2-1/8         | 4-1/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N75673</a> | REM445-0.625-D5-C030.3-Z4 | 5/8       | 5/8       | 2-1/8         | 4-1/4          | 4      | TIALN    | 0.030   |
| <a href="#">N44525</a> | REM445-0.625-D4-C030.3-Z4 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N75674</a> | REM445-0.625-D4-C030.3-Z4 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 4      | TIALN    | 0.030   |
| <a href="#">N45429</a> | REM445-0.625-D6-C030.3-Z4 | 5/8       | 5/8       | 3-1/8         | 5-1/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N75675</a> | REM445-0.625-D6-C030.3-Z4 | 5/8       | 5/8       | 3-1/8         | 5-1/4          | 4      | TIALN    | 0.030   |
| <a href="#">N44531</a> | REM445-0.750-D1-C030.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | UNCOATED | 0.030   |
| <a href="#">N75678</a> | REM445-0.750-D1-C030.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | TIALN    | 0.030   |
| <a href="#">N45433</a> | REM445-0.750-D2-C030.3-Z4 | 3/4       | 3/4       | 1-1/4         | 3-1/2          | 4      | UNCOATED | 0.030   |
| <a href="#">N75679</a> | REM445-0.750-D2-C030.3-Z4 | 3/4       | 3/4       | 1-1/4         | 3-1/2          | 4      | TIALN    | 0.030   |
| <a href="#">N45435</a> | REM445-0.750-D3-C030.3-Z4 | 3/4       | 3/4       | 1-1/2         | 3-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N75680</a> | REM445-0.750-D3-C030.3-Z4 | 3/4       | 3/4       | 1-1/2         | 3-3/4          | 4      | TIALN    | 0.030   |
| <a href="#">N44527</a> | REM445-0.750-D4-C030.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N75681</a> | REM445-0.750-D4-C030.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | TIALN    | 0.030   |
| <a href="#">N45437</a> | REM445-0.750-D5-C030.3-Z4 | 3/4       | 3/4       | 2             | 4-1/4          | 4      | UNCOATED | 0.030   |

## REM445 (CONT'D)

M42  
8% COBALT



NON  
CENTER  
CUTTING

FINE PITCH

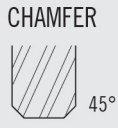
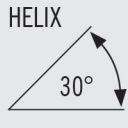


- Weldon flat standard
- Designed for profiling and slotting in all materials including high temperature alloys
- Cutting Data - Page 295-296
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N75682</a> | REM445-0.750-D5-C030.3-Z4 | 3/4       | 3/4       | 2             | 4-1/4          | 4      | TIALN    | 0.030   |
| <a href="#">N45439</a> | REM445-0.750-D6-C030.3-Z4 | 3/4       | 3/4       | 2-1/2         | 4-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N75683</a> | REM445-0.750-D6-C030.3-Z4 | 3/4       | 3/4       | 2-1/2         | 4-3/4          | 4      | TIALN    | 0.030   |
| <a href="#">N44529</a> | REM445-0.750-D7-C030.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N75684</a> | REM445-0.750-D7-C030.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | TIALN    | 0.030   |
| <a href="#">N45441</a> | REM445-0.750-D8-C030.3-Z4 | 3/4       | 3/4       | 4-1/8         | 6-3/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N75685</a> | REM445-0.750-D8-C030.3-Z4 | 3/4       | 3/4       | 4-1/8         | 6-3/8          | 4      | TIALN    | 0.030   |
| <a href="#">N44551</a> | REM445-1.000-P3-C030.3-Z5 | 1         | 3/4       | 1-1/2         | 3-3/4          | 5      | UNCOATED | 0.030   |
| <a href="#">N75696</a> | REM445-1.000-P3-C030.3-Z5 | 1         | 3/4       | 1-1/2         | 3-3/4          | 5      | TIALN    | 0.030   |
| <a href="#">N45453</a> | REM445-1.000-P4-C030.3-Z5 | 1         | 3/4       | 2             | 4-1/4          | 5      | UNCOATED | 0.030   |
| <a href="#">N75697</a> | REM445-1.000-P4-C030.3-Z5 | 1         | 3/4       | 2             | 4-1/4          | 5      | TIALN    | 0.030   |
| <a href="#">N45459</a> | REM445-1.000-D1-C030.3-Z5 | 1         | 1         | 1-1/8         | 3-5/8          | 5      | UNCOATED | 0.030   |
| <a href="#">N75700</a> | REM445-1.000-D1-C030.3-Z5 | 1         | 1         | 1-1/8         | 3-5/8          | 5      | TIALN    | 0.030   |
| <a href="#">N44543</a> | REM445-1.000-D3-C030.3-Z5 | 1         | 1         | 2             | 4-1/2          | 5      | UNCOATED | 0.030   |
| <a href="#">N75702</a> | REM445-1.000-D3-C030.3-Z5 | 1         | 1         | 2             | 4-1/2          | 5      | TIALN    | 0.030   |
| <a href="#">N44545</a> | REM445-1.000-D4-C030.3-Z5 | 1         | 1         | 3             | 5-1/2          | 5      | UNCOATED | 0.030   |
| <a href="#">N75703</a> | REM445-1.000-D4-C030.3-Z5 | 1         | 1         | 3             | 5-1/2          | 5      | TIALN    | 0.030   |
| <a href="#">N44547</a> | REM445-1.000-D5-C030.3-Z5 | 1         | 1         | 4             | 6-1/2          | 5      | UNCOATED | 0.030   |
| <a href="#">N75704</a> | REM445-1.000-D5-C030.3-Z5 | 1         | 1         | 4             | 6-1/2          | 5      | TIALN    | 0.030   |
| <a href="#">N44549</a> | REM445-1.000-D6-C030.3-Z5 | 1         | 1         | 6             | 8-1/2          | 5      | UNCOATED | 0.030   |
| <a href="#">N75705</a> | REM445-1.000-D6-C030.3-Z5 | 1         | 1         | 6             | 8-1/2          | 5      | TIALN    | 0.030   |
| <a href="#">N44557</a> | REM445-1.250-D2-C040.3-Z6 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N75715</a> | REM445-1.250-D2-C040.3-Z6 | 1-1/4     | 1-1/4     | 2             | 4-1/2          | 6      | TIALN    | 0.040   |
| <a href="#">N44559</a> | REM445-1.250-D3-C040.3-Z6 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N75716</a> | REM445-1.250-D3-C040.3-Z6 | 1-1/4     | 1-1/4     | 3             | 5-1/2          | 6      | TIALN    | 0.040   |
| <a href="#">N44561</a> | REM445-1.250-D4-C040.3-Z6 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N75717</a> | REM445-1.250-D4-C040.3-Z6 | 1-1/4     | 1-1/4     | 4             | 6-1/2          | 6      | TIALN    | 0.040   |
| <a href="#">N44563</a> | REM445-1.250-D5-C040.3-Z6 | 1-1/4     | 1-1/4     | 6             | 8-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N75718</a> | REM445-1.250-D5-C040.3-Z6 | 1-1/4     | 1-1/4     | 6             | 8-1/2          | 6      | TIALN    | 0.040   |
| <a href="#">N44569</a> | REM445-1.500-P5-C040.3-Z6 | 1-1/2     | 1-1/4     | 2             | 4-1/2          | 6      | UNCOATED | 0.040   |
| <a href="#">N75725</a> | REM445-1.500-P5-C040.3-Z6 | 1-1/2     | 1-1/4     | 2             | 4-1/2          | 6      | TIALN    | 0.040   |
| <a href="#">N44599</a> | REM445-2.000-D3-C040.7-Z8 | 2         | 2         | 4             | 7-3/4          | 8      | UNCOATED | 0.040   |
| <a href="#">N75745</a> | REM445-2.000-D3-C040.7-Z8 | 2         | 2         | 4             | 7-3/4          | 8      | TIALN    | 0.040   |
| <a href="#">N44603</a> | REM445-2.000-D5-C040.7-Z8 | 2         | 2         | 6             | 9-3/4          | 8      | UNCOATED | 0.040   |
| <a href="#">N75747</a> | REM445-2.000-D5-C040.7-Z8 | 2         | 2         | 6             | 9-3/4          | 8      | TIALN    | 0.040   |

## REC448

M42  
8% COBALT



CENTER  
CUTTING

FINE PITCH

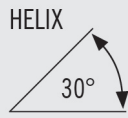



- Weldon flat standard
- Designed for profiling and slotting in all materials including high temperature alloys
- Cutting Data - Page 295-296
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N44839</a> | REC448-0.188-F3-C020.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | UNCOATED | 0.020   |
| <a href="#">N14554</a> | REC448-0.188-F3-C020.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | TIALN    | 0.020   |
| <a href="#">N44841</a> | REC448-0.250-F3-C020.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | UNCOATED | 0.020   |
| <a href="#">N14555</a> | REC448-0.250-F3-C020.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | TIALN    | 0.020   |
| <a href="#">N44843</a> | REC448-0.250-F5-C020.3-Z4 | 1/4       | 3/8       | 1-1/4         | 3-1/16         | 4      | UNCOATED | 0.020   |
| <a href="#">N14556</a> | REC448-0.250-F5-C020.3-Z4 | 1/4       | 3/8       | 1-1/4         | 3-1/16         | 4      | TIALN    | 0.020   |
| <a href="#">N44845</a> | REC448-0.313-F2-C025.3-Z4 | 5/16      | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N14558</a> | REC448-0.313-F2-C025.3-Z4 | 5/16      | 3/8       | 3/4           | 2-1/2          | 4      | TIALN    | 0.025   |
| <a href="#">N44873</a> | REC448-0.375-D1-C025.3-Z4 | 3/8       | 3/8       | 1/2           | 2-1/4          | 4      | UNCOATED | 0.025   |
| <a href="#">N14560</a> | REC448-0.375-D1-C025.3-Z4 | 3/8       | 3/8       | 1/2           | 2-1/4          | 4      | TIALN    | 0.025   |
| <a href="#">N44849</a> | REC448-0.375-D2-C025.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N14561</a> | REC448-0.375-D2-C025.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | TIALN    | 0.025   |
| <a href="#">N44876</a> | REC448-0.500-D1-C025.3-Z4 | 1/2       | 1/2       | 5/8           | 2-5/8          | 4      | UNCOATED | 0.025   |
| <a href="#">N14564</a> | REC448-0.500-D1-C025.3-Z4 | 1/2       | 1/2       | 5/8           | 2-5/8          | 4      | TIALN    | 0.025   |
| <a href="#">N44801</a> | REC448-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | UNCOATED | 0.025   |
| <a href="#">N14565</a> | REC448-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | TIALN    | 0.025   |
| <a href="#">N44803</a> | REC448-0.500-D4-C025.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | UNCOATED | 0.025   |
| <a href="#">N14566</a> | REC448-0.500-D4-C025.3-Z4 | 1/2       | 1/2       | 2             | 4              | 4      | TIALN    | 0.025   |
| <a href="#">N44879</a> | REC448-0.625-D1-C030.3-Z4 | 5/8       | 5/8       | 5/8           | 2-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N14568</a> | REC448-0.625-D1-C030.3-Z4 | 5/8       | 5/8       | 5/8           | 2-3/4          | 4      | TIALN    | 0.030   |
| <a href="#">N44805</a> | REC448-0.625-D3-C030.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N14570</a> | REC448-0.625-D3-C030.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | TIALN    | 0.030   |
| <a href="#">N44807</a> | REC448-0.625-D4-C030.3-Z4 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N14571</a> | REC448-0.625-D4-C030.3-Z4 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 4      | TIALN    | 0.030   |
| <a href="#">N44859</a> | REC448-0.750-D1-C030.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | UNCOATED | 0.030   |
| <a href="#">N14573</a> | REC448-0.750-D1-C030.3-Z4 | 3/4       | 3/4       | 3/4           | 3              | 4      | TIALN    | 0.030   |
| <a href="#">N44809</a> | REC448-0.750-D2-C030.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N14574</a> | REC448-0.750-D2-C030.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | TIALN    | 0.030   |
| <a href="#">N44811</a> | REC448-0.750-D4-C030.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N14575</a> | REC448-0.750-D4-C030.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | TIALN    | 0.030   |

## RMB449

M42  
8% COBALT



CENTER  
CUTTING

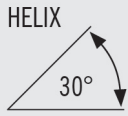


- Weldon flat standard
- Designed for profiling, slotting and contouring in all materials including high temperature alloys
- Cutting Data - Page 295-296
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION            | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  |
|------------------------|------------------------|-----------|-----------|---------------|----------------|--------|----------|
| <a href="#">N44901</a> | RMB449-0.500-D3-B.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | UNCOATED |
| <a href="#">N75764</a> | RMB449-0.500-D3-B.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | TIALN    |
| <a href="#">N45903</a> | RMB449-0.625-D4-B.3-Z4 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 4      | UNCOATED |
| <a href="#">N75767</a> | RMB449-0.625-D4-B.3-Z4 | 5/8       | 5/8       | 2-1/2         | 4-5/8          | 4      | TIALN    |
| <a href="#">N44905</a> | RMB449-0.750-D2-B.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | UNCOATED |
| <a href="#">N75768</a> | RMB449-0.750-D2-B.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | TIALN    |
| <a href="#">N45907</a> | RMB449-1.000-D4-B.3-Z5 | 1         | 1         | 4             | 6-1/2          | 5      | UNCOATED |
| <a href="#">N75771</a> | RMB449-1.000-D4-B.3-Z5 | 1         | 1         | 4             | 6-1/2          | 5      | TIALN    |

## RFM440

M42  
8% COBALT



NON  
CENTER  
CUTTING

TRUNCATED



- Weldon flat standard
- Designed for profiling and slotting in all materials
- Cutting Data - Page 297-299
- Tolerance Specs - Page 324

| PRODUCT NUMBER         | DESCRIPTION               | FLUTE DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | FLUTES | COATING  | CHAMFER |
|------------------------|---------------------------|-----------|-----------|---------------|----------------|--------|----------|---------|
| <a href="#">N44063</a> | RFM440-0.188-F3-C020.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | UNCOATED | 0.020   |
| <a href="#">N43700</a> | RFM440-0.188-F3-C020.3-Z4 | 3/16      | 3/8       | 1/2           | 2-3/8          | 4      | TICN     | 0.020   |
| <a href="#">N44083</a> | RFM440-0.250-F3-C020.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | UNCOATED | 0.020   |
| <a href="#">N43701</a> | RFM440-0.250-F3-C020.3-Z4 | 1/4       | 3/8       | 5/8           | 2-7/16         | 4      | TICN     | 0.020   |
| <a href="#">N44085</a> | RFM440-0.250-F5-C020.3-Z4 | 1/4       | 3/8       | 1-1/4         | 3-1/16         | 4      | UNCOATED | 0.020   |
| <a href="#">N43702</a> | RFM440-0.250-F5-C020.3-Z4 | 1/4       | 3/8       | 1-1/4         | 3-1/16         | 4      | TICN     | 0.020   |
| <a href="#">N44103</a> | RFM440-0.313-F2-C025.3-Z4 | 5/16      | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N43703</a> | RFM440-0.313-F2-C025.3-Z4 | 5/16      | 3/8       | 3/4           | 2-1/2          | 4      | TICN     | 0.025   |
| <a href="#">N44123</a> | RFM440-0.375-D2-C025.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | UNCOATED | 0.025   |
| <a href="#">N43705</a> | RFM440-0.375-D2-C025.3-Z4 | 3/8       | 3/8       | 3/4           | 2-1/2          | 4      | TICN     | 0.025   |
| <a href="#">N44125</a> | RFM440-0.375-D4-C025.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | UNCOATED | 0.025   |
| <a href="#">N43706</a> | RFM440-0.375-D4-C025.3-Z4 | 3/8       | 3/8       | 1-1/2         | 3-1/4          | 4      | TICN     | 0.025   |
| <a href="#">N43163</a> | RFM440-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | UNCOATED | 0.025   |
| <a href="#">N43709</a> | RFM440-0.500-D3-C025.3-Z4 | 1/2       | 1/2       | 1-1/4         | 3-1/4          | 4      | TICN     | 0.025   |
| <a href="#">N44163</a> | RFM440-0.500-D4-C025.3-Z4 | 1/2       | 1/2       | 1-5/8         | 3-5/8          | 4      | UNCOATED | 0.025   |
| <a href="#">N43710</a> | RFM440-0.500-D4-C025.3-Z4 | 1/2       | 1/2       | 1-5/8         | 3-5/8          | 4      | TICN     | 0.025   |
| <a href="#">N44204</a> | RFM440-0.625-D3-C030.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N43717</a> | RFM440-0.625-D3-C030.3-Z4 | 5/8       | 5/8       | 1-5/8         | 3-3/4          | 4      | TICN     | 0.030   |
| <a href="#">N43241</a> | RFM440-0.750-P2-C030.3-Z4 | 3/4       | 5/8       | 1-5/8         | 3-3/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N43722</a> | RFM440-0.750-P2-C030.3-Z4 | 3/4       | 5/8       | 1-5/8         | 3-3/4          | 4      | TICN     | 0.030   |
| <a href="#">N44245</a> | RFM440-0.750-D4-C030.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | UNCOATED | 0.030   |
| <a href="#">N43726</a> | RFM440-0.750-D4-C030.3-Z4 | 3/4       | 3/4       | 1-5/8         | 3-7/8          | 4      | TICN     | 0.030   |
| <a href="#">N44248</a> | RFM440-0.750-D7-C030.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | UNCOATED | 0.030   |
| <a href="#">N43729</a> | RFM440-0.750-D7-C030.3-Z4 | 3/4       | 3/4       | 3             | 5-1/4          | 4      | TICN     | 0.030   |
| <a href="#">N43322</a> | RFM440-1.000-D3-C030.3-Z5 | 1         | 1         | 2             | 4-1/2          | 5      | UNCOATED | 0.030   |
| <a href="#">N43747</a> | RFM440-1.000-D3-C030.3-Z5 | 1         | 1         | 2             | 4-1/2          | 5      | TICN     | 0.030   |
| <a href="#">N44653</a> | RFM440-2.000-D7-C040.7-Z8 | 2         | 2         | 8             | 11-3/4         | 8      | UNCOATED | 0.040   |
| <a href="#">N43791</a> | RFM440-2.000-D7-C040.7-Z8 | 2         | 2         | 8             | 11-3/4         | 8      | TICN     | 0.040   |

# CUTTING DATA - GENERAL PURPOSE COBALT END MILLS

## SP205 - START VALUES

|           |           | SLOTTING                              |                                       |                           |                         |                    |        |        |        |        |        |        |        |        |        |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 2 |        |        |        |        |        |        |        |        |        |
|           |           |                                       |                                       |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1      | 1 1/4  | 1 1/2  | 1 3/4  | 2      |
| P         | E 1 - 2   | 1.00                                  | 1.00                                  | 110                       | n (rev/min)             | 1681               | 1121   | 840    | 672    | 560    | 420    | 336    | 280    | 240    | 210    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0079 | 0.0090 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 3.8                | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    | 3.8    |
|           | E 3 - 4   | 1.00                                  | 1.00                                  | 50                        | n (rev/min)             | 764                | 509    | 382    | 306    | 255    | 191    | 153    | 127    | 109    | 96     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0061 | 0.0070 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 1.3                | 1.3    | 1.3    | 1.3    | 1.3    | 1.3    | 1.3    | 1.3    | 1.3    | 1.3    |
| E 5 - 6   | 1.00      | 1.00                                  | 35                                    | n (rev/min)               | 535                     | 357                | 267    | 214    | 178    | 134    | 107    | 89     | 76     | 67     |        |
|           |           |                                       |                                       | f <sub>z</sub> (in)       | 0.0009                  | 0.0013             | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0061 | 0.0070 |        |
|           |           |                                       |                                       | v <sub>f</sub> (in/min)   | 0.9                     | 0.9                | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    |
| M         | E 8 - 9   | 1.00                                  | 1.00                                  | 50                        | n (rev/min)             | 764                | 509    | 382    | 306    | 255    | 191    | 153    | 127    | 109    | 96     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0061 | 0.0070 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 1.3                | 1.3    | 1.3    | 1.3    | 1.3    | 1.3    | 1.3    | 1.3    | 1.3    | 1.3    |
|           | E 10 - 11 | 1.00                                  | 1.00                                  | 40                        | n (rev/min)             | 611                | 407    | 306    | 244    | 204    | 153    | 122    | 102    | 87     | 76     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0008             | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0053 | 0.0060 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.9                | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    |
| K         | E 12 - 13 | 1.00                                  | 1.00                                  | 50                        | n (rev/min)             | 764                | 509    | 382    | 306    | 255    | 191    | 153    | 127    | 109    | 96     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0079 | 0.0090 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 1.7                | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    |
|           | E 14 - 15 | 1.00                                  | 1.00                                  | 40                        | n (rev/min)             | 611                | 407    | 306    | 244    | 204    | 153    | 122    | 102    | 87     | 76     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0061 | 0.0070 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 1.1                | 1.1    | 1.1    | 1.1    | 1.1    | 1.1    | 1.1    | 1.1    | 1.1    | 1.1    |
| N         | E 18      | 1.00                                  | 1.00                                  | 240                       | n (rev/min)             | 3667               | 2445   | 1834   | 1467   | 1222   | 917    | 733    | 611    | 524    | 458    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0013             | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0088 | 0.0100 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 9.2                | 9.2    | 9.2    | 9.2    | 9.2    | 9.2    | 9.2    | 9.2    | 9.2    | 9.2    |
| S         | E 20      | 1.00                                  | 1.00                                  | 8                         | n (rev/min)             | 122                | 81     | 61     | 49     | 41     | 31     | 24     | 20     | 17     | 15     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0004             | 0.0006 | 0.0008 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0026 | 0.0030 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.1                | 0.1    | 0.1    | 0.1    | 0.1    | 0.1    | 0.1    | 0.1    | 0.1    | 0.1    |
|           | E 21      | 1.00                                  | 1.00                                  | 8                         | n (rev/min)             | 122                | 81     | 61     | 49     | 41     | 31     | 24     | 20     | 17     | 15     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0006             | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0044 | 0.0050 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.2                | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    |
| E 22      | 1.00      | 1.00                                  | 40                                    | n (rev/min)               | 611                     | 407                | 306    | 244    | 204    | 153    | 122    | 102    | 87     | 76     |        |
|           |           |                                       |                                       | f <sub>z</sub> (in)       | 0.0009                  | 0.0013             | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0061 | 0.0070 |        |
|           |           |                                       |                                       | v <sub>f</sub> (in/min)   | 1.1                     | 1.1                | 1.1    | 1.1    | 1.1    | 1.1    | 1.1    | 1.1    | 1.1    | 1.1    | 1.1    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## SP205 - START VALUES

| SIDE MILLING - ROUGHING |           |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |        |        |        |
|-------------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 2 |        |        |        |        |        |        |        |        |        |
|                         |           |                                       |                                       |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1      | 1 1/4  | 1 1/2  | 1 3/4  | 2      |
| P                       | E 1 - 2   | 1.50                                  | 0.25                                  | 160                       | n (rev/min)             | 2445               | 1630   | 1222   | 978    | 815    | 611    | 489    | 407    | 349    | 306    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0028 | 0.0035 | 0.0042 | 0.0056 | 0.0070 | 0.0084 | 0.0098 | 0.0113 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 6.9                | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    | 6.9    |
|                         | E 3 - 4   | 1.50                                  | 0.25                                  | 80                        | n (rev/min)             | 1222               | 815    | 611    | 489    | 407    | 306    | 244    | 204    | 175    | 153    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.7                | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    |
|                         | E 5 - 6   | 1.50                                  | 0.25                                  | 50                        | n (rev/min)             | 764                | 509    | 382    | 306    | 255    | 191    | 153    | 127    | 109    | 96     |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 1.7                | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    |
| M                       | E 8 - 9   | 1.50                                  | 0.25                                  | 80                        | n (rev/min)             | 1222               | 815    | 611    | 489    | 407    | 306    | 244    | 204    | 175    | 153    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.7                | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    |
|                         | E 10 - 11 | 1.50                                  | 0.25                                  | 60                        | n (rev/min)             | 917                | 611    | 458    | 367    | 306    | 229    | 183    | 153    | 131    | 115    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0014 | 0.0019 | 0.0023 | 0.0028 | 0.0038 | 0.0047 | 0.0056 | 0.0066 | 0.0075 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 1.7                | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    | 1.7    |
| K                       | E 12 - 13 | 1.50                                  | 0.25                                  | 95                        | n (rev/min)             | 1452               | 968    | 726    | 581    | 484    | 363    | 290    | 242    | 207    | 181    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0028 | 0.0035 | 0.0042 | 0.0056 | 0.0070 | 0.0084 | 0.0098 | 0.0113 |
|                         | E 14 - 15 | 1.50                                  | 0.25                                  | 65                        | n (rev/min)             | 993                | 662    | 497    | 397    | 331    | 248    | 199    | 166    | 142    | 124    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
| N                       | E 18      | 1.50                                  | 0.25                                  | 350                       | n (rev/min)             | 5348               | 3565   | 2674   | 2139   | 1783   | 1337   | 1070   | 891    | 764    | 669    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0016             | 0.0023 | 0.0031 | 0.0039 | 0.0047 | 0.0063 | 0.0078 | 0.0094 | 0.0109 | 0.0125 |
| S                       | E 20      | 1.50                                  | 0.25                                  | 10                        | n (rev/min)             | 153                | 102    | 76     | 61     | 51     | 38     | 31     | 25     | 22     | 19     |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0006             | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0044 | 0.0050 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.2                | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    |
|                         | E 21      | 1.50                                  | 0.25                                  | 12                        | n (rev/min)             | 183                | 122    | 92     | 73     | 61     | 46     | 37     | 31     | 26     | 23     |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0008             | 0.0012 | 0.0016 | 0.0020 | 0.0023 | 0.0031 | 0.0039 | 0.0047 | 0.0055 | 0.0063 |
|                         | E 22      | 1.50                                  | 0.25                                  | 60                        | n (rev/min)             | 917                | 611    | 458    | 367    | 306    | 229    | 183    | 153    | 131    | 115    |
| f <sub>z</sub> (in)     |           |                                       |                                       |                           | 0.0011                  | 0.0016             | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |        |
|                         |           |                                       |                                       | 40 - 80                   | v <sub>f</sub> (in/min) | 2.0                | 2.0    | 2.0    | 2.0    | 2.0    | 2.0    | 2.0    | 2.0    | 2.0    | 2.0    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter

v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.



## EX350 - START VALUES

| SLOTTING  |           |                                       |                                       |                           |                     |                         |                         |        |        |        |                    |                    |       |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|---------------------|-------------------------|-------------------------|--------|--------|--------|--------------------|--------------------|-------|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                     |                         | Z <sub>n</sub> = 2      |        |        |        | Z <sub>n</sub> = 5 | Z <sub>n</sub> = 6 |       |
|           |           |                                       |                                       |                           |                     |                         | 3/8                     | 1/2    | 5/8    | 3/4    | 1                  | 1 1/4              | 1 1/2 |
| M         | E 8 - 9   | 1.00                                  | 1.00                                  | 80                        | n (rev/min)         | 815                     | 611                     | 489    | 407    | 306    | 244                | 204                |       |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0011                  | 0.0015                  | 0.0019 | 0.0023 | 0.0030 | 0.0038             | 0.0045             |       |
|           |           |                                       |                                       | 70                        | -                   | 90                      | v <sub>f</sub> (in/min) | 3.7    | 3.7    | 3.7    | 3.7                | 4.6                | 5.5   |
|           | E 10 - 11 | 1.00                                  | 1.00                                  | 60                        | n (rev/min)         | 611                     | 458                     | 367    | 306    | 229    | 183                | 153                |       |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0011                  | 0.0015                  | 0.0019 | 0.0023 | 0.0030 | 0.0038             | 0.0045             |       |
|           |           |                                       |                                       | 50                        | -                   | 70                      | v <sub>f</sub> (in/min) | 2.8    | 2.8    | 2.8    | 2.8                | 3.4                | 4.1   |
| S         | E 20      | 1.00                                  | 1.00                                  | 8                         | n (rev/min)         | 81                      | 61                      | 49     | 41     | 31     | 24                 | 20                 |       |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0006                  | 0.0008                  | 0.0009 | 0.0011 | 0.0015 | 0.0019             | 0.0023             |       |
|           |           |                                       |                                       | 6                         | -                   | 10                      | v <sub>f</sub> (in/min) | 0.2    | 0.2    | 0.2    | 0.2                | 0.2                | 0.3   |
|           | E 21      | 1.00                                  | 1.00                                  | 8                         | n (rev/min)         | 81                      | 61                      | 49     | 41     | 31     | 24                 | 20                 |       |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0009                  | 0.0013                  | 0.0016 | 0.0019 | 0.0025 | 0.0031             | 0.0038             |       |
|           |           |                                       |                                       | 6                         | -                   | 10                      | v <sub>f</sub> (in/min) | 0.3    | 0.3    | 0.3    | 0.3                | 0.4                | 0.5   |
| E 22      | 1.00      | 1.00                                  | 40                                    | n (rev/min)               | 407                 | 306                     | 244                     | 204    | 153    | 122    | 102                |                    |       |
|           |           |                                       |                                       | f <sub>z</sub> (in)       | 0.0013              | 0.0018                  | 0.0022                  | 0.0026 | 0.0035 | 0.0044 | 0.0053             |                    |       |
|           |           |                                       | 30                                    | -                         | 50                  | v <sub>f</sub> (in/min) | 2.1                     | 2.1    | 2.1    | 2.1    | 2.7                | 3.2                | 3.2   |

## EX350 - START VALUES

| SLOTTING  |           |                                       |                                       |                           |                     |                         |                         |     |  |  |  |  |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|---------------------|-------------------------|-------------------------|-----|--|--|--|--|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                     |                         | Z <sub>n</sub> = 8      |     |  |  |  |  |
|           |           |                                       |                                       |                           |                     |                         | 2                       | 2   |  |  |  |  |
| M         | E 8 - 9   | 0.50                                  | 1.00                                  | 80                        | n (rev/min)         | 153                     |                         |     |  |  |  |  |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0060                  |                         |     |  |  |  |  |
|           |           |                                       |                                       | 70                        | -                   | 90                      | v <sub>f</sub> (in/min) | 7.3 |  |  |  |  |
|           | E 10 - 11 | 0.50                                  | 1.00                                  | 60                        | n (rev/min)         | 115                     |                         |     |  |  |  |  |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0060                  |                         |     |  |  |  |  |
|           |           |                                       |                                       | 50                        | -                   | 70                      | v <sub>f</sub> (in/min) | 5.5 |  |  |  |  |
| S         | E 20      | 0.50                                  | 1.00                                  | 8                         | n (rev/min)         | 15                      |                         |     |  |  |  |  |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0030                  |                         |     |  |  |  |  |
|           |           |                                       |                                       | 6                         | -                   | 10                      | v <sub>f</sub> (in/min) | 0.4 |  |  |  |  |
|           | E 21      | 0.50                                  | 1.00                                  | 8                         | n (rev/min)         | 15                      |                         |     |  |  |  |  |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in) | 0.0050                  |                         |     |  |  |  |  |
|           |           |                                       |                                       | 6                         | -                   | 10                      | v <sub>f</sub> (in/min) | 0.6 |  |  |  |  |
| E 22      | 0.50      | 1.00                                  | 40                                    | n (rev/min)               | 76                  |                         |                         |     |  |  |  |  |
|           |           |                                       |                                       | f <sub>z</sub> (in)       | 0.0070              |                         |                         |     |  |  |  |  |
|           |           |                                       | 30                                    | -                         | 50                  | v <sub>f</sub> (in/min) | 4.3                     |     |  |  |  |  |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## EX350 - START VALUES

### SIDE MILLING - ROUGHING

| ISO GROUP | SMG          | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |     |                     | Z <sub>n</sub> = 4  |        |        |        | Z <sub>n</sub> = 5 | Z <sub>n</sub> = 6 |        |        |
|-----------|--------------|--|--|------------------------------|-----|---------------------|---------------------|--------|--------|--------|--------------------|--------------------|--------|--------|
|           |              |  |  |                              |     |                     | 3/8                 | 1/2    | 5/8    | 3/4    | 1                  | 1 1/4              | 1 1/2  |        |
| M         | E<br>8 - 9   | 1.50                                     | 0.25                                     | 96                           | -   | 106                 | n (rev/min)         | 978    | 733    | 587    | 489                | 367                | 293    | 244    |
|           |              |  |  |                              |     |                     | f <sub>z</sub> (in) | 0.0014 | 0.0019 | 0.0023 | 0.0028             | 0.0038             | 0.0047 | 0.0056 |
|           |              |  |  | v <sub>f</sub> (in/min)      | 5.5 | 5.5                 | 5.5                 | 5.5    | 6.9    | 8.3    | 8.3                |                    |        |        |
|           | E<br>10 - 11 | 1.50                                     | 0.25                                     | 72                           | -   | 82                  | n (rev/min)         | 733    | 550    | 440    | 367                | 275                | 220    | 183    |
|           |              |  |  |                              |     |                     | f <sub>z</sub> (in) | 0.0014 | 0.0019 | 0.0023 | 0.0028             | 0.0038             | 0.0047 | 0.0056 |
|           |              |  |  | v <sub>f</sub> (in/min)      | 4.1 | 4.1                 | 4.1                 | 4.1    | 5.2    | 6.2    | 6.2                |                    |        |        |
| S         | E<br>20      | 1.50                                     | 0.25                                     | 10                           | -   | 12                  | n (rev/min)         | 98     | 73     | 59     | 49                 | 37                 | 29     | 24     |
|           |              |  |  |                              |     |                     | f <sub>z</sub> (in) | 0.0007 | 0.0009 | 0.0012 | 0.0014             | 0.0019             | 0.0023 | 0.0028 |
|           |              |  |  | v <sub>f</sub> (in/min)      | 0.3 | 0.3                 | 0.3                 | 0.3    | 0.3    | 0.4    | 0.4                |                    |        |        |
|           | E<br>21      | 1.50                                     | 0.25                                     | 10                           | -   | 12                  | n (rev/min)         | 98     | 73     | 59     | 49                 | 37                 | 29     | 24     |
|           |              |  |  |                              |     |                     | f <sub>z</sub> (in) | 0.0012 | 0.0016 | 0.0020 | 0.0023             | 0.0031             | 0.0039 | 0.0047 |
|           |              |  |  | v <sub>f</sub> (in/min)      | 0.5 | 0.5                 | 0.5                 | 0.5    | 0.6    | 0.7    | 0.7                |                    |        |        |
| E<br>22   | 1.50         | 0.25                                     | 48                                       | -                            | 58  | n (rev/min)         | 489                 | 367    | 293    | 244    | 183                | 147                | 122    |        |
|           |              |  |  |                              |     | f <sub>z</sub> (in) | 0.0016              | 0.0022 | 0.0027 | 0.0033 | 0.0044             | 0.0055             | 0.0066 |        |
|           |              |  | v <sub>f</sub> (in/min)                  | 3.2                          | 3.2 | 3.2                 | 3.2                 | 4.0    | 4.8    | 4.8    |                    |                    |        |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE COBALT END MILLS

## SPC408 / SPB540 - START VALUES

|           |         | SLOTTING                  |                           |                           |                         |                    |        |        |        |        |        |        |        |        |        |     |
|-----------|---------|---------------------------|---------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----|
| ISO GROUP | SMG     | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |        |        |        |        |        |        |        |        |        |     |
|           |         |                           |                           |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1      | 1 1/4  | 1 1/2  | 1 3/4  | 2      |     |
| P         | E 1 - 2 | 1.00                      | 1.00                      | 110                       | n (rev/min)             | 1681               | 1121   | 840    | 672    | 560    | 420    | 336    | 280    | 240    | 210    |     |
|           |         |                           |                           |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0017 | 0.0023 | 0.0028 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0079 | 0.0090 |     |
|           | E 3 - 4 | 1.00                      | 1.00                      | 50                        | v <sub>f</sub> (in/min) | 7.6                | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    | 7.6    | 7.6 |
|           |         |                           |                           |                           | n (rev/min)             | 764                | 509    | 382    | 306    | 255    | 191    | 153    | 127    | 109    | 96     |     |
|           | E 5 - 6 | 1.00                      | 1.00                      | 35                        | f <sub>z</sub> (in)     | 0.0009             | 0.0013 | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0061 | 0.0070 |     |
|           |         |                           |                           |                           | v <sub>f</sub> (in/min) | 2.7                | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7 |
| E 8 - 9   | 1.00    | 1.00                      | 50                        | n (rev/min)               | 764                     | 509                | 382    | 306    | 255    | 191    | 153    | 127    | 109    | 96     |        |     |
|           |         |                           |                           | f <sub>z</sub> (in)       | 0.0009                  | 0.0013             | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0061 | 0.0070 |        |     |
| E 10 - 11 | 1.00    | 1.00                      | 40                        | v <sub>f</sub> (in/min)   | 2.7                     | 2.7                | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    | 2.7    |     |
|           |         |                           |                           | n (rev/min)               | 611                     | 407                | 306    | 244    | 204    | 153    | 122    | 102    | 87     | 76     |        |     |
| E 12 - 13 | 1.00    | 1.00                      | 50                        | f <sub>z</sub> (in)       | 0.0008                  | 0.0011             | 0.0015 | 0.0019 | 0.0023 | 0.0030 | 0.0038 | 0.0045 | 0.0053 | 0.0060 |        |     |
|           |         |                           |                           | v <sub>f</sub> (in/min)   | 1.8                     | 1.8                | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    | 1.8    |     |
| E 14 - 15 | 1.00    | 1.00                      | 40                        | n (rev/min)               | 764                     | 509                | 382    | 306    | 255    | 191    | 153    | 127    | 109    | 96     |        |     |
|           |         |                           |                           | f <sub>z</sub> (in)       | 0.0011                  | 0.0017             | 0.0023 | 0.0028 | 0.0034 | 0.0045 | 0.0056 | 0.0068 | 0.0079 | 0.0090 |        |     |
| E 18      | 1.00    | 1.00                      | 240                       | v <sub>f</sub> (in/min)   | 3.4                     | 3.4                | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    |     |
|           |         |                           |                           | n (rev/min)               | 611                     | 407                | 306    | 244    | 204    | 153    | 122    | 102    | 87     | 76     |        |     |
| E 20      | 1.00    | 1.00                      | 8                         | f <sub>z</sub> (in)       | 0.0009                  | 0.0013             | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0061 | 0.0070 |        |     |
|           |         |                           |                           | v <sub>f</sub> (in/min)   | 2.1                     | 2.1                | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    |     |
| E 21      | 1.00    | 1.00                      | 8                         | n (rev/min)               | 3667                    | 2445               | 1834   | 1467   | 1222   | 917    | 733    | 611    | 524    | 458    |        |     |
|           |         |                           |                           | f <sub>z</sub> (in)       | 0.0013                  | 0.0019             | 0.0025 | 0.0031 | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0088 | 0.0100 |        |     |
| E 22      | 1.00    | 1.00                      | 40                        | v <sub>f</sub> (in/min)   | 18.3                    | 18.3               | 18.3   | 18.3   | 18.3   | 18.3   | 18.3   | 18.3   | 18.3   | 18.3   | 18.3   |     |
|           |         |                           |                           | n (rev/min)               | 122                     | 81                 | 61     | 49     | 41     | 31     | 24     | 20     | 17     | 15     |        |     |
| E 20      | 1.00    | 1.00                      | 6 - 10                    | f <sub>z</sub> (in)       | 0.0004                  | 0.0006             | 0.0008 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023 | 0.0026 | 0.0030 |        |     |
|           |         |                           |                           | v <sub>f</sub> (in/min)   | 0.2                     | 0.2                | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    |     |
| E 21      | 1.00    | 1.00                      | 6 - 10                    | n (rev/min)               | 122                     | 81                 | 61     | 49     | 41     | 31     | 24     | 20     | 17     | 15     |        |     |
|           |         |                           |                           | f <sub>z</sub> (in)       | 0.0006                  | 0.0009             | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0044 | 0.0050 |        |     |
| E 22      | 1.00    | 1.00                      | 20 - 60                   | v <sub>f</sub> (in/min)   | 0.3                     | 0.3                | 0.3    | 0.3    | 0.3    | 0.3    | 0.3    | 0.3    | 0.3    | 0.3    |        |     |
|           |         |                           |                           | n (rev/min)               | 611                     | 407                | 306    | 244    | 204    | 153    | 122    | 102    | 87     | 76     |        |     |
| E 20      | 1.00    | 1.00                      | 8                         | f <sub>z</sub> (in)       | 0.0009                  | 0.0013             | 0.0018 | 0.0022 | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0061 | 0.0070 |        |     |
|           |         |                           |                           | v <sub>f</sub> (in/min)   | 2.1                     | 2.1                | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    |     |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter

v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE COBALT END MILLS

## SPC408 / SPB540 - START VALUES

| SIDE MILLING - ROUGHING |           |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |        |        |        |
|-------------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |        |        |        |        |        |        |        |        |        |
|                         |           |                                       |                                       |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1      | 1 1/4  | 1 1/2  | 1 3/4  | 2      |
| P                       | E 1 - 2   | 1.50                                  | 0.25                                  | 160                       | n (rev/min)             | 2445               | 1630   | 1222   | 978    | 815    | 611    | 489    | 407    | 349    | 306    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0028 | 0.0035 | 0.0042 | 0.0056 | 0.0070 | 0.0084 | 0.0098 | 0.0113 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 13.8               | 13.8   | 13.8   | 13.8   | 13.8   | 13.8   | 13.8   | 13.8   | 13.8   | 13.8   |
|                         | E 3 - 4   | 1.50                                  | 0.25                                  | 80                        | n (rev/min)             | 1222               | 815    | 611    | 489    | 407    | 306    | 244    | 204    | 175    | 153    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 5.3                | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    |
|                         | E 5 - 6   | 1.50                                  | 0.25                                  | 50                        | n (rev/min)             | 764                | 509    | 382    | 306    | 255    | 191    | 153    | 127    | 109    | 96     |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 3.3                | 3.3    | 3.3    | 3.3    | 3.3    | 3.3    | 3.3    | 3.3    | 3.3    | 3.3    |
| M                       | E 8 - 9   | 1.50                                  | 0.25                                  | 80                        | n (rev/min)             | 1222               | 815    | 611    | 489    | 407    | 306    | 244    | 204    | 175    | 153    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 5.3                | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    | 5.3    |
|                         | E 10 - 11 | 1.50                                  | 0.25                                  | 60                        | n (rev/min)             | 917                | 611    | 458    | 367    | 306    | 229    | 183    | 153    | 131    | 115    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0014 | 0.0019 | 0.0023 | 0.0028 | 0.0038 | 0.0047 | 0.0056 | 0.0066 | 0.0075 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 3.4                | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    | 3.4    |
| K                       | E 12 - 13 | 1.50                                  | 0.25                                  | 95                        | n (rev/min)             | 1452               | 968    | 726    | 581    | 484    | 363    | 290    | 242    | 207    | 181    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0028 | 0.0035 | 0.0042 | 0.0056 | 0.0070 | 0.0084 | 0.0098 | 0.0113 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 8.2                | 8.2    | 8.2    | 8.2    | 8.2    | 8.2    | 8.2    | 8.2    | 8.2    | 8.2    |
|                         | E 14 - 15 | 1.50                                  | 0.25                                  | 65                        | n (rev/min)             | 993                | 662    | 497    | 397    | 331    | 248    | 199    | 166    | 142    | 124    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 4.3                | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    | 4.3    |
| N                       | E 18      | 1.50                                  | 0.25                                  | 350                       | n (rev/min)             | 5348               | 3565   | 2674   | 2139   | 1783   | 1337   | 1070   | 891    | 764    | 669    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0016             | 0.0023 | 0.0031 | 0.0039 | 0.0047 | 0.0063 | 0.0078 | 0.0094 | 0.0109 | 0.0125 |
| S                       | E 20      | 1.50                                  | 0.25                                  | 10                        | n (rev/min)             | 153                | 102    | 76     | 61     | 51     | 38     | 31     | 25     | 22     | 19     |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0006             | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0044 | 0.0050 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.4                | 0.4    | 0.4    | 0.4    | 0.4    | 0.4    | 0.4    | 0.4    | 0.4    | 0.4    |
|                         | E 21      | 1.50                                  | 0.25                                  | 12                        | n (rev/min)             | 183                | 122    | 92     | 73     | 61     | 46     | 37     | 31     | 26     | 23     |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0008             | 0.0012 | 0.0016 | 0.0020 | 0.0023 | 0.0031 | 0.0039 | 0.0047 | 0.0055 | 0.0063 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.6                | 0.6    | 0.6    | 0.6    | 0.6    | 0.6    | 0.6    | 0.6    | 0.6    | 0.6    |
|                         | E 22      | 1.50                                  | 0.25                                  | 60                        | n (rev/min)             | 917                | 611    | 458    | 367    | 306    | 229    | 183    | 153    | 131    | 115    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
|                         |           |                                       |                                       | 40 - 80                   | v <sub>f</sub> (in/min) | 4.0                | 4.0    | 4.0    | 4.0    | 4.0    | 4.0    | 4.0    | 4.0    | 4.0    | 4.0    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE COBALT END MILLS

## SPC408 / SPB540 - START VALUES

|           |           | SIDE MILLING - ROUGHING               |                                       |                           |                        |                    |        |        |        |        |        |        |        |        |        |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                        | Z <sub>n</sub> = 6 |        |        |        |        |        |        |        |        |        |
|           |           |                                       |                                       |                           |                        | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1      | 1 1/4  | 1 1/2  | 1 3/4  | 2      |
| P         | E 1 - 2   | 1.50                                  | 0.25                                  | 160                       | n (rev/min)            | 2445               | 1630   | 1222   | 978    | 815    | 611    | 489    | 407    | 349    | 306    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (mm)    | 0.0014             | 0.0021 | 0.0028 | 0.0035 | 0.0042 | 0.0056 | 0.0070 | 0.0084 | 0.0098 | 0.0113 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (m/min) | 20.6               | 20.6   | 20.6   | 20.6   | 20.6   | 20.6   | 20.6   | 20.6   | 20.6   | 20.6   |
|           | E 3 - 4   | 1.50                                  | 0.25                                  | 80                        | n (rev/min)            | 1222               | 815    | 611    | 489    | 407    | 306    | 244    | 204    | 175    | 153    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (mm)    | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (m/min) | 8.0                | 8.0    | 8.0    | 8.0    | 8.0    | 8.0    | 8.0    | 8.0    | 8.0    | 8.0    |
|           | E 5 - 6   | 1.50                                  | 0.25                                  | 50                        | n (rev/min)            | 764                | 509    | 382    | 306    | 255    | 191    | 153    | 127    | 109    | 96     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (mm)    | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (m/min) | 5.0                | 5.0    | 5.0    | 5.0    | 5.0    | 5.0    | 5.0    | 5.0    | 5.0    | 5.0    |
| M         | E 8 - 9   | 1.50                                  | 0.25                                  | 80                        | n (rev/min)            | 1222               | 815    | 611    | 489    | 407    | 306    | 244    | 204    | 175    | 153    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (mm)    | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (m/min) | 8.0                | 8.0    | 8.0    | 8.0    | 8.0    | 8.0    | 8.0    | 8.0    | 8.0    | 8.0    |
|           | E 10 - 11 | 1.50                                  | 0.25                                  | 60                        | n (rev/min)            | 917                | 611    | 458    | 367    | 306    | 229    | 183    | 153    | 131    | 115    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (mm)    | 0.0009             | 0.0014 | 0.0019 | 0.0023 | 0.0028 | 0.0038 | 0.0047 | 0.0056 | 0.0066 | 0.0075 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (m/min) | 5.2                | 5.2    | 5.2    | 5.2    | 5.2    | 5.2    | 5.2    | 5.2    | 5.2    | 5.2    |
| K         | E 12 - 13 | 1.50                                  | 0.25                                  | 95                        | n (rev/min)            | 1452               | 968    | 726    | 581    | 484    | 363    | 290    | 242    | 207    | 181    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (mm)    | 0.0014             | 0.0021 | 0.0028 | 0.0035 | 0.0042 | 0.0056 | 0.0070 | 0.0084 | 0.0098 | 0.0113 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (m/min) | 12.2               | 12.2   | 12.2   | 12.2   | 12.2   | 12.2   | 12.2   | 12.2   | 12.2   | 12.2   |
|           | E 14 - 15 | 1.50                                  | 0.25                                  | 65                        | n (rev/min)            | 993                | 662    | 497    | 397    | 331    | 248    | 199    | 166    | 142    | 124    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (mm)    | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (m/min) | 6.5                | 6.5    | 6.5    | 6.5    | 6.5    | 6.5    | 6.5    | 6.5    | 6.5    | 6.5    |
| N         | E 18      | 1.50                                  | 0.25                                  | 350                       | n (rev/min)            | 5348               | 3565   | 2674   | 2139   | 1783   | 1337   | 1070   | 891    | 764    | 669    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (mm)    | 0.0016             | 0.0023 | 0.0031 | 0.0039 | 0.0047 | 0.0063 | 0.0078 | 0.0094 | 0.0109 | 0.0125 |
| S         | E 20      | 1.50                                  | 0.25                                  | 10                        | n (rev/min)            | 153                | 102    | 76     | 61     | 51     | 38     | 31     | 25     | 22     | 19     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (mm)    | 0.0006             | 0.0009 | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038 | 0.0044 | 0.0050 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (m/min) | 0.6                | 0.6    | 0.6    | 0.6    | 0.6    | 0.6    | 0.6    | 0.6    | 0.6    | 0.6    |
|           | E 21      | 1.50                                  | 0.25                                  | 12                        | n (rev/min)            | 183                | 122    | 92     | 73     | 61     | 46     | 37     | 31     | 26     | 23     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (mm)    | 0.0008             | 0.0012 | 0.0016 | 0.0020 | 0.0023 | 0.0031 | 0.0039 | 0.0047 | 0.0055 | 0.0063 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (m/min) | 0.9                | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    | 0.9    |
|           | E 22      | 1.50                                  | 0.25                                  | 60                        | n (rev/min)            | 917                | 611    | 458    | 367    | 306    | 229    | 183    | 153    | 131    | 115    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (mm)    | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 | 0.0066 | 0.0077 | 0.0088 |
|           |           |                                       |                                       | 40 - 80                   | v <sub>f</sub> (m/min) | 6.0                | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE COBALT END MILLS



## SMM845 - START VALUES

|           |         | SLOTTING                              |                                       |                          |             |                    |       |       |       |       |       |       |       |       |       |       |     |
|-----------|---------|---------------------------------------|---------------------------------------|--------------------------|-------------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|
| ISO GROUP | SMG     | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (m / min) |             | Z <sub>n</sub> = 4 |       |       |       |       |       |       |       |       |       |       |     |
|           |         |                                       |                                       |                          |             | 3                  | 4     | 5     | 6     | 8     | 10    | 12    | 14    | 16    | 18    | 20    |     |
| P         | E 1 - 2 | 1.00                                  | 1.00                                  | 110                      | n (min-1)   | 3558               | 2668  | 2135  | 1779  | 1334  | 1067  | 889   | 762   | 667   | 593   | 534   |     |
|           |         |                                       |                                       |                          | fz (in)     | .0005              | .0007 | .0009 | .0011 | .0014 | .0018 | .0021 | .0025 | .0028 | .0032 | .0035 |     |
|           | E 3 - 4 | 1.00                                  | 1.00                                  | 50                       | 80 - 140    | vf (in/min)        | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6   | 7.6 |
|           |         |                                       |                                       |                          | n (min-1)   | 1617               | 1213  | 970   | 809   | 606   | 485   | 404   | 347   | 303   | 270   | 243   |     |
|           | E 5 - 6 | 1.00                                  | 1.00                                  | 35                       | fz (in)     | .0004              | .0006 | .0007 | .0008 | .0011 | .0014 | .0017 | .0019 | .0022 | .0025 | .0028 |     |
|           |         |                                       |                                       |                          | 40 - 60     | vf (in/min)        | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7 |
| E 8 - 9   | 1.00    | 1.00                                  | 50                                    | n (min-1)                | 1132        | 849                | 679   | 566   | 424   | 340   | 283   | 243   | 212   | 189   | 170   |       |     |
|           |         |                                       |                                       | fz (in)                  | .0004       | .0006              | .0007 | .0008 | .0011 | .0014 | .0017 | .0019 | .0022 | .0025 | .0028 |       |     |
| E 10 - 11 | 1.00    | 1.00                                  | 40                                    | 25 - 45                  | vf (in/min) | 1.9                | 1.9   | 1.9   | 1.9   | 1.9   | 1.9   | 1.9   | 1.9   | 1.9   | 1.9   | 1.9   |     |
|           |         |                                       |                                       | n (min-1)                | 1617        | 1213               | 970   | 809   | 606   | 485   | 404   | 347   | 303   | 270   | 243   |       |     |
| E 12 - 13 | 1.00    | 1.00                                  | 50                                    | fz (in)                  | .0004       | .0006              | .0007 | .0008 | .0011 | .0014 | .0017 | .0019 | .0022 | .0025 | .0028 |       |     |
|           |         |                                       |                                       | 40 - 60                  | vf (in/min) | 2.7                | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   | 2.7   |     |
| E 14 - 15 | 1.00    | 1.00                                  | 40                                    | n (min-1)                | 1294        | 970                | 776   | 647   | 485   | 388   | 323   | 277   | 243   | 216   | 194   |       |     |
|           |         |                                       |                                       | fz (in)                  | .0004       | .0005              | .0006 | .0007 | .0009 | .0012 | .0014 | .0017 | .0019 | .0021 | .0024 |       |     |
| E 18      | 1.00    | 1.00                                  | 240                                   | 30 - 50                  | vf (in/min) | 1.8                | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   |     |
|           |         |                                       |                                       | n (min-1)                | 1617        | 1213               | 970   | 809   | 606   | 485   | 404   | 347   | 303   | 270   | 243   |       |     |
| E 20      | 1.00    | 1.00                                  | 5                                     | fz (in)                  | .0005       | .0007              | .0009 | .0011 | .0014 | .0018 | .0021 | .0025 | .0028 | .0032 | .0035 |       |     |
|           |         |                                       |                                       | 40 - 60                  | vf (in/min) | 3.4                | 3.4   | 3.4   | 3.4   | 3.4   | 3.4   | 3.4   | 3.4   | 3.4   | 3.4   | 3.4   |     |
| E 21      | 1.00    | 1.00                                  | 5                                     | n (min-1)                | 1294        | 970                | 776   | 647   | 485   | 388   | 323   | 277   | 243   | 216   | 194   |       |     |
|           |         |                                       |                                       | fz (in)                  | .0004       | .0006              | .0007 | .0008 | .0011 | .0014 | .0017 | .0019 | .0022 | .0025 | .0028 |       |     |
| E 22      | 1.00    | 1.00                                  | 40                                    | 30 - 50                  | vf (in/min) | 2.1                | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   |       |     |
|           |         |                                       |                                       | n (min-1)                | 7762        | 5822               | 4657  | 3881  | 2911  | 2329  | 1941  | 1663  | 1455  | 1294  | 1164  |       |     |
| E 20      | 1.00    | 1.00                                  | 5                                     | fz (in)                  | .0006       | .0008              | .0010 | .0012 | .0016 | .0020 | .0024 | .0028 | .0031 | .0035 | .0039 |       |     |
|           |         |                                       |                                       | 200 - 280                | vf (in/min) | 18.3               | 18.3  | 18.3  | 18.3  | 18.3  | 18.3  | 18.3  | 18.3  | 18.3  | 18.3  | 18.3  |     |
| E 21      | 1.00    | 1.00                                  | 5                                     | n (min-1)                | 162         | 121                | 97    | 81    | 61    | 49    | 40    | 35    | 30    | 27    | 24    |       |     |
|           |         |                                       |                                       | fz (in)                  | .0002       | .0002              | .0003 | .0004 | .0005 | .0006 | .0007 | .0008 | .0009 | .0011 | .0012 |       |     |
| E 22      | 1.00    | 1.00                                  | 40                                    | 5 - 10                   | vf (in/min) | .1                 | .1    | .1    | .1    | .1    | .1    | .1    | .1    | .1    | .1    |       |     |
|           |         |                                       |                                       | n (min-1)                | 162         | 121                | 97    | 81    | 61    | 49    | 40    | 35    | 30    | 27    | 24    |       |     |
| E 20      | 1.00    | 1.00                                  | 5                                     | fz (in)                  | .0003       | .0004              | .0005 | .0006 | .0008 | .0010 | .0012 | .0014 | .0016 | .0018 | .0020 |       |     |
|           |         |                                       |                                       | 5 - 10                   | vf (in/min) | .2                 | .2    | .2    | .2    | .2    | .2    | .2    | .2    | .2    | .2    | .2    |     |
| E 21      | 1.00    | 1.00                                  | 5                                     | n (min-1)                | 1294        | 970                | 776   | 647   | 485   | 388   | 323   | 277   | 243   | 216   | 194   |       |     |
|           |         |                                       |                                       | fz (in)                  | .0004       | .0006              | .0007 | .0008 | .0011 | .0014 | .0017 | .0019 | .0022 | .0025 | .0028 |       |     |
| E 22      | 1.00    | 1.00                                  | 40                                    | 20 - 60                  | vf (in/min) | 2.1                | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   | 2.1   |       |     |
|           |         |                                       |                                       | n (min-1)                | 1294        | 970                | 776   | 647   | 485   | 388   | 323   | 277   | 243   | 216   | 194   |       |     |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE COBALT END MILLS

## SMM845 - START VALUES

|           |           | SIDE MILLING - ROUGHING               |                                       |                          |             |                    |       |       |       |       |       |       |       |       |       |       |
|-----------|-----------|---------------------------------------|---------------------------------------|--------------------------|-------------|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (m / min) |             | Z <sub>n</sub> = 4 |       |       |       |       |       |       |       |       |       |       |
|           |           |                                       |                                       |                          |             | 3                  | 4     | 5     | 6     | 8     | 10    | 12    | 14    | 16    | 18    | 20    |
| P         | E 1 - 2   | 1.50                                  | 0.25                                  | 160                      | n (min-1)   | 5175               | 3881  | 3105  | 2587  | 1941  | 1552  | 1294  | 1109  | 970   | 862   | 776   |
|           |           |                                       |                                       |                          | fz (in)     | .0007              | .0009 | .0011 | .0013 | .0018 | .0022 | .0026 | .0031 | .0035 | .0040 | .0044 |
|           |           |                                       |                                       |                          | vf (in/min) | 13.7               | 13.7  | 13.7  | 13.7  | 13.7  | 13.7  | 13.7  | 13.7  | 13.7  | 13.7  | 13.7  |
|           | E 3 - 4   | 1.50                                  | 0.25                                  | 80                       | n (min-1)   | 2587               | 1941  | 1552  | 1294  | 970   | 776   | 647   | 554   | 485   | 431   | 388   |
|           |           |                                       |                                       |                          | fz (in)     | .0005              | .0007 | .0009 | .0010 | .0014 | .0017 | .0021 | .0024 | .0028 | .0031 | .0035 |
|           |           |                                       |                                       |                          | vf (in/min) | 5.4                | 5.4   | 5.4   | 5.4   | 5.4   | 5.4   | 5.4   | 5.4   | 5.4   | 5.4   | 5.4   |
|           | E 5 - 6   | 1.50                                  | 0.25                                  | 50                       | n (min-1)   | 1617               | 1213  | 970   | 809   | 606   | 485   | 404   | 347   | 303   | 270   | 243   |
|           |           |                                       |                                       |                          | fz (in)     | .0005              | .0007 | .0009 | .0010 | .0014 | .0017 | .0021 | .0024 | .0028 | .0031 | .0035 |
|           |           |                                       |                                       |                          | vf (in/min) | 3.4                | 3.4   | 3.4   | 3.4   | 3.4   | 3.4   | 3.4   | 3.4   | 3.4   | 3.4   | 3.4   |
| M         | E 8 - 9   | 1.50                                  | 0.25                                  | 80                       | n (min-1)   | 2587               | 1941  | 1552  | 1294  | 970   | 776   | 647   | 554   | 485   | 431   | 388   |
|           |           |                                       |                                       |                          | fz (in)     | .0005              | .0007 | .0009 | .0010 | .0014 | .0017 | .0021 | .0024 | .0028 | .0031 | .0035 |
|           |           |                                       |                                       |                          | vf (in/min) | 5.4                | 5.4   | 5.4   | 5.4   | 5.4   | 5.4   | 5.4   | 5.4   | 5.4   | 5.4   | 5.4   |
|           | E 10 - 11 | 1.50                                  | 0.25                                  | 60                       | n (min-1)   | 1941               | 1455  | 1164  | 970   | 728   | 582   | 485   | 416   | 364   | 323   | 291   |
|           |           |                                       |                                       |                          | fz (in)     | .0004              | .0006 | .0007 | .0009 | .0012 | .0015 | .0018 | .0021 | .0024 | .0027 | .0030 |
|           |           |                                       |                                       |                          | vf (in/min) | 3.5                | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   | 3.5   |
| K         | E 12 - 13 | 1.50                                  | 0.25                                  | 95                       | n (min-1)   | 3073               | 2304  | 1844  | 1536  | 1152  | 922   | 768   | 658   | 576   | 512   | 461   |
|           |           |                                       |                                       |                          | fz (in)     | .0007              | .0009 | .0011 | .0013 | .0018 | .0022 | .0026 | .0031 | .0035 | .0040 | .0044 |
|           |           |                                       |                                       |                          | vf (in/min) | 8.1                | 8.1   | 8.1   | 8.1   | 8.1   | 8.1   | 8.1   | 8.1   | 8.1   | 8.1   | 8.1   |
|           | E 14 - 15 | 1.50                                  | 0.25                                  | 65                       | n (min-1)   | 2102               | 1577  | 1261  | 1051  | 788   | 631   | 526   | 450   | 394   | 350   | 315   |
|           |           |                                       |                                       |                          | fz (in)     | .0005              | .0007 | .0009 | .0010 | .0014 | .0017 | .0021 | .0024 | .0028 | .0031 | .0035 |
|           |           |                                       |                                       |                          | vf (in/min) | 4.4                | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   | 4.4   |
| N         | E 18      | 1.50                                  | 0.25                                  | 350                      | n (min-1)   | 11320              | 8490  | 6792  | 5660  | 4245  | 3396  | 2830  | 2426  | 2122  | 1887  | 1698  |
|           |           |                                       |                                       |                          | fz (in)     | .0007              | .0010 | .0012 | .0015 | .0020 | .0025 | .0030 | .0035 | .0040 | .0045 | .0050 |
| S         | E 20      | 1.50                                  | 0.25                                  | 10                       | n (min-1)   | 323                | 243   | 194   | 162   | 121   | 97    | 81    | 69    | 61    | 54    | 49    |
|           |           |                                       |                                       |                          | fz (in)     | .0003              | .0004 | .0005 | .0006 | .0008 | .0010 | .0012 | .0014 | .0016 | .0018 | .0020 |
|           |           |                                       |                                       |                          | vf (in/min) | .4                 | .4    | .4    | .4    | .4    | .4    | .4    | .4    | .4    | .4    | .4    |
|           | E 21      | 1.50                                  | 0.25                                  | 15                       | n (min-1)   | 485                | 364   | 291   | 243   | 182   | 146   | 121   | 104   | 91    | 81    | 73    |
|           |           |                                       |                                       |                          | fz (in)     | .0004              | .0005 | .0006 | .0007 | .0010 | .0012 | .0015 | .0017 | .0020 | .0022 | .0024 |
|           |           |                                       |                                       |                          | vf (in/min) | .7                 | .7    | .7    | .7    | .7    | .7    | .7    | .7    | .7    | .7    | .7    |
|           | E 22      | 1.50                                  | 0.25                                  | 60                       | n (min-1)   | 1941               | 1455  | 1164  | 970   | 728   | 582   | 485   | 416   | 364   | 323   | 291   |
|           |           |                                       |                                       |                          | fz (in)     | .0005              | .0007 | .0009 | .0010 | .0014 | .0017 | .0021 | .0024 | .0028 | .0031 | .0035 |
|           |           |                                       |                                       |                          | vf (in/min) | 4.0                | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   | 4.0   |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

fz [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 vf [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## RTM713 - START VALUES

| SLOTTING                |              |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |
|-------------------------|--------------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG          | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        |        |
|                         |              |                                       |                                       |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1      | 1 1/4  |
| P                       | E<br>1 - 2   | 1.00                                  | 1.00                                  | 132                       | n (rev/min)             | 2017               | 1345   | 1008   | 807    | 672    | 504    | 403    |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0028 | 0.0035 | 0.0042 | 0.0056 | 0.0070 |
|                         |              |                                       |                                       | 102 - 162                 | v <sub>f</sub> (in/min) | 8.5                | 8.5    | 8.5    | 8.5    | 8.5    | 8.5    | 8.5    |
|                         | E<br>3 - 4   | 1.00                                  | 1.00                                  | 60                        | n (rev/min)             | 917                | 611    | 458    | 367    | 306    | 229    | 183    |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 |
|                         |              |                                       |                                       | 50 - 70                   | v <sub>f</sub> (in/min) | 3.0                | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    |
| K                       | E<br>12 - 13 | 1.00                                  | 1.00                                  | 60                        | n (rev/min)             | 917                | 611    | 458    | 367    | 306    | 229    | 183    |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0028 | 0.0035 | 0.0042 | 0.0056 | 0.0070 |
|                         |              |                                       |                                       | 50 - 70                   | v <sub>f</sub> (in/min) | 3.9                | 3.9    | 3.9    | 3.9    | 3.9    | 3.9    | 3.9    |
| N                       | E<br>18      | 1.00                                  | 1.00                                  | 288                       | n (rev/min)             | 4401               | 2934   | 2200   | 1760   | 1467   | 1100   | 880    |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0016             | 0.0023 | 0.0031 | 0.0039 | 0.0047 | 0.0063 | 0.0078 |
|                         |              |                                       |                                       | 248 - 328                 | v <sub>f</sub> (in/min) | 20.6               | 20.6   | 20.6   | 20.6   | 20.6   | 20.6   | 20.6   |
| SIDE MILLING - ROUGHING |              |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |
| P                       | E<br>1 - 2   | 1.50                                  | 0.25                                  | 192                       | n (rev/min)             | 2934               | 1956   | 1467   | 1174   | 978    | 733    | 587    |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0018             | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0070 | 0.0088 |
|                         |              |                                       |                                       | 152 - 232                 | v <sub>f</sub> (in/min) | 15.5               | 15.5   | 15.5   | 15.5   | 15.5   | 15.5   | 15.5   |
|                         | E<br>3 - 4   | 1.50                                  | 0.25                                  | 96                        | n (rev/min)             | 1467               | 978    | 733    | 587    | 489    | 367    | 293    |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0027 | 0.0034 | 0.0041 | 0.0055 | 0.0068 |
|                         |              |                                       |                                       | 76 - 116                  | v <sub>f</sub> (in/min) | 6.0                | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    | 6.0    |
| K                       | E<br>12 - 13 | 1.50                                  | 0.25                                  | 114                       | n (rev/min)             | 1742               | 1161   | 871    | 697    | 581    | 435    | 348    |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0018             | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0070 | 0.0088 |
|                         |              |                                       |                                       | 94 - 134                  | v <sub>f</sub> (in/min) | 9.2                | 9.2    | 9.2    | 9.2    | 9.2    | 9.2    | 9.2    |
| N                       | E<br>18      | 1.50                                  | 0.25                                  | 420                       | n (rev/min)             | 6418               | 4278   | 3209   | 2567   | 2139   | 1604   | 1284   |
|                         |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0020             | 0.0029 | 0.0039 | 0.0049 | 0.0059 | 0.0078 | 0.0098 |
|                         |              |                                       |                                       | 370 - 470                 | v <sub>f</sub> (in/min) | 37.6               | 37.6   | 37.6   | 37.6   | 37.6   | 37.6   | 37.6   |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.



# CUTTING DATA - GENERAL PURPOSE COBALT END MILLS

## RHC752 - START VALUES

| SLOTTING  |      |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |        |        |        |
|-----------|------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG  | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        |        |        |        |        |
|           |      |                                       |                                       |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1      | 1 1/4  | 1 1/2  | 1 3/4  | 2      |
| N         | E 16 | 1.00                                  | 1.00                                  | 600                       | n (rev/min)             | 9168               | 6112   | 4584   | 3667   | 3056   | 2292   | 1834   | 1528   | 1310   | 1146   |
|           |      |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0031             | 0.0047 | 0.0063 | 0.0078 | 0.0094 | 0.0125 | 0.0156 | 0.0188 | 0.0219 | 0.0250 |
|           |      |                                       |                                       | 300 - 900                 | v <sub>f</sub> (in/min) | 86.0               | 86.0   | 86.0   | 85.9   | 86.0   | 86.0   | 86.0   | 86.0   | 86.0   | 86.0   |
|           | E 17 | 1.00                                  | 1.00                                  | 600                       | n (rev/min)             | 9168               | 6112   | 4584   | 3667   | 3056   | 2292   | 1834   | 1528   | 1310   | 1146   |
|           |      |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0031             | 0.0047 | 0.0063 | 0.0078 | 0.0094 | 0.0125 | 0.0156 | 0.0188 | 0.0219 | 0.0250 |
|           |      |                                       |                                       | 300 - 900                 | v <sub>f</sub> (in/min) | 86.0               | 86.0   | 86.0   | 85.9   | 86.0   | 86.0   | 86.0   | 86.0   | 86.0   | 86.0   |

| SIDE MILLING - ROUGHING |      |      |      |            |                         |        |        |        |        |        |        |        |        |        |        |
|-------------------------|------|------|------|------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| N                       | E 16 | 1.50 | 0.25 | 900        | n (rev/min)             | 13752  | 9168   | 6876   | 5501   | 4584   | 3438   | 2750   | 2292   | 1965   | 1719   |
|                         |      |      |      |            | f <sub>z</sub> (in)     | 0.0039 | 0.0059 | 0.0078 | 0.0098 | 0.0117 | 0.0156 | 0.0195 | 0.0234 | 0.0273 | 0.0313 |
|                         |      |      |      | 600 - 1200 | v <sub>f</sub> (in/min) | 161.2  | 161.2  | 161.2  | 161.2  | 161.2  | 161.2  | 161.1  | 161.2  | 161.2  | 161.2  |
|                         | E 17 | 1.50 | 0.25 | 900        | n (rev/min)             | 13752  | 9168   | 6876   | 5501   | 4584   | 3438   | 2750   | 2292   | 1965   | 1719   |
|                         |      |      |      |            | f <sub>z</sub> (in)     | 0.0039 | 0.0059 | 0.0078 | 0.0098 | 0.0117 | 0.0156 | 0.0195 | 0.0234 | 0.0273 | 0.0313 |
|                         |      |      |      | 600 - 1200 | v <sub>f</sub> (in/min) | 161.2  | 161.2  | 161.2  | 161.2  | 161.2  | 161.2  | 161.1  | 161.2  | 161.2  | 161.2  |

## RHLC754 - START VALUES

| SLOTTING  |      |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |        |        |        |
|-----------|------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG  | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        |        |        |        |        |
|           |      |                                       |                                       |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1      | 1 1/4  | 1 1/2  | 1 3/4  | 2      |
| N         | E 16 | 1.00                                  | 1.00                                  | 500                       | n (rev/min)             | 7640               | 5093   | 3820   | 3056   | 2547   | 1910   | 1528   | 1273   | 1091   | 955    |
|           |      |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0025             | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 | 0.0150 | 0.0175 | 0.0200 |
|           |      |                                       |                                       | 200 - 800                 | v <sub>f</sub> (in/min) | 57.3               | 57.3   | 57.3   | 57.3   | 57.3   | 57.3   | 57.3   | 57.3   | 57.3   | 57.3   |
|           | E 17 | 1.00                                  | 1.00                                  | 500                       | n (rev/min)             | 7640               | 5093   | 3820   | 3056   | 2547   | 1910   | 1528   | 1273   | 1091   | 955    |
|           |      |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0025             | 0.0038 | 0.0050 | 0.0063 | 0.0075 | 0.0100 | 0.0125 | 0.0150 | 0.0175 | 0.0200 |
|           |      |                                       |                                       | 200 - 800                 | v <sub>f</sub> (in/min) | 57.3               | 57.3   | 57.3   | 57.3   | 57.3   | 57.3   | 57.3   | 57.3   | 57.3   | 57.3   |

| SIDE MILLING - ROUGHING |      |      |      |            |                         |        |        |        |        |        |        |        |        |        |        |
|-------------------------|------|------|------|------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| N                       | E 16 | 1.50 | 0.25 | 750        | n (rev/min)             | 11460  | 7640   | 5730   | 4584   | 3820   | 2865   | 2292   | 1910   | 1637   | 1433   |
|                         |      |      |      |            | f <sub>z</sub> (in)     | 0.0031 | 0.0047 | 0.0063 | 0.0078 | 0.0094 | 0.0125 | 0.0156 | 0.0188 | 0.0219 | 0.0250 |
|                         |      |      |      | 450 - 1050 | v <sub>f</sub> (in/min) | 107.4  | 107.4  | 107.4  | 107.4  | 107.4  | 107.4  | 107.4  | 107.4  | 107.4  | 107.4  |
|                         | E 17 | 1.50 | 0.25 | 750        | n (rev/min)             | 11460  | 7640   | 5730   | 4584   | 3820   | 2865   | 2292   | 1910   | 1637   | 1433   |
|                         |      |      |      |            | f <sub>z</sub> (in)     | 0.0031 | 0.0047 | 0.0063 | 0.0078 | 0.0094 | 0.0125 | 0.0156 | 0.0188 | 0.0219 | 0.0250 |
|                         |      |      |      | 450 - 1050 | v <sub>f</sub> (in/min) | 107.4  | 107.4  | 107.4  | 107.4  | 107.4  | 107.4  | 107.4  | 107.4  | 107.4  | 107.4  |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## RTM447 - START VALUES

| SLOTTING  |           |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        |        |
|           |           |                                       |                                       |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1      | 1 1/4  |
| P         | E 5 - 6   | 1.00                                  | 1.00                                  | 42                        | n (rev/min)             | 642                | 428    | 321    | 257    | 214    | 160    | 128    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.1                | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    |
| M         | E 8 - 9   | 1.00                                  | 1.00                                  | 60                        | n (rev/min)             | 917                | 611    | 458    | 367    | 306    | 229    | 183    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 3.0                | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    | 3.0    |
|           | E 10 - 11 | 1.00                                  | 1.00                                  | 48                        | n (rev/min)             | 733                | 489    | 367    | 293    | 244    | 183    | 147    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0014 | 0.0019 | 0.0023 | 0.0028 | 0.0038 | 0.0047 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.1                | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    | 2.1    |
| K         | E 14 - 15 | 1.00                                  | 1.00                                  | 48                        | n (rev/min)             | 733                | 489    | 367    | 293    | 244    | 183    | 147    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.4                | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    |
| S         | E 20      | 1.00                                  | 1.00                                  | 9.6                       | n (rev/min)             | 147                | 98     | 73     | 59     | 49     | 37     | 29     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0005             | 0.0007 | 0.0009 | 0.0012 | 0.0014 | 0.0019 | 0.0023 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.2                | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    | 0.2    |
|           | E 21      | 1.00                                  | 1.00                                  | 9.6                       | n (rev/min)             | 147                | 98     | 73     | 59     | 49     | 37     | 29     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0008             | 0.0012 | 0.0016 | 0.0020 | 0.0023 | 0.0031 | 0.0039 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.3                | 0.3    | 0.3    | 0.3    | 0.3    | 0.3    | 0.3    |
|           | E 22      | 1.00                                  | 1.00                                  | 48                        | n (rev/min)             | 733                | 489    | 367    | 293    | 244    | 183    | 147    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.4                | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    | 2.4    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE COBALT END MILLS

## RTM447 - START VALUES

| SIDE MILLING - ROUGHING |           |                                       |                                       |                           |                         |                    |        |        |        |        |        |        |
|-------------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------|
| ISO GROUP               | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        |        |
|                         |           |                                       |                                       |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1      | 1 1/4  |
| P                       | E 5 - 6   | 1.50                                  | 0.25                                  | 63                        | n (rev/min)             | 955                | 637    | 478    | 382    | 318    | 239    | 191    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0027 | 0.0034 | 0.0041 | 0.0055 | 0.0068 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 3.9                | 3.9    | 3.9    | 3.9    | 3.9    | 3.9    | 3.9    |
| M                       | E 8 - 9   | 1.50                                  | 0.25                                  | 96                        | n (rev/min)             | 1467               | 978    | 733    | 587    | 489    | 367    | 293    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0018 | 0.0023 | 0.0029 | 0.0035 | 0.0047 | 0.0059 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 6.0                | 5.2    | 5.2    | 5.2    | 5.2    | 5.2    | 5.2    |
|                         | E 10 - 11 | 1.50                                  | 0.25                                  | 72                        | n (rev/min)             | 1100               | 733    | 550    | 440    | 367    | 275    | 220    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0012             | 0.0018 | 0.0023 | 0.0029 | 0.0035 | 0.0047 | 0.0059 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 3.9                | 3.9    | 3.9    | 3.9    | 3.9    | 3.9    | 3.9    |
| K                       | E 14 - 15 | 1.50                                  | 0.25                                  | 78                        | n (rev/min)             | 1192               | 795    | 596    | 477    | 397    | 298    | 238    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0027 | 0.0034 | 0.0041 | 0.0055 | 0.0068 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 4.9                | 4.9    | 4.9    | 4.9    | 4.9    | 4.9    | 4.9    |
| S                       | E 20      | 1.50                                  | 0.25                                  | 12                        | n (rev/min)             | 183                | 122    | 92     | 73     | 61     | 46     | 37     |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0006             | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0023 | 0.0029 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.3                | 0.3    | 0.3    | 0.3    | 0.3    | 0.3    | 0.3    |
|                         | E 21      | 1.50                                  | 0.25                                  | 14                        | n (rev/min)             | 220                | 147    | 110    | 88     | 73     | 55     | 44     |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0010             | 0.0015 | 0.0020 | 0.0024 | 0.0029 | 0.0039 | 0.0049 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.6                | 0.6    | 0.6    | 0.6    | 0.6    | 0.6    | 0.6    |
|                         | E 22      | 1.50                                  | 0.25                                  | 72                        | n (rev/min)             | 1100               | 733    | 550    | 440    | 367    | 275    | 220    |
|                         |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0027 | 0.0034 | 0.0041 | 0.0055 | 0.0068 |
|                         |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 4.5                | 4.5    | 4.5    | 4.5    | 4.5    | 4.5    | 4.5    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## REM710 / REC700 / RMB700 - START VALUES

| SLOTTING  |              |                                       |                                       |                           |                         |                    |        |        |        |        |                    |        |                    |        |  |
|-----------|--------------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------------------|--------|--------------------|--------|--|
| ISO GROUP | SMG          | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |        |        |        |        | Z <sub>n</sub> = 5 |        | Z <sub>n</sub> = 6 |        |  |
|           |              |                                       |                                       |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1                  | 1 1/4  | 1 1/2              | 1 3/4  |  |
| P         | E<br>1 - 2   | 1.00                                  | 1.00                                  | 132                       | n (rev/min)             | 2017               | 1345   | 1008   | 807    | 672    | 504                | 403    | 336                | 288    |  |
|           |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0028 | 0.0035 | 0.0042 | 0.0056             | 0.0070 | 0.0084             | 0.0098 |  |
|           |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 11.3               | 11.3   | 11.3   | 11.3   | 11.3   | 14.2               | 17.0   | 17.0               | 17.0   |  |
|           | E<br>3 - 4   | 1.00                                  | 1.00                                  | 60                        | n (rev/min)             | 917                | 611    | 458    | 367    | 306    | 229                | 183    | 153                | 131    |  |
|           |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044             | 0.0055 | 0.0066             | 0.0077 |  |
|           |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 4.0                | 4.0    | 4.0    | 4.0    | 4.0    | 5.0                | 6.0    | 6.0                | 6.0    |  |
| K         | E<br>12 - 13 | 1.00                                  | 1.00                                  | 60                        | n (rev/min)             | 917                | 611    | 458    | 367    | 306    | 229                | 183    | 153                | 131    |  |
|           |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0028 | 0.0035 | 0.0042 | 0.0056             | 0.0070 | 0.0084             | 0.0098 |  |
|           |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 5.2                | 5.2    | 5.2    | 5.2    | 5.2    | 6.4                | 7.7    | 7.7                | 7.7    |  |
| N         | E<br>18      | 1.00                                  | 1.00                                  | 288                       | n (rev/min)             | 4401               | 2934   | 2200   | 1760   | 1467   | 1100               | 880    | 733                | 629    |  |
|           |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0016             | 0.0023 | 0.0031 | 0.0039 | 0.0047 | 0.0063             | 0.0078 | 0.0094             | 0.0109 |  |
|           |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 27.5               | 27.5   | 27.5   | 27.5   | 27.5   | 34.4               | 41.3   | 41.3               | 41.3   |  |

## REM710 / REC700 / RMB700 - START VALUES

| SLOTTING  |              |                                       |                                       |                           |                         |                    |        |                     |  |
|-----------|--------------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|---------------------|--|
| ISO GROUP | SMG          | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 8 |        | Z <sub>n</sub> = 10 |  |
|           |              |                                       |                                       |                           |                         | 2                  | 2 1/2  | 3                   |  |
| P         | E<br>1 - 2   | 0.50                                  | 1.00                                  | 132                       | n (rev/min)             | 252                | 202    | 168                 |  |
|           |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0113             | 0.0141 | 0.0169              |  |
|           |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 22.7               | 22.7   | 28.4                |  |
|           | E<br>3 - 4   | 0.50                                  | 1.00                                  | 60                        | n (rev/min)             | 115                | 92     | 76                  |  |
|           |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0088             | 0.0109 | 0.0131              |  |
|           |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 8.0                | 8.0    | 10.0                |  |
| K         | E<br>12 - 13 | 0.50                                  | 1.00                                  | 60                        | n (rev/min)             | 115                | 92     | 76                  |  |
|           |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0113             | 0.0141 | 0.0169              |  |
|           |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 10.3               | 10.3   | 12.9                |  |
| N         | E<br>18      | 0.50                                  | 1.00                                  | 288                       | n (rev/min)             | 550                | 440    | 367                 |  |
|           |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0125             | 0.0156 | 0.0188              |  |
|           |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 55.0               | 55.0   | 68.8                |  |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## REM710 / REC700 / RMB700 - START VALUES

### SIDE MILLING - ROUGHING

| ISO GROUP | SMG          | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |                     |                         |        |        |        |        |        |        |        |        | Z <sub>n</sub> = 5 |       |       | Z <sub>n</sub> = 6 |       |   | Z <sub>n</sub> = 8 |  | Z <sub>n</sub> = 10 |
|-----------|--------------|---------------------------|---------------------------|---------------------------|-------------------------|--------------------|---------------------|-------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------------------|-------|-------|--------------------|-------|---|--------------------|--|---------------------|
|           |              |                           |                           |                           |                         |                    |                     |                         |        |        | 1/4    | 3/8    | 1/2    | 5/8    | 3/4    | 1      | 1 1/4              | 1 1/2 | 1 3/4 | 2                  | 2 1/2 | 3 |                    |  |                     |
|           |              |                           |                           |                           |                         | n (rev/min)        | f <sub>z</sub> (in) | v <sub>f</sub> (in/min) |        |        |        |        |        |        |        |        |                    |       |       |                    |       |   |                    |  |                     |
| P         | E<br>1 - 2   | 1.50                      | 0.25                      | 192                       | n (rev/min)             | 2934               | 1956                | 1467                    | 1174   | 978    | 733    | 587    | 489    | 419    | 367    | 293    | 244                |       |       |                    |       |   |                    |  |                     |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0018             | 0.0026              | 0.0035                  | 0.0044 | 0.0053 | 0.0070 | 0.0088 | 0.0105 | 0.0123 | 0.0141 | 0.0176 | 0.0211             |       |       |                    |       |   |                    |  |                     |
|           |              |                           |                           | 152 - 232                 | v <sub>f</sub> (in/min) | 20.6               | 20.6                | 20.6                    | 20.6   | 20.6   | 25.8   | 30.9   | 30.9   | 30.9   | 41.3   | 41.3   | 51.6               |       |       |                    |       |   |                    |  |                     |
|           | E<br>3 - 4   | 1.50                      | 0.25                      | 96                        | n (rev/min)             | 1467               | 978                 | 733                     | 587    | 489    | 367    | 293    | 244    | 210    | 183    | 147    | 122                |       |       |                    |       |   |                    |  |                     |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021              | 0.0027                  | 0.0034 | 0.0041 | 0.0055 | 0.0068 | 0.0082 | 0.0096 | 0.0109 | 0.0137 | 0.0164             |       |       |                    |       |   |                    |  |                     |
|           |              |                           |                           | 76 - 116                  | v <sub>f</sub> (in/min) | 8.0                | 8.0                 | 8.0                     | 8.0    | 8.0    | 10.0   | 12.0   | 12.0   | 12.0   | 16.0   | 16.0   | 20.1               |       |       |                    |       |   |                    |  |                     |
| K         | E<br>12 - 13 | 1.50                      | 0.25                      | 114                       | n (rev/min)             | 1742               | 1161                | 871                     | 697    | 581    | 435    | 348    | 290    | 249    | 218    | 174    | 145                |       |       |                    |       |   |                    |  |                     |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0018             | 0.0026              | 0.0035                  | 0.0044 | 0.0053 | 0.0070 | 0.0088 | 0.0105 | 0.0123 | 0.0141 | 0.0176 | 0.0211             |       |       |                    |       |   |                    |  |                     |
|           |              |                           |                           | 94 - 134                  | v <sub>f</sub> (in/min) | 12.2               | 12.2                | 12.2                    | 12.2   | 12.2   | 15.3   | 18.4   | 18.4   | 18.4   | 24.5   | 24.5   | 30.6               |       |       |                    |       |   |                    |  |                     |
| N         | E<br>18      | 1.50                      | 0.25                      | 420                       | n (rev/min)             | 6418               | 4278                | 3209                    | 2567   | 2139   | 1604   | 1284   | 1070   | 917    | 802    | 642    | 535                |       |       |                    |       |   |                    |  |                     |
|           |              |                           |                           |                           | f <sub>z</sub> (in)     | 0.0020             | 0.0029              | 0.0039                  | 0.0049 | 0.0059 | 0.0078 | 0.0098 | 0.0117 | 0.0137 | 0.0156 | 0.0195 | 0.0234             |       |       |                    |       |   |                    |  |                     |
|           |              |                           |                           | 370 - 470                 | v <sub>f</sub> (in/min) | 50.1               | 50.1                | 50.1                    | 50.1   | 50.1   | 62.7   | 75.2   | 75.2   | 75.2   | 100.3  | 100.3  | 125.3              |       |       |                    |       |   |                    |  |                     |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## RXC753 - START VALUES

| SLOTTING  |           |                           |                           |                           |                         |        |        |      |
|-----------|-----------|---------------------------|---------------------------|---------------------------|-------------------------|--------|--------|------|
| ISO GROUP | SMG       | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) | Z <sub>n</sub>          |        |        |      |
|           |           |                           |                           |                           | 1                       | 1 1/4  | 1 1/2  |      |
| P         | E 1 - 2   | 1.00                      | 1.00                      | 110                       | n (rev/min)             | 420    | 336    | 280  |
|           |           |                           |                           | f <sub>z</sub> (in)       | 0.0045                  | 0.0056 | 0.0068 |      |
|           |           |                           |                           | 80 - 140                  | v <sub>f</sub> (in/min) | 9.5    | 11.3   | 11.3 |
|           | E 3 - 4   | 1.00                      | 1.00                      | 50                        | n (rev/min)             | 191    | 153    | 127  |
|           |           |                           |                           | f <sub>z</sub> (in)       | 0.0035                  | 0.0044 | 0.0053 |      |
|           |           |                           |                           | 40 - 60                   | v <sub>f</sub> (in/min) | 3.3    | 4.0    | 4.0  |
| K         | E 12 - 13 | 1.00                      | 1.00                      | 50                        | n (rev/min)             | 191    | 153    | 127  |
|           |           |                           |                           | f <sub>z</sub> (in)       | 0.0045                  | 0.0056 | 0.0068 |      |
|           |           |                           |                           | 40 - 60                   | v <sub>f</sub> (in/min) | 4.3    | 5.2    | 5.2  |
| N         | E 18      | 1.00                      | 1.00                      | 240                       | n (rev/min)             | 917    | 733    | 611  |
|           |           |                           |                           | f <sub>z</sub> (in)       | 0.0050                  | 0.0063 | 0.0075 |      |
|           |           |                           |                           | 200 - 280                 | v <sub>f</sub> (in/min) | 22.9   | 27.5   | 27.5 |

## RXC753 - START VALUES

| SLOTTING  |           |                           |                           |                           |                         |      |
|-----------|-----------|---------------------------|---------------------------|---------------------------|-------------------------|------|
| ISO GROUP | SMG       | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) | Z <sub>n</sub>          |      |
|           |           |                           |                           |                           | 1                       | 2    |
| P         | E 1 - 2   | 0.50                      | 1.00                      | 110                       | n (rev/min)             | 210  |
|           |           |                           |                           | f <sub>z</sub> (in)       | 0.0090                  |      |
|           |           |                           |                           | 80 - 140                  | v <sub>f</sub> (in/min) | 15.1 |
|           | E 3 - 4   | 0.50                      | 1.00                      | 50                        | n (rev/min)             | 96   |
|           |           |                           |                           | f <sub>z</sub> (in)       | 0.0070                  |      |
|           |           |                           |                           | 40 - 60                   | v <sub>f</sub> (in/min) | 5.3  |
| K         | E 12 - 13 | 0.50                      | 1.00                      | 50                        | n (rev/min)             | 96   |
|           |           |                           |                           | f <sub>z</sub> (in)       | 0.0090                  |      |
|           |           |                           |                           | 40 - 60                   | v <sub>f</sub> (in/min) | 6.9  |
| N         | E 18      | 0.50                      | 1.00                      | 240                       | n (rev/min)             | 458  |
|           |           |                           |                           | f <sub>z</sub> (in)       | 0.0100                  |      |
|           |           |                           |                           | 200 - 280                 | v <sub>f</sub> (in/min) | 36.7 |

## RXC753 - START VALUES

| SIDE MILLING - ROUGHING |           |                           |                           |                           |                         |        |        |        |      |
|-------------------------|-----------|---------------------------|---------------------------|---------------------------|-------------------------|--------|--------|--------|------|
| ISO GROUP               | SMG       | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) | Z <sub>n</sub>          |        |        |        |      |
|                         |           |                           |                           |                           | 1                       | 1 1/4  | 1 1/2  | 2      |      |
| P                       | E 1 - 2   | 1.50                      | 0.25                      | 192                       | n (rev/min)             | 733    | 587    | 489    | 367  |
|                         |           |                           |                           | f <sub>z</sub> (in)       | 0.0056                  | 0.0070 | 0.0084 | 0.0113 |      |
|                         |           |                           |                           | 152 - 232                 | v <sub>f</sub> (in/min) | 20.6   | 24.8   | 24.8   | 33.0 |
|                         | E 3 - 4   | 1.50                      | 0.25                      | 96                        | n (rev/min)             | 367    | 293    | 244    | 183  |
|                         |           |                           |                           | f <sub>z</sub> (in)       | 0.0044                  | 0.0055 | 0.0066 | 0.0088 |      |
|                         |           |                           |                           | 76 - 116                  | v <sub>f</sub> (in/min) | 8.0    | 9.6    | 9.6    | 12.8 |
| K                       | E 12 - 13 | 1.50                      | 0.25                      | 114                       | n (rev/min)             | 435    | 348    | 290    | 218  |
|                         |           |                           |                           | f <sub>z</sub> (in)       | 0.0056                  | 0.0070 | 0.0084 | 0.0113 |      |
|                         |           |                           |                           | 94 - 134                  | v <sub>f</sub> (in/min) | 12.2   | 14.7   | 14.7   | 19.6 |
| N                       | E 18      | 1.50                      | 0.25                      | 420                       | n (rev/min)             | 1604   | 1284   | 1070   | 802  |
|                         |           |                           |                           | f <sub>z</sub> (in)       | 0.0063                  | 0.0078 | 0.0094 | 0.0125 |      |
|                         |           |                           |                           | 370 - 470                 | v <sub>f</sub> (in/min) | 50.1   | 60.2   | 60.2   | 80.2 |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE COBALT END MILLS

## EXR350 - START VALUES

| SLOTTING  |           |                                       |                                       |                           |                         |                    |        |        |        |                    |                    |        |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------------------|--------------------|--------|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |        |        |        | Z <sub>n</sub> = 5 | Z <sub>n</sub> = 6 |        |
|           |           |                                       |                                       |                           |                         | 3/8                | 1/2    | 5/8    | 3/4    | 1                  | 1 1/4              | 1 1/2  |
| M         | E 8 - 9   | 1.00                                  | 1.00                                  | 96                        | n (rev/min)             | 978                | 733    | 587    | 489    | 367                | 293                | 244    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0019 | 0.0023 | 0.0028 | 0.0038             | 0.0047             | 0.0056 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 5.5                | 5.5    | 5.5    | 5.5    | 6.9                | 8.3                | 8.3    |
|           | E 10 - 11 | 1.00                                  | 1.00                                  | 72                        | n (rev/min)             | 733                | 550    | 440    | 367    | 275                | 220                | 183    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0019 | 0.0023 | 0.0028 | 0.0038             | 0.0047             | 0.0056 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 4.1                | 4.1    | 4.1    | 4.1    | 5.2                | 6.2                | 6.2    |
| S         | E 20      | 1.00                                  | 1.00                                  | 10                        | n (rev/min)             | 98                 | 73     | 59     | 49     | 37                 | 29                 | 24     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0007             | 0.0009 | 0.0012 | 0.0014 | 0.0019             | 0.0023             | 0.0028 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.3                | 0.3    | 0.3    | 0.3    | 0.3                | 0.4                | 0.4    |
|           | E 21      | 1.00                                  | 1.00                                  | 10                        | n (rev/min)             | 98                 | 73     | 59     | 49     | 37                 | 29                 | 24     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0012             | 0.0016 | 0.0020 | 0.0023 | 0.0031             | 0.0039             | 0.0047 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.5                | 0.5    | 0.5    | 0.5    | 0.6                | 0.7                | 0.7    |
| E 22      | 1.00      | 1.00                                  | 48                                    | n (rev/min)               | 489                     | 367                | 293    | 244    | 183    | 147                | 122                |        |
|           |           |                                       |                                       | f <sub>z</sub> (in)       | 0.0016                  | 0.0022             | 0.0027 | 0.0033 | 0.0044 | 0.0055             | 0.0066             |        |
|           |           |                                       |                                       | v <sub>f</sub> (in/min)   | 3.2                     | 3.2                | 3.2    | 3.2    | 4.0    | 4.8                | 4.8                |        |

## EXR350 - START VALUES

| SLOTTING  |           |                                       |                                       |                           |                         |                    |  |  |  |  |  |  |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--|--|--|--|--|--|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 8 |  |  |  |  |  |  |
|           |           |                                       |                                       |                           |                         | 2                  |  |  |  |  |  |  |
| M         | E 8 - 9   | 0.50                                  | 1.00                                  | 96                        | n (rev/min)             | 183                |  |  |  |  |  |  |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0075             |  |  |  |  |  |  |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 11.0               |  |  |  |  |  |  |
|           | E 10 - 11 | 0.50                                  | 1.00                                  | 72                        | n (rev/min)             | 138                |  |  |  |  |  |  |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0075             |  |  |  |  |  |  |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 8.3                |  |  |  |  |  |  |
| S         | E 20      | 0.50                                  | 1.00                                  | 10                        | n (rev/min)             | 18                 |  |  |  |  |  |  |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0038             |  |  |  |  |  |  |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.6                |  |  |  |  |  |  |
|           | E 21      | 0.50                                  | 1.00                                  | 10                        | n (rev/min)             | 18                 |  |  |  |  |  |  |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0063             |  |  |  |  |  |  |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.9                |  |  |  |  |  |  |
| E 22      | 0.50      | 1.00                                  | 48                                    | n (rev/min)               | 92                      |                    |  |  |  |  |  |  |
|           |           |                                       |                                       | f <sub>z</sub> (in)       | 0.0088                  |                    |  |  |  |  |  |  |
|           |           |                                       |                                       | v <sub>f</sub> (in/min)   | 6.4                     |                    |  |  |  |  |  |  |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## EXR350 - START VALUES

### SIDE MILLING - ROUGHING

| ISO GROUP | SMG          | a <sub>p</sub> x D <sub>c</sub><br>(max) | a <sub>e</sub> x D <sub>c</sub><br>(max) | v <sub>c</sub><br>(sf / min) |     |      | Z <sub>n</sub> = 4      |                         |                         |             | Z <sub>n</sub> = 5  | Z <sub>n</sub> = 6      |             | Z <sub>n</sub> = 8  |                         |             |
|-----------|--------------|--|--|------------------------------|-----|------|-------------------------|-------------------------|-------------------------|-------------|---------------------|-------------------------|-------------|---------------------|-------------------------|-------------|
|           |              |  |  |                              |     |      | 3/8                     | 1/2                     | 5/8                     | 3/4         | 1                   | 1 1/4                   | 1 1/2       | 2                   |                         |             |
|           |              |  |  |                              |     |      | n (rev/min)             | f <sub>z</sub> (in)     | v <sub>f</sub> (in/min) | n (rev/min) | f <sub>z</sub> (in) | v <sub>f</sub> (in/min) | n (rev/min) | f <sub>z</sub> (in) | v <sub>f</sub> (in/min) | n (rev/min) |
| M         | E<br>8 - 9   | 1.50                                     | 0.25                                     | 115                          | 105 | -    | 125                     | n (rev/min)             | 1174                    | 880         | 704                 | 587                     | 440         | 352                 | 293                     | 220         |
|           |              |  |  |                              |     |      |                         | f <sub>z</sub> (in)     | 0.0018                  | 0.0023      | 0.0029              | 0.0035                  | 0.0047      | 0.0059              | 0.0070                  | 0.0094      |
|           |              |  |  |                              |     |      |                         | v <sub>f</sub> (in/min) | 8.3                     | 8.3         | 8.3                 | 8.3                     | 10.3        | 12.4                | 12.4                    | 16.5        |
|           | E<br>10 - 11 | 1.50                                     | 0.25                                     | 86                           | 76  | -    | 96                      | n (rev/min)             | 880                     | 660         | 528                 | 440                     | 330         | 264                 | 220                     | 165         |
|           |              |  |  |                              |     |      |                         | f <sub>z</sub> (in)     | 0.0018                  | 0.0023      | 0.0029              | 0.0035                  | 0.0047      | 0.0059              | 0.0070                  | 0.0094      |
|           |              |  |  |                              |     |      |                         | v <sub>f</sub> (in/min) | 6.2                     | 6.2         | 6.2                 | 6.2                     | 7.7         | 9.3                 | 9.3                     | 12.4        |
| S         | E<br>20      | 1.50                                     | 0.25                                     | 12                           | 10  | -    | 14                      | n (rev/min)             | 122                     | 92          | 73                  | 61                      | 46          | 37                  | 31                      | 23          |
|           |              |  |  |                              |     |      |                         | f <sub>z</sub> (in)     | 0.0009                  | 0.0012      | 0.0015              | 0.0018                  | 0.0023      | 0.0029              | 0.0035                  | 0.0047      |
|           |              |  |  |                              |     |      |                         | v <sub>f</sub> (in/min) | 0.4                     | 0.4         | 0.4                 | 0.4                     | 0.5         | 0.6                 | 0.6                     | 0.9         |
|           | E<br>21      | 1.50                                     | 0.25                                     | 12                           | 10  | -    | 14                      | n (rev/min)             | 122                     | 92          | 73                  | 61                      | 46          | 37                  | 31                      | 23          |
|           |              |  |  |                              |     |      |                         | f <sub>z</sub> (in)     | 0.0015                  | 0.0020      | 0.0024              | 0.0029                  | 0.0039      | 0.0049              | 0.0059                  | 0.0078      |
|           |              |  |  |                              |     |      |                         | v <sub>f</sub> (in/min) | 0.7                     | 0.7         | 0.7                 | 0.7                     | 0.9         | 1.1                 | 1.1                     | 1.4         |
| E<br>22   | 1.50         | 0.25                                     | 57.6                                     | 47.6                         | -   | 67.6 | n (rev/min)             | 587                     | 440                     | 352         | 293                 | 220                     | 176         | 147                 | 110                     |             |
|           |              |  |  |                              |     |      | f <sub>z</sub> (in)     | 0.0021                  | 0.0027                  | 0.0034      | 0.0041              | 0.0055                  | 0.0068      | 0.0082              | 0.0109                  |             |
|           |              |  |  |                              |     |      | v <sub>f</sub> (in/min) | 4.8                     | 4.8                     | 4.8         | 4.8                 | 6.0                     | 7.2         | 7.2                 | 9.6                     |             |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.



# CUTTING DATA - GENERAL PURPOSE COBALT END MILLS

## REM445 / REC448 / RMB449 - START VALUES

|           |           | SLOTTING                              |                                       |                           |                         |                    |        |        |        |        |                    |        |                    |        |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------------------|--------|--------------------|--------|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |        |        |        |        | Z <sub>n</sub> = 5 |        | Z <sub>n</sub> = 6 |        |
|           |           |                                       |                                       |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1                  | 1 1/4  | 1 1/2              | 1 3/4  |
| P         | E 5 - 6   | 1.00                                  | 1.00                                  | 42                        | n (rev/min)             | 642                | 428    | 321    | 257    | 214    | 160                | 128    | 107                | 92     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022 | 0.0027 | 0.0033 | 0.0044             | 0.0055 | 0.0066             | 0.0077 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.8                | 2.8    | 2.8    | 2.8    | 2.8    | 3.5                | 4.2    | 4.2                | 4.2    |
| M         | E 8 - 9   | 1.00                                  | 1.00                                  | 96                        | n (rev/min)             | 1467               | 978    | 733    | 587    | 489    | 367                | 293    | 244                | 210    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0014 | 0.0019 | 0.0023 | 0.0028 | 0.0038             | 0.0047 | 0.0056             | 0.0066 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 5.5                | 5.5    | 5.5    | 5.5    | 5.5    | 6.9                | 8.3    | 8.3                | 8.3    |
|           | E 10 - 11 | 1.00                                  | 1.00                                  | 72                        | n (rev/min)             | 1100               | 733    | 550    | 440    | 367    | 275                | 220    | 183                | 157    |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0014 | 0.0019 | 0.0023 | 0.0028 | 0.0038             | 0.0047 | 0.0056             | 0.0066 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 4.1                | 4.1    | 4.1    | 4.1    | 4.1    | 5.2                | 6.2    | 6.2                | 6.2    |
| S         | E 20      | 1.00                                  | 1.00                                  | 9.6                       | n (rev/min)             | 147                | 98     | 73     | 59     | 49     | 37                 | 29     | 24                 | 21     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0005             | 0.0007 | 0.0009 | 0.0012 | 0.0014 | 0.0019             | 0.0023 | 0.0028             | 0.0033 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.3                | 0.3    | 0.3    | 0.3    | 0.3    | 0.3                | 0.4    | 0.4                | 0.4    |
|           | E 21      | 1.00                                  | 1.00                                  | 9.6                       | n (rev/min)             | 147                | 98     | 73     | 59     | 49     | 37                 | 29     | 24                 | 21     |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0008             | 0.0012 | 0.0016 | 0.0020 | 0.0023 | 0.0031             | 0.0039 | 0.0047             | 0.0055 |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.5                | 0.5    | 0.5    | 0.5    | 0.5    | 0.6                | 0.7    | 0.7                | 0.7    |
| E 22      | 1.00      | 1.00                                  | 48                                    | n (rev/min)               | 733                     | 489                | 367    | 293    | 244    | 183    | 147                | 122    | 105                |        |
|           |           |                                       |                                       | f <sub>z</sub> (in)       | 0.0011                  | 0.0016             | 0.0022 | 0.0027 | 0.0033 | 0.0044 | 0.0055             | 0.0066 | 0.0077             |        |
|           |           |                                       |                                       | v <sub>f</sub> (in/min)   | 3.2                     | 3.2                | 3.2    | 3.2    | 3.2    | 4.0    | 4.8                | 4.8    | 4.8                |        |

## REM445 / REC448 / RMB449 - START VALUES

|           |           | SLOTTING                              |                                       |                           |                         |                    |        |        |                     |  |  |  |
|-----------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|---------------------|--|--|--|
| ISO GROUP | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 8 |        |        | Z <sub>n</sub> = 10 |  |  |  |
|           |           |                                       |                                       |                           |                         | 2                  | 2 1/2  | 3      |                     |  |  |  |
| P         | E 5 - 6   | 0.50                                  | 1.00                                  | 42                        | n (rev/min)             | 80                 | 64     | 53     |                     |  |  |  |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0088             | 0.0109 | 0.0131 |                     |  |  |  |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 5.6                | 5.6    | 7.0    |                     |  |  |  |
| M         | E 8 - 9   | 0.50                                  | 1.00                                  | 96                        | n (rev/min)             | 183                | 147    | 122    |                     |  |  |  |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0075             | 0.0094 | 0.0113 |                     |  |  |  |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 11.0               | 11.0   | 13.8   |                     |  |  |  |
|           | E 10 - 11 | 0.50                                  | 1.00                                  | 72                        | n (rev/min)             | 138                | 110    | 92     |                     |  |  |  |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0075             | 0.0094 | 0.0113 |                     |  |  |  |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 8.3                | 8.3    | 10.3   |                     |  |  |  |
| S         | E 20      | 0.50                                  | 1.00                                  | 9.6                       | n (rev/min)             | 18                 | 15     | 12     |                     |  |  |  |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0038             | 0.0047 | 0.0056 |                     |  |  |  |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.6                | 0.6    | 0.7    |                     |  |  |  |
|           | E 21      | 0.50                                  | 1.00                                  | 9.6                       | n (rev/min)             | 18                 | 15     | 12     |                     |  |  |  |
|           |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0063             | 0.0078 | 0.0094 |                     |  |  |  |
|           |           |                                       |                                       |                           | v <sub>f</sub> (in/min) | 0.9                | 0.9    | 1.1    |                     |  |  |  |
| E 22      | 0.50      | 1.00                                  | 48                                    | n (rev/min)               | 92                      | 73                 | 61     |        |                     |  |  |  |
|           |           |                                       |                                       | f <sub>z</sub> (in)       | 0.0088                  | 0.0109             | 0.0131 |        |                     |  |  |  |
|           |           |                                       |                                       | v <sub>f</sub> (in/min)   | 6.4                     | 6.4                | 8.0    |        |                     |  |  |  |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## REM445 / REC448 / RMB449 - START VALUES

| SIDE MILLING - ROUGHING |           |                           |                           |                           |                         |                    |        |        |        |        |                    |                    |        |        |                    |        |                     |
|-------------------------|-----------|---------------------------|---------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------------------|--------------------|--------|--------|--------------------|--------|---------------------|
| ISO GROUP               | SMG       | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |        |        |        |        | Z <sub>n</sub> = 5 | Z <sub>n</sub> = 6 |        |        | Z <sub>n</sub> = 8 |        | Z <sub>n</sub> = 10 |
|                         |           |                           |                           |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1                  | 1 1/4              | 1 1/2  | 1 3/4  | 2                  | 2 1/2  | 3                   |
| P                       | E 5 - 6   | 1.50                      | 0.25                      | 63                        | n (rev/min)             | 955                | 637    | 478    | 382    | 318    | 239                | 191                | 159    | 136    | 119                | 96     | 80                  |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0027 | 0.0034 | 0.0041 | 0.0055             | 0.0068             | 0.0082 | 0.0096 | 0.0109             | 0.0137 | 0.0164              |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 5.2                | 5.2    | 5.2    | 5.2    | 5.2    | 6.5                | 7.8                | 7.8    | 7.8    | 10.4               | 10.4   | 13.1                |
| M                       | E 8 - 9   | 1.50                      | 0.25                      | 115                       | n (rev/min)             | 1760               | 1174   | 880    | 704    | 587    | 440                | 352                | 293    | 251    | 220                | 176    | 147                 |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0012             | 0.0018 | 0.0023 | 0.0029 | 0.0035 | 0.0047             | 0.0059             | 0.0070 | 0.0082 | 0.0094             | 0.0117 | 0.0141              |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 8.3                | 8.3    | 8.3    | 8.3    | 8.3    | 10.3               | 12.4               | 12.4   | 12.4   | 16.5               | 16.5   | 20.6                |
|                         | E 10 - 11 | 1.50                      | 0.25                      | 86                        | n (rev/min)             | 1320               | 880    | 660    | 528    | 440    | 330                | 264                | 220    | 189    | 165                | 132    | 110                 |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0012             | 0.0018 | 0.0023 | 0.0029 | 0.0035 | 0.0047             | 0.0059             | 0.0070 | 0.0082 | 0.0094             | 0.0117 | 0.0141              |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 6.2                | 6.2    | 6.2    | 6.2    | 6.2    | 7.7                | 9.3                | 9.3    | 9.3    | 12.4               | 12.4   | 15.5                |
| S                       | E 20      | 1.50                      | 0.25                      | 12                        | n (rev/min)             | 183                | 122    | 92     | 73     | 61     | 46                 | 37                 | 31     | 26     | 23                 | 18     | 15                  |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0006             | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0023             | 0.0029             | 0.0035 | 0.0041 | 0.0047             | 0.0059 | 0.0070              |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 0.4                | 0.4    | 0.4    | 0.4    | 0.4    | 0.5                | 0.6                | 0.6    | 0.6    | 0.9                | 0.9    | 1.1                 |
|                         | E 21      | 1.50                      | 0.25                      | 14                        | n (rev/min)             | 220                | 147    | 110    | 88     | 73     | 55                 | 44                 | 37     | 31     | 28                 | 22     | 18                  |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0010             | 0.0015 | 0.0020 | 0.0024 | 0.0029 | 0.0039             | 0.0049             | 0.0059 | 0.0068 | 0.0078             | 0.0098 | 0.0117              |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 0.9                | 0.9    | 0.9    | 0.9    | 0.9    | 1.1                | 1.3                | 1.3    | 1.3    | 1.7                | 1.7    | 2.1                 |
| E 22                    | 1.50      | 0.25                      | 72                        | n (rev/min)               | 1100                    | 733                | 550    | 440    | 367    | 275    | 220                | 183                | 157    | 138    | 110                | 92     |                     |
|                         |           |                           |                           | f <sub>z</sub> (in)       | 0.0014                  | 0.0021             | 0.0027 | 0.0034 | 0.0041 | 0.0055 | 0.0068             | 0.0082             | 0.0096 | 0.0109 | 0.0137             | 0.0164 |                     |
|                         |           |                           |                           | v <sub>f</sub> (in/min)   | 6.0                     | 6.0                | 6.0    | 6.0    | 6.0    | 7.5    | 9.0                | 9.0                | 9.0    | 12.0   | 12.0               | 15.0   |                     |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## RFM440 - START VALUES

| ISO GROUP           | SMG       | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) | SLOTTING                |                    |        |             |        |        |                    |                    |        |        |
|---------------------|-----------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|-------------|--------|--------|--------------------|--------------------|--------|--------|
|                     |           |                                       |                                       |                           | n (rev/min)             | Z <sub>n</sub> = 4 |        |             |        |        | Z <sub>n</sub> = 5 | Z <sub>n</sub> = 6 |        |        |
|                     |           |                                       |                                       |                           |                         | 1/4                | 3/8    | 1/2         | 5/8    | 3/4    | 1                  | 1 1/4              | 1 1/2  | 1 3/4  |
| P                   | E 1 - 2   | 1.00                                  | 1.00                                  | 132                       | n (rev/min)             | 2017               | 1345   | 1008        | 807    | 672    | 504                | 403                | 336    | 288    |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0028      | 0.0035 | 0.0042 | 0.0056             | 0.0070             | 0.0084 | 0.0098 |
|                     |           |                                       |                                       | 122 - 142                 | v <sub>f</sub> (in/min) | 11.3               | 11.3   | 11.3        | 11.3   | 11.3   | 14.2               | 17.0               | 17.0   | 17.0   |
|                     | E 3 - 4   | 1.00                                  | 1.00                                  | 60                        | n (rev/min)             | 917                | 611    | 458         | 367    | 306    | 229                | 183                | 153    | 131    |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0011             | 0.0016 | 0.0022      | 0.0027 | 0.0033 | 0.0044             | 0.0055             | 0.0066 | 0.0077 |
|                     |           |                                       |                                       | 50 - 70                   | v <sub>f</sub> (in/min) | 4.0                | 4.0    | 4.0         | 4.0    | 4.0    | 5.0                | 6.0                | 6.0    | 6.0    |
| E 5 - 6             | 1.00      | 1.00                                  | 42                                    | n (rev/min)               | 642                     | 428                | 321    | 257         | 214    | 160    | 128                | 107                | 92     |        |
|                     |           |                                       |                                       | f <sub>z</sub> (in)       | 0.0011                  | 0.0016             | 0.0022 | 0.0027      | 0.0033 | 0.0044 | 0.0055             | 0.0066             | 0.0077 |        |
|                     |           |                                       | 32 - 52                               | v <sub>f</sub> (in/min)   | 2.8                     | 2.8                | 2.8    | 2.8         | 2.8    | 3.5    | 4.2                | 4.2                | 4.2    |        |
| M                   | E 8 - 9   | 1.00                                  | 1.00                                  | 96                        | n (rev/min)             | 1467               | 978    | 733         | 587    | 489    | 367                | 293                | 244    | 210    |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0014 | 0.0019      | 0.0023 | 0.0028 | 0.0038             | 0.0047             | 0.0056 | 0.0066 |
|                     | E 10 - 11 | 1.00                                  | 1.00                                  | 72                        | n (rev/min)             | 1100               | 733    | 550         | 440    | 367    | 275                | 220                | 183    | 157    |
|                     |           |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0009             | 0.0014 | 0.0019      | 0.0023 | 0.0028 | 0.0038             | 0.0047             | 0.0056 | 0.0066 |
| E 12 - 13           | 1.00      | 1.00                                  | 60                                    | n (rev/min)               | 917                     | 611                | 458    | 367         | 306    | 229    | 183                | 153                | 131    |        |
|                     |           |                                       |                                       | f <sub>z</sub> (in)       | 0.0014                  | 0.0021             | 0.0028 | 0.0035      | 0.0042 | 0.0056 | 0.0070             | 0.0084             | 0.0098 |        |
| E 14 - 15           | 1.00      | 1.00                                  | 48                                    | n (rev/min)               | 733                     | 489                | 367    | 293         | 244    | 183    | 147                | 122                | 105    |        |
|                     |           |                                       |                                       | f <sub>z</sub> (in)       | 0.0011                  | 0.0016             | 0.0022 | 0.0027      | 0.0033 | 0.0044 | 0.0055             | 0.0066             | 0.0077 |        |
| E 16 - 17           | 1.00      | 1.00                                  | 38 - 58                               | v <sub>f</sub> (in/min)   | 3.2                     | 3.2                | 3.2    | 3.2         | 3.2    | 4.0    | 4.8                | 4.8                | 4.8    |        |
|                     |           |                                       |                                       | E 18                      | 1.00                    | 1.00               | 288    | n (rev/min) | 4401   | 2934   | 2200               | 1760               | 1467   | 1100   |
| f <sub>z</sub> (in) | 0.0016    | 0.0023                                | 0.0031                                |                           |                         |                    |        | 0.0039      | 0.0047 | 0.0063 | 0.0078             | 0.0094             | 0.0109 |        |
| E 19 - 20           | 1.00      | 1.00                                  | 286 - 290                             | v <sub>f</sub> (in/min)   | 27.5                    | 27.5               | 27.5   | 27.5        | 27.5   | 34.4   | 41.3               | 41.3               | 41.3   |        |
|                     |           |                                       |                                       | E 20                      | 1.00                    | 1.00               | 10     | n (rev/min) | 147    | 98     | 73                 | 59                 | 49     | 37     |
| f <sub>z</sub> (in) | 0.0005    | 0.0007                                | 0.0009                                |                           |                         |                    |        | 0.0012      | 0.0014 | 0.0019 | 0.0023             | 0.0028             | 0.0033 |        |
| E 21                | 1.00      | 1.00                                  | 8 - 12                                | v <sub>f</sub> (in/min)   | 0.3                     | 0.3                | 0.3    | 0.3         | 0.3    | 0.3    | 0.4                | 0.4                | 0.4    |        |
|                     |           |                                       |                                       | E 21                      | 1.00                    | 1.00               | 10     | n (rev/min) | 147    | 98     | 73                 | 59                 | 49     | 37     |
| f <sub>z</sub> (in) | 0.0008    | 0.0012                                | 0.0016                                |                           |                         |                    |        | 0.0020      | 0.0023 | 0.0031 | 0.0039             | 0.0047             | 0.0055 |        |
| E 22                | 1.00      | 1.00                                  | 8 - 12                                | v <sub>f</sub> (in/min)   | 0.5                     | 0.5                | 0.5    | 0.5         | 0.5    | 0.6    | 0.7                | 0.7                | 0.7    |        |
|                     |           |                                       |                                       | E 22                      | 1.00                    | 1.00               | 48     | n (rev/min) | 733    | 489    | 367                | 293                | 244    | 183    |
| f <sub>z</sub> (in) | 0.0011    | 0.0016                                | 0.0022                                |                           |                         |                    |        | 0.0027      | 0.0033 | 0.0044 | 0.0055             | 0.0066             | 0.0077 |        |
| E 23 - 24           | 1.00      | 1.00                                  | 38 - 58                               | v <sub>f</sub> (in/min)   | 3.2                     | 3.2                | 3.2    | 3.2         | 3.2    | 4.0    | 4.8                | 4.8                | 4.8    |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## RFM440 - START VALUES

| SLOTTING  |              |                           |                           |                     |        |  |                |        |
|-----------|--------------|---------------------------|---------------------------|---------------------|--------|--|----------------|--------|
| ISO GROUP | SMG          | $a_p \times D_c$<br>(max) | $a_e \times D_c$<br>(max) | $v_c$<br>(sf / min) |        |  | $Z_n = 8$      |        |
|           |              |                           |                           |                     |        |  |                | 2      |
| P         | E<br>1 - 2   | 0.50                      | 1.00                      | 132                 |        |  | n (rev/min)    | 252    |
|           |              |                           |                           |                     |        |  | $f_z$ (in)     | 0.0113 |
|           |              |                           |                           | 122 - 142           |        |  | $v_f$ (in/min) | 22.7   |
|           | E<br>3 - 4   | 0.50                      | 1.00                      |                     |        |  | 60             |        |
|           |              |                           |                           | $f_z$ (in)          | 0.0088 |  |                |        |
|           |              |                           |                           | 50 - 70             |        |  | $v_f$ (in/min) | 8.0    |
|           | E<br>5 - 6   | 0.50                      | 1.00                      |                     |        |  | 42             |        |
|           |              |                           |                           | $f_z$ (in)          | 0.0088 |  |                |        |
|           |              |                           |                           | 32 - 52             |        |  | $v_f$ (in/min) | 5.6    |
| M         | E<br>8 - 9   | 0.50                      | 1.00                      |                     |        |  | 96             |        |
|           |              |                           |                           | $f_z$ (in)          | 0.0075 |  |                |        |
|           |              |                           |                           | 86 - 106            |        |  | $v_f$ (in/min) | 11.0   |
|           | E<br>10 - 11 | 0.50                      | 1.00                      |                     |        |  | 72             |        |
|           |              |                           |                           | $f_z$ (in)          | 0.0075 |  |                |        |
|           |              |                           |                           | 62 - 82             |        |  | $v_f$ (in/min) | 8.3    |
| K         | E<br>12 - 13 | 0.50                      | 1.00                      |                     |        |  | 60             |        |
|           |              |                           |                           | $f_z$ (in)          | 0.0113 |  |                |        |
|           |              |                           |                           | 50 - 70             |        |  | $v_f$ (in/min) | 10.3   |
|           | E<br>14 - 15 | 0.50                      | 1.00                      |                     |        |  | 48             |        |
|           |              |                           |                           | $f_z$ (in)          | 0.0088 |  |                |        |
|           |              |                           |                           | 38 - 58             |        |  | $v_f$ (in/min) | 6.4    |
| N         | E<br>18      | 0.50                      | 1.00                      |                     |        |  | 288            |        |
|           |              |                           |                           | $f_z$ (in)          | 0.0125 |  |                |        |
|           |              |                           |                           | 286 - 290           |        |  | $v_f$ (in/min) | 55.0   |
| S         | E<br>20      | 0.50                      | 1.00                      |                     |        |  | 10             |        |
|           |              |                           |                           | $f_z$ (in)          | 0.0038 |  |                |        |
|           |              |                           |                           | 8 - 12              |        |  | $v_f$ (in/min) | 0.6    |
|           | E<br>21      | 0.50                      | 1.00                      |                     |        |  | 10             |        |
|           |              |                           |                           | $f_z$ (in)          | 0.0063 |  |                |        |
|           |              |                           |                           | 8 - 12              |        |  | $v_f$ (in/min) | 0.9    |
|           | E<br>22      | 0.50                      | 1.00                      |                     |        |  | 48             |        |
|           |              |                           |                           | $f_z$ (in)          | 0.0088 |  |                |        |
|           |              |                           |                           | 38 - 58             |        |  | $v_f$ (in/min) | 6.4    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 $v_c$  (sf/min) = Surface feet/min

$f_z$  [in] = Feed/tooth  
 $a_p/D_c$  = % of diameter  
 $v_f$  [in/min] = Feed rate  
 $a_e/D_c$  = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

# CUTTING DATA - GENERAL PURPOSE COBALT END MILLS

## RFM440 - START VALUES

| SIDE MILLING - ROUGHING |           |                           |                           |                           |                         |                    |        |        |        |        |                    |                    |        |        |                    |
|-------------------------|-----------|---------------------------|---------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------------------|--------------------|--------|--------|--------------------|
| ISO GROUP               | SMG       | a <sub>p</sub> x Dc (max) | a <sub>e</sub> x Dc (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |        |        |        |        | Z <sub>n</sub> = 5 | Z <sub>n</sub> = 6 |        |        | Z <sub>n</sub> = 8 |
|                         |           |                           |                           |                           |                         | 1/4                | 3/8    | 1/2    | 5/8    | 3/4    | 1                  | 1 1/4              | 1 1/2  | 1 3/4  | 2                  |
| P                       | E 1 - 2   | 1.50                      | 0.25                      | 192                       | n (rev/min)             | 2934               | 1956   | 1467   | 1174   | 978    | 733                | 587                | 489    | 419    | 367                |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0018             | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0070             | 0.0088             | 0.0105 | 0.0123 | 0.0141             |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 20.6               | 20.6   | 20.6   | 20.6   | 20.6   | 25.8               | 30.9               | 30.9   | 30.9   | 41.3               |
|                         | E 3 - 4   | 1.50                      | 0.25                      | 96                        | n (rev/min)             | 1467               | 978    | 733    | 587    | 489    | 367                | 293                | 244    | 210    | 183                |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0027 | 0.0034 | 0.0041 | 0.0055             | 0.0068             | 0.0082 | 0.0096 | 0.0109             |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 8.0                | 8.0    | 8.0    | 8.0    | 8.0    | 10.0               | 12.0               | 12.0   | 12.0   | 16.0               |
| E 5 - 6                 | 1.50      | 0.25                      | 63                        | n (rev/min)               | 955                     | 637                | 478    | 382    | 318    | 239    | 191                | 159                | 136    | 119    |                    |
|                         |           |                           |                           | f <sub>z</sub> (in)       | 0.0014                  | 0.0021             | 0.0027 | 0.0034 | 0.0041 | 0.0055 | 0.0068             | 0.0082             | 0.0096 | 0.0109 |                    |
|                         |           |                           |                           | v <sub>f</sub> (in/min)   | 5.2                     | 5.2                | 5.2    | 5.2    | 5.2    | 6.5    | 7.8                | 7.8                | 7.8    | 10.4   |                    |
| M                       | E 8 - 9   | 1.50                      | 0.25                      | 115                       | n (rev/min)             | 1760               | 1174   | 880    | 704    | 587    | 440                | 352                | 293    | 251    | 220                |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0012             | 0.0018 | 0.0023 | 0.0029 | 0.0035 | 0.0047             | 0.0059             | 0.0070 | 0.0082 | 0.0094             |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 8.3                | 8.3    | 8.3    | 8.3    | 8.3    | 10.3               | 12.4               | 12.4   | 12.4   | 16.5               |
|                         | E 10 - 11 | 1.50                      | 0.25                      | 86                        | n (rev/min)             | 1320               | 880    | 660    | 528    | 440    | 330                | 264                | 220    | 189    | 165                |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0012             | 0.0018 | 0.0023 | 0.0029 | 0.0035 | 0.0047             | 0.0059             | 0.0070 | 0.0082 | 0.0094             |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 6.2                | 6.2    | 6.2    | 6.2    | 6.2    | 7.7                | 9.3                | 9.3    | 9.3    | 12.4               |
| K                       | E 12 - 13 | 1.50                      | 0.25                      | 114                       | n (rev/min)             | 1742               | 1161   | 871    | 697    | 581    | 435                | 348                | 290    | 249    | 218                |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0018             | 0.0026 | 0.0035 | 0.0044 | 0.0053 | 0.0070             | 0.0088             | 0.0105 | 0.0123 | 0.0141             |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 12.2               | 12.2   | 12.2   | 12.2   | 12.2   | 15.3               | 18.4               | 18.4   | 18.4   | 24.5               |
|                         | E 14 - 15 | 1.50                      | 0.25                      | 78                        | n (rev/min)             | 1192               | 795    | 596    | 477    | 397    | 298                | 238                | 199    | 170    | 149                |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0014             | 0.0021 | 0.0027 | 0.0034 | 0.0041 | 0.0055             | 0.0068             | 0.0082 | 0.0096 | 0.0109             |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 6.5                | 6.5    | 6.5    | 6.5    | 6.5    | 8.1                | 9.8                | 9.8    | 9.8    | 13.0               |
| N                       | E 18      | 1.50                      | 0.25                      | 420                       | n (rev/min)             | 6418               | 4278   | 3209   | 2567   | 2139   | 1604               | 1284               | 1070   | 917    | 802                |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0020             | 0.0029 | 0.0039 | 0.0049 | 0.0059 | 0.0078             | 0.0098             | 0.0117 | 0.0137 | 0.0156             |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 50.1               | 50.1   | 50.1   | 50.1   | 50.1   | 62.7               | 75.2               | 75.2   | 75.2   | 100.3              |
| S                       | E 20      | 1.50                      | 0.25                      | 12                        | n (rev/min)             | 183                | 122    | 92     | 73     | 61     | 46                 | 37                 | 31     | 26     | 23                 |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0006             | 0.0009 | 0.0012 | 0.0015 | 0.0018 | 0.0023             | 0.0029             | 0.0035 | 0.0041 | 0.0047             |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 0.4                | 0.4    | 0.4    | 0.4    | 0.4    | 0.5                | 0.6                | 0.6    | 0.6    | 0.9                |
|                         | E 21      | 1.50                      | 0.25                      | 14                        | n (rev/min)             | 220                | 147    | 110    | 88     | 73     | 55                 | 44                 | 37     | 31     | 28                 |
|                         |           |                           |                           |                           | f <sub>z</sub> (in)     | 0.0010             | 0.0015 | 0.0020 | 0.0024 | 0.0029 | 0.0039             | 0.0049             | 0.0059 | 0.0068 | 0.0078             |
|                         |           |                           |                           |                           | v <sub>f</sub> (in/min) | 0.9                | 0.9    | 0.9    | 0.9    | 0.9    | 1.1                | 1.3                | 1.3    | 1.3    | 1.7                |
| E 22                    | 1.50      | 0.25                      | 72                        | n (rev/min)               | 1100                    | 733                | 550    | 440    | 367    | 275    | 220                | 183                | 157    | 138    |                    |
|                         |           |                           |                           | f <sub>z</sub> (in)       | 0.0014                  | 0.0021             | 0.0027 | 0.0034 | 0.0041 | 0.0055 | 0.0068             | 0.0082             | 0.0096 | 0.0109 |                    |
|                         |           |                           |                           | v <sub>f</sub> (in/min)   | 6.0                     | 6.0                | 6.0    | 6.0    | 6.0    | 7.5    | 9.0                | 9.0                | 9.0    | 12.0   |                    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## VFP435 / VFP635 / VFP435SB / VFP635SB / VFP435SBR / VFP635SBR - START VALUES

| SLOTTING  |              |                                       |                                       |                           |                         |                    |        |        |                    |        |        |
|-----------|--------------|---------------------------------------|---------------------------------------|---------------------------|-------------------------|--------------------|--------|--------|--------------------|--------|--------|
| ISO GROUP | SMG          | a <sub>p</sub> x D <sub>c</sub> (max) | a <sub>e</sub> x D <sub>c</sub> (max) | v <sub>c</sub> (sf / min) |                         | Z <sub>n</sub> = 4 |        |        | Z <sub>n</sub> = 6 |        |        |
|           |              |                                       |                                       |                           |                         | 3/4                | 1      | 1 1/4  | 1 1/4              | 1 1/2  | 2      |
| M         | E<br>8 - 9   | 1.00                                  | 1.00                                  | 65                        | n (rev/min)             | 331                | 248    | 199    | 199                | 166    | 124    |
|           |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0024             | 0.0032 | 0.0040 | 0.0040             | 0.0048 | 0.0064 |
|           |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 3.2                | 3.2    | 3.2    | 4.8                | 4.8    | 4.8    |
|           | E<br>10 - 11 | 1.00                                  | 1.00                                  | 40                        | n (rev/min)             | 204                | 153    | 122    | 122                | 102    | 76     |
|           |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0024             | 0.0032 | 0.0040 | 0.0040             | 0.0048 | 0.0064 |
|           |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.0                | 2.0    | 2.0    | 2.9                | 2.9    | 2.9    |
| S         | E<br>22      | 1.00                                  | 1.00                                  | 60                        | n (rev/min)             | 306                | 229    | 183    | 183                | 153    | 115    |
|           |              |                                       |                                       |                           | f <sub>z</sub> (in)     | 0.0021             | 0.0028 | 0.0035 | 0.0035             | 0.0042 | 0.0056 |
|           |              |                                       |                                       |                           | v <sub>f</sub> (in/min) | 2.6                | 2.6    | 2.6    | 3.9                | 3.9    | 3.9    |

| SIDE MILLING - ROUGHING |              |      |      |    |                         |        |        |        |        |        |        |
|-------------------------|--------------|------|------|----|-------------------------|--------|--------|--------|--------|--------|--------|
| M                       | E<br>8 - 9   | 1.50 | 0.25 | 78 | n (rev/min)             | 397    | 298    | 238    | 238    | 199    | 149    |
|                         |              |      |      |    | f <sub>z</sub> (in)     | 0.0030 | 0.0040 | 0.0050 | 0.0050 | 0.0060 | 0.0080 |
|                         |              |      |      |    | v <sub>f</sub> (in/min) | 4.8    | 4.8    | 4.8    | 7.2    | 7.2    | 7.2    |
|                         | E<br>10 - 11 | 1.50 | 0.25 | 48 | n (rev/min)             | 244    | 183    | 147    | 147    | 122    | 92     |
|                         |              |      |      |    | f <sub>z</sub> (in)     | 0.0030 | 0.0040 | 0.0050 | 0.0050 | 0.0060 | 0.0080 |
|                         |              |      |      |    | v <sub>f</sub> (in/min) | 2.9    | 2.9    | 2.9    | 4.4    | 4.4    | 4.4    |
| S                       | E<br>22      | 1.50 | 0.25 | 72 | n (rev/min)             | 367    | 275    | 220    | 220    | 183    | 138    |
|                         |              |      |      |    | f <sub>z</sub> (in)     | 0.0026 | 0.0035 | 0.0044 | 0.0044 | 0.0053 | 0.0070 |
|                         |              |      |      |    | v <sub>f</sub> (in/min) | 3.9    | 3.9    | 3.9    | 5.8    | 5.8    | 5.8    |

SMG = Seco Material Group  
 n [min-1] = RPM  
 v<sub>c</sub> (sf/min) = Surface feet/min

f<sub>z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>e</sub>/D<sub>c</sub> = % of diameter

A = Air    D = Dry    E = Emulsion (flood coolant)    M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## UN THREADMILLS-NTM100UN

SOLID CARBIDE



- Helical flutes for internal and external threading
- Ideal for flat bottom holes
- Large diameter applications where torque and horsepower requirements for taps are not available
- Suitable for use in most materials
- Cutting Data - Page 306-307
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION            | THREAD SIZE | THREADS PER INCH | CUTTER DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | CUTTING TEETH | COATING | DRILL SIZE 50% | DRILL SIZE 75% |
|------------------------|------------------------|-------------|------------------|------------|-----------|---------------|----------------|---------------|---------|----------------|----------------|
| <a href="#">N68746</a> | NTM100-NR.2X56UN-.125  | 2           | 56               | 0.065      | 1/8       | 0.1250        | 2              | 3             | ALCRN   | 49             | 50             |
| <a href="#">N68748</a> | NTM100-NR.4X40UN-.125  | 4           | 40               | 0.085      | 1/8       | 0.1750        | 2              | 3             | ALCRN   | 41             | 43             |
| <a href="#">N68750</a> | NTM100-NR.6X32UN-.125  | 6           | 32               | 0.100      | 1/8       | 0.2180        | 2              | 3             | ALCRN   | 32             | 36             |
| <a href="#">N68752</a> | NTM100-NR.8X32UN-.125  | 8           | 32               | 0.115      | 1/8       | 0.2500        | 2              | 3             | ALCRN   | 27             | 29             |
| <a href="#">N68754</a> | NTM100-NR.10X24UN-.187 | 10          | 24               | 0.134      | 3/16      | 0.3130        | 2              | 3             | ALCRN   | 20             | 25             |
| <a href="#">N68756</a> | NTM100-NR.12X28UN-.187 | 10          | 28               | 0.134      | 3/16      | 0.3130        | 2              | 3             | ALCRN   | 19             | 23             |
| <a href="#">N68758</a> | NTM100-NR.10X32UN-.187 | 10          | 32               | 0.134      | 3/16      | 0.3130        | 2              | 3             | ALCRN   | 18             | 21             |
| <a href="#">N68760</a> | NTM100-1/4X20UN-.187   | 1/4         | 20               | 0.180      | 3/16      | 0.5000        | 2-1/2          | 3             | ALCRN   | 7/32           | 7              |
| <a href="#">N68762</a> | NTM100-1/4X28UN-.187   | 1/4         | 28               | 0.180      | 3/16      | 0.5000        | 2-1/2          | 3             | ALCRN   | 1              | 3              |
| <a href="#">N68764</a> | NTM100-1/4X32UN-.187   | 1/4         | 32               | 0.180      | 3/16      | 0.5000        | 2-1/2          | 3             | ALCRN   | 1              | 7/32           |
| <a href="#">N68766</a> | NTM100-5/16X18UN-.250  | 5/16        | 18               | 0.235      | 1/4       | 0.6250        | 2-1/2          | 3             | ALCRN   | J              | F              |
| <a href="#">N68768</a> | NTM100-5/16X24UN-.250  | 5/16        | 24               | 0.235      | 1/4       | 0.6250        | 2-1/2          | 3             | ALCRN   | 9/32           | I              |
| <a href="#">N68770</a> | NTM100-5/16X32UN-.250  | 5/16        | 32               | 0.235      | 1/4       | 0.6250        | 2-1/2          | 3             | ALCRN   | L              | 9/32           |
| <a href="#">N68772</a> | NTM100-3/8X16UN-.312   | 3/8         | 16               | 0.285      | 5/16      | 0.7500        | 3              | 3             | ALCRN   | Q              | 5/16           |
| <a href="#">N68774</a> | NTM100-3/8X24UN-.312   | 3/8         | 24               | 0.285      | 5/16      | 0.7500        | 3              | 3             | ALCRN   | S              | Q              |
| <a href="#">N68776</a> | NTM100-7/16X14UN-.312  | 7/16        | 14               | 0.305      | 5/16      | 0.8750        | 3              | 3             | ALCRN   | 25/64          | U              |
| <a href="#">N68778</a> | NTM100-7/16X20UN-.312  | 7/16        | 20               | 0.305      | 5/16      | 0.8750        | 3              | 3             | ALCRN   | 13/32          | 25/64          |
| <a href="#">N68780</a> | NTM100-1/2X13UN-.375   | 1/2         | 13               | 0.350      | 3/8       | 0.8750        | 3-1/2          | 3             | ALCRN   | 29/64          | 27/64          |
| <a href="#">N68782</a> | NTM100-1/2X20UN-.375   | 1/2         | 20               | 0.350      | 3/8       | 0.8750        | 3-1/2          | 3             | ALCRN   | 15/32          | 29/64          |
| <a href="#">N68784</a> | NTM100-1/2X28UN-.375   | 1/2         | 28               | 0.350      | 3/8       | 0.8750        | 3-1/2          | 3             | ALCRN   | 15/32          | 15/32          |
| <a href="#">N68786</a> | NTM100-9/16X12UN-.375  | 9/16        | 12               | 0.370      | 3/8       | 0.8750        | 3-1/2          | 4             | ALCRN   | 33/64          | 31/64          |
| <a href="#">N68788</a> | NTM100-9/16X18UN-.375  | 9/16        | 18               | 0.370      | 3/8       | 0.8750        | 3-1/2          | 4             | ALCRN   | 17/32          | 33/64          |
| <a href="#">N68790</a> | NTM100-5/8X11UN-.500   | 5/8         | 11               | 0.470      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 9/16           | 17/32          |
| <a href="#">N68792</a> | NTM100-5/8X12UN-.500   | 5/8         | 12               | 0.470      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 9/16           | 35/64          |
| <a href="#">N68794</a> | NTM100-5/8X18UN-.500   | 5/8         | 18               | 0.470      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 19/32          | 37/64          |
| <a href="#">N68796</a> | NTM100-3/4X10UN-.500   | 3/4         | 10               | 0.495      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 11/16          | 21/32          |
| <a href="#">N68798</a> | NTM100-3/4X12UN-.500   | 3/4         | 12               | 0.495      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 11/16          | 43/64          |
| <a href="#">N68800</a> | NTM100-3/4X16UN-.500   | 3/4         | 16               | 0.495      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 45/64          | 11/16          |
| <a href="#">N68802</a> | NTM100-3/4X20UN-.500   | 3/4         | 20               | 0.495      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 23/32          | 45/64          |
| <a href="#">N68804</a> | NTM100-7/8X9UN-.625    | 7/8         | 9                | 0.620      | 5/8       | 1.3750        | 4              | 4             | ALCRN   | 51/64          | 49/64          |
| <a href="#">N68806</a> | NTM100-7/8X12UN-.625   | 7/8         | 12               | 0.620      | 5/8       | 1.3750        | 4              | 4             | ALCRN   | 13/16          | 51/64          |
| <a href="#">N68808</a> | NTM100-7/8X14UN-.625   | 7/8         | 14               | 0.620      | 5/8       | 1.3750        | 4              | 4             | ALCRN   | 53/64          | 13/16          |
| <a href="#">N68810</a> | NTM100-7/8X16UN-.625   | 7/8         | 16               | 0.620      | 5/8       | 1.3750        | 4              | 4             | ALCRN   | 53/64          | 13/16          |
| <a href="#">N68812</a> | NTM100-7/8X20UN-.625   | 7/8         | 20               | 0.620      | 5/8       | 1.3750        | 4              | 4             | ALCRN   | 27/32          | 53/64          |
| <a href="#">N68814</a> | NTM100-1X8UN-.625      | 1           | 8                | 0.620      | 5/8       | 1.3750        | 4              | 4             | ALCRN   | 59/64          | 7/8            |
| <a href="#">N68816</a> | NTM100-1X12UN-.625     | 1           | 12               | 0.620      | 5/8       | 1.3750        | 4              | 4             | ALCRN   | 61/64          | 15/16          |
| <a href="#">N68818</a> | NTM100-1X16UN-.625     | 1           | 16               | 0.620      | 5/8       | 1.3750        | 4              | 4             | ALCRN   | 61/64          | 15/16          |

# UN THREADMILLS-NTM120UN

SOLID  
CARBIDE



- Helical flutes for internal and external threading
- Coolant-through feature
- Ideal for flat bottom holes
- Large diameter applications where torque and horsepower requirements for taps are not available
- Suitable for use in most materials
- Cutting Data - Page 306-307
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION            | THREAD SIZE | THREADS PER INCH | CUTTER DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | CUTTING TEETH | COATING | DRILL SIZE 50% | DRILL SIZE 75% |
|------------------------|------------------------|-------------|------------------|------------|-----------|---------------|----------------|---------------|---------|----------------|----------------|
| <a href="#">N34479</a> | NTM120-NR.10X24UN-.187 | 10          | 24               | 0.134      | 3/16      | 0.3130        | 2              | 3             | ALCRN   | 20             | 25             |
| <a href="#">N34480</a> | NTM120-NR.10X32UN-.187 | 10          | 32               | 0.134      | 3/16      | 0.3130        | 2              | 3             | ALCRN   | 18             | 21             |
| <a href="#">N34481</a> | NTM120-1/4X20UN-.187   | 1/4         | 20               | 0.180      | 3/16      | 0.5000        | 2-1/2          | 3             | ALCRN   | 7/32           | 7              |
| <a href="#">N34482</a> | NTM120-1/4X28UN-.187   | 1/4         | 28               | 0.180      | 3/16      | 0.5000        | 2-1/2          | 3             | ALCRN   | 1              | 3              |
| <a href="#">N34483</a> | NTM120-5/16X18UN-.250  | 5/16        | 18               | 0.235      | 1/4       | 0.6250        | 2-1/2          | 3             | ALCRN   | J              | F              |
| <a href="#">N34484</a> | NTM120-5/16X24UN-.250  | 5/16        | 24               | 0.235      | 1/4       | 0.6250        | 2-1/2          | 3             | ALCRN   | 9/32           | I              |
| <a href="#">N34485</a> | NTM120-3/8X16UN-.312   | 3/8         | 16               | 0.285      | 5/16      | 0.7500        | 3              | 3             | ALCRN   | Q              | 5/16           |
| <a href="#">N34486</a> | NTM120-3/8X24UN-.312   | 3/8         | 24               | 0.285      | 5/16      | 0.7500        | 3              | 3             | ALCRN   | S              | Q              |
| <a href="#">N34487</a> | NTM120-7/16X14UN-.312  | 7/16        | 14               | 0.305      | 5/16      | 0.8750        | 3              | 3             | ALCRN   | 25/64          | U              |
| <a href="#">N34488</a> | NTM120-7/16X20UN-.312  | 7/16        | 20               | 0.305      | 5/16      | 0.8750        | 3              | 3             | ALCRN   | 13/32          | 25/64          |
| <a href="#">N34489</a> | NTM120-1/2X13UN-.375   | 1/2         | 13               | 0.350      | 3/8       | 0.8750        | 3-1/2          | 3             | ALCRN   | 29/64          | 27/64          |
| <a href="#">N34490</a> | NTM120-1/2X20UN-.375   | 1/2         | 20               | 0.350      | 3/8       | 0.8750        | 3-1/2          | 3             | ALCRN   | 15/32          | 29/64          |
| <a href="#">N34491</a> | NTM120-9/16X12UN-.375  | 9/16        | 12               | 0.370      | 3/8       | 0.8750        | 3-1/2          | 4             | ALCRN   | 33/64          | 31/64          |
| <a href="#">N34492</a> | NTM120-9/16X18UN-.375  | 9/16        | 18               | 0.370      | 3/8       | 0.8750        | 3-1/2          | 4             | ALCRN   | 17/32          | 33/64          |
| <a href="#">N34493</a> | NTM120-5/8X11UN-.500   | 5/8         | 11               | 0.470      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 9/16           | 17/32          |
| <a href="#">N34494</a> | NTM120-3/4X10UN-.500   | 3/4         | 10               | 0.495      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 11/16          | 21/32          |
| <a href="#">N34495</a> | NTM120-3/4X12UN-.500   | 3/4         | 12               | 0.495      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 11/16          | 43/64          |
| <a href="#">N34496</a> | NTM120-3/4X16UN-.500   | 3/4         | 16               | 0.495      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 45/64          | 11/16          |
| <a href="#">N34497</a> | NTM120-7/8X9UN-.625    | 7/8         | 9                | 0.620      | 5/8       | 1.3750        | 4              | 4             | ALCRN   | 51/64          | 49/64          |
| <a href="#">N34498</a> | NTM120-1X8UN-.625      | 1           | 8                | 0.620      | 5/8       | 1.3750        | 4              | 4             | ALCRN   | 59/64          | 7/8            |



## UN THREAD MILLS-NTM160UN

SOLID  
CARBIDE



- Helical flutes for internal and external threading
- Extended reach
- Ideal for flat bottom holes
- Large diameter applications where torque and horsepower requirements for taps are not available
- Suitable for use in most materials
- Cutting Data - Page 306-307
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION            | THREAD SIZE | THREADS PER INCH | CUTTER DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | CUTTING TEETH | COATING | REACH | DRILL SIZE 50% | DRILL SIZE 75% |
|------------------------|------------------------|-------------|------------------|------------|-----------|---------------|----------------|---------------|---------|-------|----------------|----------------|
| <a href="#">N34570</a> | NTM160-NR.10X32UN-.187 | 10          | 32               | 0.134      | 3/16      | 0.1000        | 2              | 3             | ALCRN   | .500  | 18             | 21             |
| <a href="#">N34569</a> | NTM160-NR.10X28UN-.187 | 10          | 28               | 0.134      | 3/16      | 0.1100        | 2              | 3             | ALCRN   | .400  | 19             | 23             |
| <a href="#">N34568</a> | NTM160-NR.10X24UN-.187 | 10          | 24               | 0.134      | 3/16      | 0.1250        | 2              | 3             | ALCRN   | .300  | 20             | 25             |
| <a href="#">N34573</a> | NTM160-1/4X32UN-.187   | 1/4         | 32               | 0.180      | 3/16      | 0.1000        | 2-1/2          | 3             | ALCRN   | .950  | 1              | 7/32           |
| <a href="#">N34572</a> | NTM160-1/4X28UN-.187   | 1/4         | 28               | 0.180      | 3/16      | 0.1100        | 2-1/2          | 3             | ALCRN   | .875  | 1              | 3              |
| <a href="#">N34571</a> | NTM160-1/4X20UN-.187   | 1/4         | 20               | 0.180      | 3/16      | 0.1500        | 2-1/2          | 3             | ALCRN   | .670  | 7/32           | 7              |
| <a href="#">N34576</a> | NTM160-5/16X32UN-.250  | 5/16        | 32               | 0.235      | 1/4       | 0.1000        | 2-1/2          | 3             | ALCRN   | 1.375 | L              | 9/32           |
| <a href="#">N34575</a> | NTM160-5/16X24UN-.250  | 5/16        | 24               | 0.235      | 1/4       | 0.1250        | 2-1/2          | 3             | ALCRN   | 1.250 | 9/32           | I              |
| <a href="#">N34574</a> | NTM160-5/16X18UN-.250  | 5/16        | 18               | 0.235      | 1/4       | 0.1700        | 2-1/2          | 3             | ALCRN   | 1     | J              | F              |
| <a href="#">N34578</a> | NTM160-3/8X24UN-.312   | 3/8         | 24               | 0.285      | 5/16      | 0.1250        | 3              | 3             | ALCRN   | 1.625 | S              | Q              |
| <a href="#">N34577</a> | NTM160-3/8X16UN-.312   | 3/8         | 16               | 0.285      | 5/16      | 0.1880        | 3              | 3             | ALCRN   | 1.350 | Q              | 5/16           |
| <a href="#">N34580</a> | NTM160-7/16X20UN-.312  | 7/16        | 20               | 0.305      | 5/16      | 0.1500        | 3              | 3             | ALCRN   | 1.670 | 13/32          | 25/64          |
| <a href="#">N34579</a> | NTM160-7/16X14UN-.312  | 7/16        | 14               | 0.305      | 5/16      | 0.2150        | 3              | 3             | ALCRN   | 1.375 | 25/64          | U              |
| <a href="#">N34583</a> | NTM160-1/2X28UN-.375   | 1/2         | 28               | 0.350      | 3/8       | 0.1100        | 4              | 3             | ALCRN   | 2.250 | 15/32          | 15/32          |
| <a href="#">N34582</a> | NTM160-1/2X20UN-.375   | 1/2         | 20               | 0.350      | 3/8       | 0.1500        | 4              | 3             | ALCRN   | 1.250 | 15/32          | 29/64          |
| <a href="#">N34581</a> | NTM160-1/2X13UN-.375   | 1/2         | 13               | 0.350      | 3/8       | 0.2300        | 4              | 3             | ALCRN   | 1.670 | 29/64          | 27/64          |
| <a href="#">N34584</a> | NTM160-9/16X12UN-.375  | 9/16        | 12               | 0.370      | 3/8       | 0.2500        | 4              | 4             | ALCRN   | 1.725 | 33/64          | 31/64          |
| <a href="#">N34585</a> | NTM160-9/16X18UN-.375  | 9/16        | 18               | 0.370      | 3/8       | 0.1700        | 4              | 4             | ALCRN   | 2.100 | 17/32          | 33/64          |
| <a href="#">N34588</a> | NTM160-5/8X18UN-.500   | 5/8         | 18               | 0.470      | 1/2       | 0.1700        | 4-1/2          | 4             | ALCRN   | 2.900 | 19/32          | 37/64          |
| <a href="#">N34587</a> | NTM160-5/8X12UN-.500   | 5/8         | 12               | 0.470      | 1/2       | 0.2500        | 4-1/2          | 4             | ALCRN   | 2.525 | 9/16           | 35/64          |
| <a href="#">N34586</a> | NTM160-5/8X11UN-.500   | 5/8         | 11               | 0.470      | 1/2       | 0.2750        | 4-1/2          | 4             | ALCRN   | 2.400 | 9/16           | 17/32          |
| <a href="#">N34592</a> | NTM160-3/4X20UN-.500   | 3/4         | 20               | 0.495      | 1/2       | 0.1500        | 5              | 4             | ALCRN   | 3.188 | 23/32          | 45/64          |
| <a href="#">N34591</a> | NTM160-3/4X16UN-.500   | 3/4         | 16               | 0.495      | 1/2       | 0.1880        | 5              | 4             | ALCRN   | 3.000 | 45/64          | 11/16          |
| <a href="#">N34590</a> | NTM160-3/4X12UN-.500   | 3/4         | 12               | 0.495      | 1/2       | 0.2500        | 5              | 4             | ALCRN   | 2.750 | 11/16          | 43/64          |
| <a href="#">N34589</a> | NTM160-3/4X10UN-.500   | 3/4         | 10               | 0.495      | 1/2       | 0.3000        | 5              | 4             | ALCRN   | 2.500 | 11/16          | 21/32          |
| <a href="#">N34597</a> | NTM160-7/8X20UN-.625   | 7/8         | 20               | 0.620      | 5/8       | 0.1500        | 6              | 4             | ALCRN   | 4.188 | 27/32          | 53/64          |
| <a href="#">N34596</a> | NTM160-7/8X16UN-.625   | 7/8         | 16               | 0.620      | 5/8       | 0.1880        | 6              | 4             | ALCRN   | 4.000 | 53/64          | 13/16          |
| <a href="#">N34595</a> | NTM160-7/8X14UN-.625   | 7/8         | 14               | 0.620      | 5/8       | 0.2150        | 6              | 4             | ALCRN   | 3.900 | 53/64          | 13/16          |
| <a href="#">N34594</a> | NTM160-7/8X12UN-.625   | 7/8         | 12               | 0.620      | 5/8       | 0.2500        | 6              | 4             | ALCRN   | 3.725 | 13/16          | 51/64          |
| <a href="#">N34593</a> | NTM160-7/8X9UN-.625    | 7/8         | 9                | 0.620      | 5/8       | 0.3300        | 6              | 4             | ALCRN   | 3.300 | 51/64          | 49/64          |
| <a href="#">N34600</a> | NTM160-1X16UN-.625     | 1           | 16               | 0.620      | 5/8       | 0.1880        | 6              | 4             | ALCRN   | 4.000 | 61/64          | 15/16          |
| <a href="#">N34599</a> | NTM160-1X12UN-.625     | 1           | 12               | 0.620      | 5/8       | 0.2500        | 6              | 4             | ALCRN   | 3.725 | 61/64          | 15/16          |
| <a href="#">N34598</a> | NTM160-1X8UN-.625      | 1           | 8                | 0.620      | 5/8       | 0.3750        | 6              | 4             | ALCRN   | 3.150 | 59/64          | 7/8            |

**METRIC THREAD MILLS-NTM400MI**

SOLID CARBIDE



- Helical flutes for internal and external threading
- Cutting Data - Page 306-307
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION             | THREAD SIZE | THREADS PER INCH | CUTTER DIA | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | CUTTING TEETH | COATING | DRILL SIZE 75% |
|------------------------|-------------------------|-------------|------------------|------------|-----------|---------------|----------------|---------------|---------|----------------|
| <a href="#">N68850</a> | NTM400-M3X.5ISO-.125    | M3          | 0.5              | 0.085      | 1/8       | 0.1780        | 2              | 3             | ALCRN   | 39             |
| <a href="#">N68852</a> | NTM400-M3.5X.6ISO-.125  | M3.5        | 0.6              | 0.095      | 1/8       | 0.2350        | 2              | 3             | ALCRN   | 32             |
| <a href="#">N68854</a> | NTM400-M4X.7ISO-.125    | M4          | 0.7              | 0.115      | 1/8       | 0.2760        | 2              | 3             | ALCRN   | 30             |
| <a href="#">N68856</a> | NTM400-M4.5X.75ISO-.187 | M4.5        | 0.75             | 0.134      | 3/16      | 0.3130        | 2              | 3             | ALCRN   | 19             |
| <a href="#">N68858</a> | NTM400-M5-X.8ISO-.187   | M5          | 0.8              | 0.134      | 3/16      | 0.3130        | 2              | 3             | ALCRN   | 19             |
| <a href="#">N68860</a> | NTM400-M6X1.0ISO-.187   | M6          | 1                | 0.170      | 3/16      | 0.5000        | 2-1/2          | 3             | ALCRN   | 8              |
| <a href="#">N68862</a> | NTM400-M8X1.0ISO-.250   | M8          | 1                | 0.235      | 1/4       | 0.6250        | 2-1/2          | 3             | ALCRN   | J              |
| <a href="#">N68864</a> | NTM400-M8X1.25ISO-.250  | M8          | 1.25             | 0.235      | 1/4       | 0.6250        | 2-1/2          | 3             | ALCRN   | H              |
| <a href="#">N68866</a> | NTM400-M10X1.25ISO-.312 | M10         | 1.25             | 0.300      | 5/16      | 0.7500        | 3              | 3             | ALCRN   | 11/32          |
| <a href="#">N68868</a> | NTM400-M10X1.5ISO-.312  | M10         | 1.5              | 0.300      | 5/16      | 0.7500        | 3              | 3             | ALCRN   | R              |
| <a href="#">N68870</a> | NTM400-M12X1.25ISO-.375 | M12         | 1.25             | 0.360      | 3/8       | 0.8750        | 3-1/2          | 3             | ALCRN   | 27/64          |
| <a href="#">N68872</a> | NTM400-M12X1.75ISO-.375 | M12         | 1.75             | 0.360      | 3/8       | 0.8750        | 3-1/2          | 3             | ALCRN   | 13/32          |
| <a href="#">N68874</a> | NTM400-M14X1.25ISO-.375 | M14         | 1.25             | 0.370      | 3/8       | 0.8750        | 3-1/2          | 4             | ALCRN   | 1/2            |
| <a href="#">N68876</a> | NTM400-M14X1.5ISO-.375  | M14         | 1.5              | 0.370      | 3/8       | 0.8750        | 3-1/2          | 4             | ALCRN   | 1/2            |
| <a href="#">N68878</a> | NTM400-M14X2.0ISO-.375  | M14         | 2                | 0.370      | 3/8       | 0.8750        | 3-1/2          | 4             | ALCRN   | 15/32          |
| <a href="#">N68880</a> | NTM400-M16X2.0ISO-.500  | M16         | 2                | 0.470      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 35/64          |
| <a href="#">N68882</a> | NTM400-M18X2.5ISO-.500  | M18         | 2.5              | 0.490      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 39/64          |
| <a href="#">N68884</a> | NTM400-M20X1.5ISO-.500  | M20         | 1.5              | 0.495      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 47/64          |
| <a href="#">N68886</a> | NTM400-M20X2.0ISO-.500  | M20         | 2                | 0.495      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 11/16          |
| <a href="#">N68888</a> | NTM400-M20X2.5ISO-.500  | M20         | 2.5              | 0.495      | 1/2       | 1.2500        | 4              | 4             | ALCRN   | 11/16          |
| <a href="#">N68890</a> | NTM400-M24X1.5ISO-.625  | M24         | 1.5              | 0.620      | 5/8       | 1.3730        | 4              | 4             | ALCRN   | 22.5MM         |
| <a href="#">N68892</a> | NTM400-M24X2.0ISO-.625  | M24         | 2                | 0.620      | 5/8       | 1.3730        | 4              | 4             | ALCRN   | 7/8            |
| <a href="#">N68894</a> | NTM400-M24X2.5ISO-.625  | M24         | 2.5              | 0.620      | 5/8       | 1.3730        | 4              | 4             | ALCRN   | 21.5MM         |
| <a href="#">N68896</a> | NTM400-M24X3.0ISO-.625  | M24         | 3                | 0.620      | 5/8       | 1.3750        | 4              | 4             | ALCRN   | 53/64          |

## THREAD MILLS-NTM200NPT

SOLID CARBIDE



- Straight flutes for internal and external threading
- National Pipe Taper
- Cutting Data - Page 306-307
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION            | THREAD SIZE | THREADS PER INCH | CUTTER DIAMETER | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | CUTTING TEETH | COATING | DRILL SIZE |
|------------------------|------------------------|-------------|------------------|-----------------|-----------|---------------|----------------|---------------|---------|------------|
| <a href="#">N68820</a> | NTM200-1/16X27NPT-.250 | 1/16        | 27               | 0.245           | 1/4       | 0.4375        | 2-1/2          | 3             | ALCRN   | B          |
| <a href="#">N68822</a> | NTM200-1/8X27NPT-.250  | 1/8         | 27               | 0.245           | 1/4       | 0.4375        | 2-1/2          | 3             | ALCRN   | 21/64      |
| <a href="#">N68824</a> | NTM200-1/4X18NPT-.312  | 1/4         | 18               | 0.312           | 5/16      | 0.6250        | 3              | 3             | ALCRN   | 27/64      |
| <a href="#">N68826</a> | NTM200-3/8X18NPT-.312  | 3/8         | 18               | 0.312           | 5/16      | 0.6250        | 3              | 3             | ALCRN   | 9/16       |
| <a href="#">N68828</a> | NTM200-1/2X14NPT-.500  | 1/2         | 14               | 0.495           | 1/2       | 0.8750        | 4              | 4             | ALCRN   | 11/16      |
| <a href="#">N68830</a> | NTM200-3/4X14NPT-.500  | 3/4         | 14               | 0.495           | 1/2       | 0.8750        | 4              | 4             | ALCRN   | 29/32      |
| <a href="#">N68832</a> | NTM200-1X11.5NPT-.625  | 1           | 11.5             | 0.620           | 5/8       | 1.1250        | 4              | 4             | ALCRN   | 1-5/32     |
| <a href="#">N68834</a> | NTM200-2-1/2X8NPT-.750 | 2.5         | 8                | 0.745           | 3/4       | 1.5000        | 5              | 4             | ALCRN   | 2-39/64    |

## THREAD MILLS-NTM300NPTF

SOLID CARBIDE



- Straight flutes for internal and external threading
- National Pipe Taper for Fuels
- Cutting Data - Page 306-307
- Tolerance Specs - Page 323

| PRODUCT NUMBER         | DESCRIPTION             | THREAD SIZE | THREADS PER INCH | CUTTER DIAMETER | SHANK DIA | LENGTH OF CUT | OVERALL LENGTH | CUTTING TEETH | COATING | DRILL SIZE |
|------------------------|-------------------------|-------------|------------------|-----------------|-----------|---------------|----------------|---------------|---------|------------|
| <a href="#">N68836</a> | NTM300-1/16X27NPTF-.250 | 1/16        | 27               | 0.245           | 1/4       | 0.4375        | 2-1/2          | 3             | ALCRN   | B          |
| <a href="#">N68838</a> | NTM300-1/8X27NPTF-.250  | 1/8         | 27               | 0.245           | 1/4       | 0.4375        | 2-1/2          | 3             | ALCRN   | 21/64      |
| <a href="#">N68840</a> | NTM300-1/4X18NPTF-.312  | 1/4         | 18               | 0.305           | 5/16      | 0.6250        | 3              | 3             | ALCRN   | 27/64      |
| <a href="#">N68842</a> | NTM300-3/8X18NPTF-.312  | 3/8         | 18               | 0.305           | 5/16      | 0.6250        | 3              | 3             | ALCRN   | 9/16       |
| <a href="#">N68844</a> | NTM300-1/2X14NPTF-.500  | 1/2         | 14               | 0.495           | 1/2       | 0.8750        | 4              | 4             | ALCRN   | 11/16      |
| <a href="#">N68846</a> | NTM300-3/4X14NPTF-.500  | 3/4         | 14               | 0.495           | 1/2       | 0.8750        | 4              | 4             | ALCRN   | 29/32      |
| <a href="#">N68848</a> | NTM300-1X11.5NPTF-.625  | 1           | 11.5             | 0.620           | 5/8       | 1.1250        | 4              | 4             | ALCRN   | 1-5/32     |

## THREAD MILLS - INCH - START VALUES

|                     |                         | THREAD MILLING               |                         |                    |        |        |        |        |        |                    |        |        |
|---------------------|-------------------------|------------------------------|-------------------------|--------------------|--------|--------|--------|--------|--------|--------------------|--------|--------|
| ISO GROUP           | SMG                     | V <sub>C</sub><br>(sf / min) |                         | Z <sub>n</sub> = 3 |        |        |        |        |        | Z <sub>n</sub> = 4 |        |        |
|                     |                         |                              |                         | 1/8                | 3/16   | 1/4    | 5/16   | 3/8    | 1/2    | 5/8                | 3/4    | 1      |
| P                   | E<br>1 - 2              | 500                          | n (rev/min)             | 15280              | 10187  | 7640   | 6112   | 5093   | 3820   | 3056               | 2547   | 1910   |
|                     |                         |                              | f <sub>Z</sub> (in)     | 0.0005             | 0.0008 | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025             | 0.0030 | 0.0040 |
|                     | 450 - 550               | v <sub>f</sub> (in/min)      | 22.9                    | 22.9               | 22.9   | 22.9   | 22.9   | 22.9   | 30.6   | 30.6               | 30.6   |        |
|                     |                         | n (rev/min)                  | 10696                   | 7131               | 5348   | 4278   | 3565   | 2674   | 2139   | 1783               | 1337   |        |
|                     | E<br>3 - 4              | 350                          | f <sub>Z</sub> (in)     | 0.0005             | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0023             | 0.0027 | 0.0036 |
|                     |                         |                              | v <sub>f</sub> (in/min) | 14.4               | 14.4   | 14.4   | 14.4   | 14.4   | 14.4   | 19.3               | 19.3   | 19.3   |
| E<br>5 - 6          | 275                     | n (rev/min)                  | 8404                    | 5603               | 4202   | 3362   | 2801   | 2101   | 1681   | 1401               | 1051   |        |
|                     |                         | f <sub>Z</sub> (in)          | 0.0004                  | 0.0006             | 0.0008 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023             | 0.0030 |        |
| 250 - 300           | v <sub>f</sub> (in/min) | 9.5                          | 9.5                     | 9.5                | 9.5    | 9.5    | 9.5    | 12.6   | 12.6   | 12.6               |        |        |
|                     | H                       | M / A<br>7<br>>45HRc         | 150                     | n (rev/min)        | 4584   | 3056   | 2292   | 1834   | 1528   | 1146               | 917    | 764    |
| f <sub>Z</sub> (in) |                         |                              |                         | 0.0002             | 0.0003 | 0.0005 | 0.0006 | 0.0007 | 0.0009 | 0.0011             | 0.0014 | 0.0018 |
| 125 - 175           | v <sub>f</sub> (in/min) | 3.1                          | 3.1                     | 3.1                | 3.1    | 3.1    | 3.1    | 4.1    | 4.1    | 4.1                |        |        |
|                     | E<br>8 - 9              | 350                          | n (rev/min)             | 10696              | 7131   | 5348   | 4278   | 3565   | 2674   | 2139               | 1783   | 1337   |
| f <sub>Z</sub> (in) |                         |                              | 0.0004                  | 0.0006             | 0.0008 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023             | 0.0030 |        |
| 300 - 400           | v <sub>f</sub> (in/min) | 12.0                         | 12.0                    | 12.0               | 12.0   | 12.0   | 12.0   | 16.0   | 16.0   | 16.0               |        |        |
|                     | E<br>10 - 11            | 250                          | n (rev/min)             | 7640               | 5093   | 3820   | 3056   | 2547   | 1910   | 1528               | 1273   | 955    |
| f <sub>Z</sub> (in) |                         |                              | 0.0004                  | 0.0006             | 0.0008 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023             | 0.0030 |        |
| 200 - 300           | v <sub>f</sub> (in/min) | 8.6                          | 8.6                     | 8.6                | 8.6    | 8.6    | 8.6    | 11.5   | 11.5   | 11.5               |        |        |
|                     | E<br>12 - 13            | 500                          | n (rev/min)             | 15280              | 10187  | 7640   | 6112   | 5093   | 3820   | 3056               | 2547   | 1910   |
| f <sub>Z</sub> (in) |                         |                              | 0.0006                  | 0.0009             | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038             | 0.0050 |        |
| 450 - 550           | v <sub>f</sub> (in/min) | 28.7                         | 28.7                    | 28.7               | 28.7   | 28.7   | 28.7   | 38.2   | 38.2   | 38.2               |        |        |
|                     | E<br>14 - 15            | 425                          | n (rev/min)             | 12988              | 8659   | 6494   | 5195   | 4329   | 3247   | 2598               | 2165   | 1624   |
| f <sub>Z</sub> (in) |                         |                              | 0.0005                  | 0.0007             | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0023 | 0.0027             | 0.0036 |        |
| 375 - 475           | v <sub>f</sub> (in/min) | 17.5                         | 17.5                    | 17.5               | 17.5   | 17.5   | 17.5   | 23.4   | 23.4   | 23.4               |        |        |
|                     | E<br>16                 | 600                          | n (rev/min)             | 18336              | 12224  | 9168   | 7334   | 6112   | 4584   | 3667               | 3056   | 2292   |
| f <sub>Z</sub> (in) |                         |                              | 0.0006                  | 0.0009             | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038             | 0.0050 |        |
| 550 - 650           | v <sub>f</sub> (in/min) | 34.4                         | 34.4                    | 34.4               | 34.4   | 34.4   | 34.4   | 45.8   | 45.8   | 45.8               |        |        |
|                     | E<br>17                 | 600                          | n (rev/min)             | 18336              | 12224  | 9168   | 7334   | 6112   | 4584   | 3667               | 3056   | 2292   |
| f <sub>Z</sub> (in) |                         |                              | 0.0006                  | 0.0009             | 0.0013 | 0.0016 | 0.0019 | 0.0025 | 0.0031 | 0.0038             | 0.0050 |        |
| 550 - 650           | v <sub>f</sub> (in/min) | 34.4                         | 34.4                    | 34.4               | 34.4   | 34.4   | 34.4   | 45.8   | 45.8   | 45.8               |        |        |
|                     | E<br>18                 | 600                          | n (rev/min)             | 18336              | 12224  | 9168   | 7334   | 6112   | 4584   | 3667               | 3056   | 2292   |
| f <sub>Z</sub> (in) |                         |                              | 0.0005                  | 0.0008             | 0.0010 | 0.0013 | 0.0015 | 0.0020 | 0.0025 | 0.0030             | 0.0040 |        |
| 550 - 650           | v <sub>f</sub> (in/min) | 27.5                         | 27.5                    | 27.5               | 27.5   | 27.5   | 27.5   | 36.7   | 36.7   | 36.7               |        |        |
|                     | E<br>20                 | 100                          | n (rev/min)             | 3056               | 2037   | 1528   | 1222   | 1019   | 764    | 611                | 509    | 382    |
| f <sub>Z</sub> (in) |                         |                              | 0.0003                  | 0.0005             | 0.0006 | 0.0008 | 0.0009 | 0.0012 | 0.0015 | 0.0018             | 0.0024 |        |
| 80 - 120            | v <sub>f</sub> (in/min) | 2.8                          | 2.8                     | 2.8                | 2.8    | 2.8    | 2.8    | 3.7    | 3.7    | 3.7                |        |        |
|                     | E<br>21                 | 100                          | n (rev/min)             | 3056               | 2037   | 1528   | 1222   | 1019   | 764    | 611                | 509    | 382    |
| f <sub>Z</sub> (in) |                         |                              | 0.0003                  | 0.0005             | 0.0006 | 0.0008 | 0.0009 | 0.0012 | 0.0015 | 0.0018             | 0.0024 |        |
| 80 - 120            | v <sub>f</sub> (in/min) | 2.8                          | 2.8                     | 2.8                | 2.8    | 2.8    | 2.8    | 3.7    | 3.7    | 3.7                |        |        |
|                     | E<br>22                 | 350                          | n (rev/min)             | 10696              | 7131   | 5348   | 4278   | 3565   | 2674   | 2139               | 1783   | 1337   |
| f <sub>Z</sub> (in) |                         |                              | 0.0004                  | 0.0006             | 0.0008 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0023             | 0.0030 |        |
| 330 - 370           | v <sub>f</sub> (in/min) | 12.0                         | 12.0                    | 12.0               | 12.0   | 12.0   | 12.0   | 16.0   | 16.0   | 16.0               |        |        |
|                     | GRAPHITE                | 300                          | n (rev/min)             | 9168               | 6112   | 4584   | 3667   | 3056   | 2292   | 1834               | 1528   | 1146   |
| f <sub>Z</sub> (in) |                         |                              | 0.0004                  | 0.0005             | 0.0007 | 0.0009 | 0.0011 | 0.0014 | 0.0018 | 0.0021             | 0.0028 |        |
| 250 - 350           | v <sub>f</sub> (in/min) | 9.6                          | 9.6                     | 9.6                | 9.6    | 9.6    | 9.6    | 12.8   | 12.8   | 12.8               |        |        |

SMG = Seco Material Group  
 n [min-1] = RPM  
 V<sub>C</sub> (sf/min) = Surface feet/min

f<sub>Z</sub> [in] = Feed/tooth  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter  
 v<sub>f</sub> [in/min] = Feed rate  
 a<sub>p</sub>/D<sub>c</sub> = % of diameter

A = Air D = Dry E = Emulsion (flood coolant) M = Mist  
 All cutting data are start values. All cutting data is in inch values.  
 Please reference the Workpiece Material Classification chart located on page 15.

## THREAD MILLS - METRIC - START VALUES

|           |                | THREAD MILLING |             |             |       |       |       |       |       |       |        |       |       |       |       |       |      |
|-----------|----------------|----------------|-------------|-------------|-------|-------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|------|
| ISO GROUP | SMG            | vc (m / min)   |             | Zn = 3      |       |       |       |       |       |       | Zn = 4 |       |       |       |       |       |      |
|           |                |                |             | 3           | 4     | 5     | 6     | 8     | 10    | 12    | 14     | 16    | 18    | 20    | 24    |       |      |
| P         | E 1 - 2        | 500            | n [min-1]   | 16171       | 12129 | 9703  | 8086  | 6064  | 4851  | 4043  | 3465   | 3032  | 2695  | 2426  | 2021  |       |      |
|           |                |                | fz [in]     | .0005       | .0006 | .0008 | .0009 | .0013 | .0016 | .0019 | .0022  | .0025 | .0028 | .0031 | .0038 |       |      |
|           | E 3 - 4        | 350            | 450 - 550   | vf [in/min] | 22.9  | 22.9  | 22.9  | 22.9  | 22.9  | 22.9  | 22.9   | 3.6   | 3.6   | 3.6   | 3.6   | 3.6   |      |
|           |                |                | n [min-1]   | 11320       | 8490  | 6792  | 5660  | 4245  | 3396  | 2830  | 2426   | 2122  | 1887  | 1698  | 1415  |       |      |
|           | E 5 - 6        | 275            | 400 - 400   | fz [in]     | .0004 | .0006 | .0007 | .0009 | .0011 | .0014 | .0017  | .0020 | .0023 | .0026 | .0028 | .0034 |      |
|           |                |                |             | vf [in/min] | 14.4  | 14.4  | 14.4  | 14.4  | 14.4  | 14.4  | 14.4   | 14.4  | 19.3  | 19.3  | 19.3  | 19.3  | 19.3 |
| H         | M / A 7 >45HRC | 150            | n [min-1]   | 8894        | 6671  | 5337  | 4447  | 3335  | 2668  | 2224  | 1906   | 1668  | 1482  | 1334  | 1112  |       |      |
|           |                |                | fz [in]     | .0004       | .0005 | .0006 | .0007 | .0009 | .0012 | .0014 | .0017  | .0019 | .0021 | .0024 | .0028 |       |      |
| M         | E 8 - 9        | 350            | 125 - 175   | vf [in/min] | 9.5   | 9.5   | 9.5   | 9.5   | 9.5   | 9.5   | 9.5    | 12.6  | 12.6  | 12.6  | 12.6  |       |      |
|           |                |                | n [min-1]   | 4851        | 3639  | 2911  | 2426  | 1819  | 1455  | 1213  | 1040   | 910   | 809   | 728   | 606   |       |      |
|           | E 10 - 11      | 250            | 300 - 1310  | fz [in]     | .0002 | .0003 | .0004 | .0004 | .0006 | .0007 | .0009  | .0010 | .0011 | .0013 | .0014 | .0017 |      |
|           |                |                |             | vf [in/min] | 3.1   | 3.1   | 3.1   | 3.1   | 3.1   | 3.1   | 3.1    | 3.1   | 4.1   | 4.1   | 4.1   | 4.1   | 4.1  |
|           | E 12 - 13      | 500            | 450 - 550   | n [min-1]   | 11320 | 8490  | 6792  | 5660  | 4245  | 3396  | 2830   | 2426  | 2122  | 1887  | 1698  | 1415  |      |
|           |                |                |             | fz [in]     | .0004 | .0005 | .0006 | .0007 | .0009 | .0012 | .0014  | .0017 | .0019 | .0021 | .0024 | .0028 |      |
| E 14 - 15 | 425            | 375 - 475      | vf [in/min] | 12.0        | 12.0  | 12.0  | 12.0  | 12.0  | 12.0  | 12.0  | 16.0   | 16.0  | 16.0  | 16.0  | 16.0  |       |      |
|           |                |                | n [min-1]   | 8086        | 6064  | 4851  | 4043  | 3032  | 2426  | 2021  | 1733   | 1516  | 1348  | 1213  | 1011  |       |      |
| E 16      | 600            | 550 - 650      | fz [in]     | .0004       | .0005 | .0006 | .0007 | .0009 | .0012 | .0014 | .0017  | .0019 | .0021 | .0024 | .0028 |       |      |
|           |                |                | vf [in/min] | 8.6         | 8.6   | 8.6   | 8.6   | 8.6   | 8.6   | 8.6   | 8.6    | 11.5  | 11.5  | 11.5  | 11.5  | 11.5  |      |
| K         | E 12 - 13      | 500            | n [min-1]   | 16171       | 12129 | 9703  | 8086  | 6064  | 4851  | 4043  | 3465   | 3032  | 2695  | 2426  | 2021  |       |      |
|           |                |                | fz [in]     | .0006       | .0008 | .0010 | .0012 | .0016 | .0020 | .0024 | .0028  | .0031 | .0035 | .0039 | .0047 |       |      |
|           | E 14 - 15      | 425            | 450 - 550   | vf [in/min] | 28.7  | 28.7  | 28.7  | 28.7  | 28.7  | 28.7  | 28.7   | 38.2  | 38.2  | 38.2  | 38.2  | 38.2  |      |
|           |                |                |             | n [min-1]   | 13746 | 10309 | 8247  | 6873  | 5155  | 4124  | 3436   | 2945  | 2577  | 2291  | 2062  | 1718  |      |
|           | E 16           | 600            | 550 - 650   | fz [in]     | .0004 | .0006 | .0007 | .0009 | .0011 | .0014 | .0017  | .0020 | .0023 | .0026 | .0028 | .0034 |      |
|           |                |                |             | vf [in/min] | 17.5  | 17.5  | 17.5  | 17.5  | 17.5  | 17.5  | 17.5   | 17.5  | 23.4  | 23.4  | 23.4  | 23.4  | 23.4 |
| N         | E 17           | 600            | n [min-1]   | 19406       | 14554 | 11643 | 9703  | 7277  | 5822  | 4851  | 4158   | 3639  | 3234  | 2911  | 2426  |       |      |
|           |                |                | fz [in]     | .0006       | .0008 | .0010 | .0012 | .0016 | .0020 | .0024 | .0028  | .0031 | .0035 | .0039 | .0047 |       |      |
|           | E 18           | 600            | 550 - 650   | vf [in/min] | 34.4  | 34.4  | 34.4  | 34.4  | 34.4  | 34.4  | 34.4   | 45.8  | 45.8  | 45.8  | 45.8  | 45.8  |      |
|           |                |                |             | n [min-1]   | 19406 | 14554 | 11643 | 9703  | 7277  | 5822  | 4851   | 4158  | 3639  | 3234  | 2911  | 2426  |      |
|           | E 20           | 100            | 80 - 120    | fz [in]     | .0006 | .0008 | .0010 | .0012 | .0016 | .0020 | .0024  | .0028 | .0031 | .0035 | .0039 | .0047 |      |
|           |                |                |             | vf [in/min] | 34.4  | 34.4  | 34.4  | 34.4  | 34.4  | 34.4  | 34.4   | 34.4  | 45.8  | 45.8  | 45.8  | 45.8  | 45.8 |
| S         | E 21           | 100            | n [min-1]   | 19406       | 14554 | 11643 | 9703  | 7277  | 5822  | 4851  | 4158   | 3639  | 3234  | 2911  | 2426  |       |      |
|           |                |                | fz [in]     | .0005       | .0006 | .0008 | .0009 | .0013 | .0016 | .0019 | .0022  | .0025 | .0028 | .0031 | .0038 |       |      |
|           | E 22           | 350            | 330 - 370   | vf [in/min] | 27.5  | 27.5  | 27.5  | 27.5  | 27.5  | 27.5  | 27.5   | 36.7  | 36.7  | 36.7  | 36.7  | 36.7  |      |
|           |                |                |             | n [min-1]   | 3234  | 2426  | 1941  | 1617  | 1213  | 970   | 809    | 693   | 606   | 539   | 485   | 404   |      |
|           | GRAPHITE       | 300            | 250 - 350   | fz [in]     | .0003 | .0004 | .0005 | .0006 | .0008 | .0009 | .0011  | .0013 | .0015 | .0017 | .0019 | .0023 |      |
|           |                |                |             | vf [in/min] | 2.8   | 2.8   | 2.8   | 2.8   | 2.8   | 2.8   | 2.8    | 2.8   | 3.7   | 3.7   | 3.7   | 3.7   | 3.7  |

SMG = Seco Material Group

n [min-1] = RPM

vc (sf/min) = Surface feet/min

fz [in] = Feed/tooth

a<sub>p</sub>/D<sub>c</sub> = % of diameter

vf [in/min] = Feed rate

a<sub>p</sub>/D<sub>c</sub> = % of diameter







A = Air D = Dry E = Emulsion (flood coolant) M = Mist

All cutting data are start values. All cutting data is in inch values.

Please reference the Workpiece Material Classification chart located on page 15.

## THREAD FORMS AND DESIGN

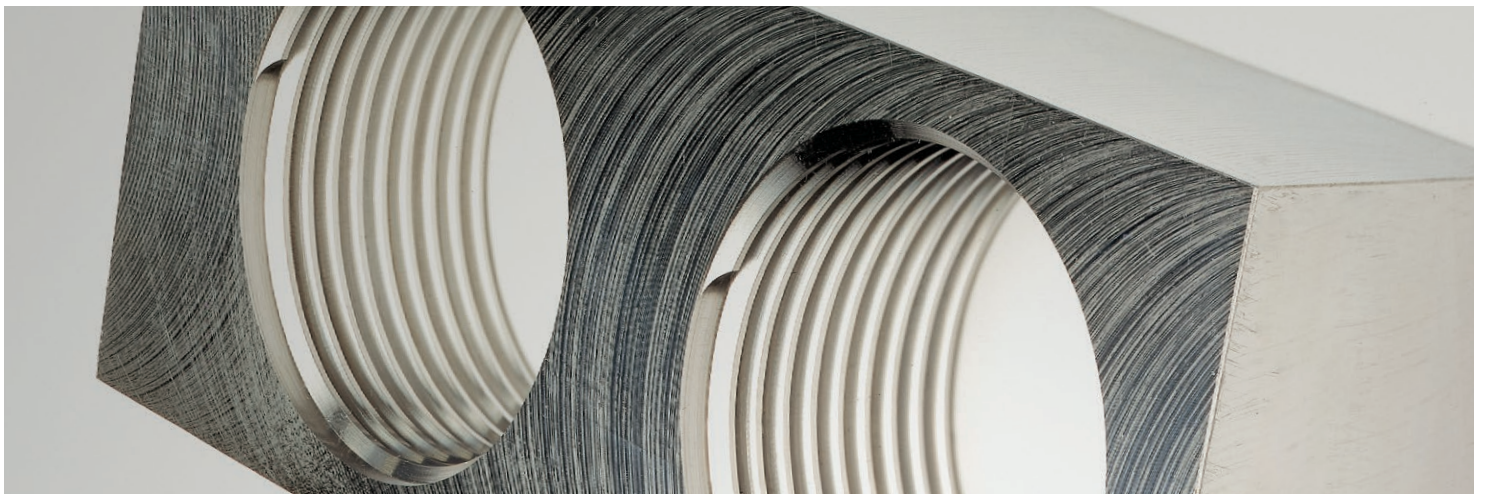
Standard Niagara Cutter Thread Mills - Thread Form Styles

|  |  |
|--|--|
|   | <b>UNIFIED NATIONAL COARSE</b><br>UNC / 60 Degree / Common Std.      |
|   | <b>UNIFIED NATIONAL FINE</b><br>UNF / 60 Degree / Common Std.        |
|   | <b>UNIFIED NATIONAL EXTRA FINE</b><br>UNEF / 60 Degree / Common Std. |
|   | <b>NATIONAL PIPE TAPERED</b><br>NPT – 60 Degree                      |
|   | <b>NATIONAL PIPE TAPERED</b><br>NPTF                                 |
|  | <b>METRIC</b><br>M Series  |

## THREAD MILL DESIGN

Niagara Cutter Thread Mills are designed and comply with following standards:

- UN - ASME B1.1
- NPT / NPTF - ANSI / ASME B1.20.1
- Metric ISO 724



## THREAD MILL JUSTIFICATION

With modern machining centers utilizing helical interpolation programs, thread milling operations can be achieved economically. Thread milling offers many advantages over tapping and is a fast growing machining concept in the industry today.

Thread milling offers many advantages:

- One thread mill produces varying thread diameters of the same pitch
- One tool for left and right hand threads
- Increases quality; milled threads can be cut to full depth with excellent form, finish, and dimensional accuracy
- Easy machining of difficult materials
- Pitch diameter can be controlled by CNC offset
- NPT holes do not require taper reaming
- Produces small controllable chips
- Eliminates the safety issues and downtime associated with tap breakage
- Smaller machines can produce larger threads due to less spindle torque
- Less cutting pressure for thin walled workpieces
- Allows 100% thread depth -Tapping usually permits 65-75%



Is it faster to thread mill or tap the work piece?

This question is often asked. Look at the following example:

## THREADING APPLICATION COMPARISON

|                       |                |                  |
|-----------------------|----------------|------------------|
| Material              | 4140 Steel     |                  |
| Thread Size           | 1/4 - 20       |                  |
| Depth-of-Thread       | 1/2"           |                  |
| Parameters            | Thread Milling | Standard Tapping |
| SFM                   | 150            | 50               |
| IPM                   | 16.04          | 38.20            |
| Time-in-Cut (seconds) | .100           | .218             |

Thread milling is generating a very small circumference at a high feed rate.

Example: Circumference = .050"      Feed Rate = 16.04 IPM

## TAPPING VS THREAD MILLING

| Machining Comparison  | Thread Mill | Traditional Tap |
|---|-------------|-----------------|
| Broken Tooling Easy to Remove   | +           | -               |
| Free Cutting  | +           | -               |
| Consistent Results  | +           | -               |
| Easy to thread difficult materials:<br>Inconel, Stainless, Titanium, etc. | +           | -               |
| Special Programming   | -           | +               |

## APPLICATION RECOMMENDATIONS

Thread milling tools form a thread using a motion referred to as helical interpolation. This process involves the movement of all three axes on the machine simultaneously. The X and Y axes move in a circular motion and the Z in an axial direction per 360 degrees at a distance equal to the pitch of the thread being machined.

Shown in Figure 1, the programmed tool path starts from the bottom (Point A) and moves toward the top (Point B). A right-hand thread will be climb cut using this process.

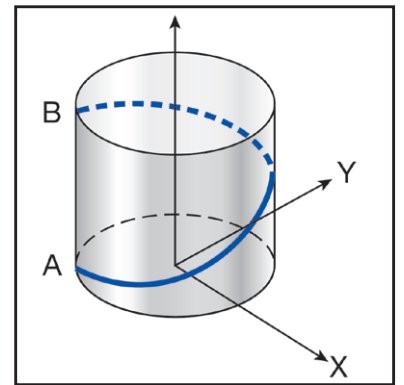
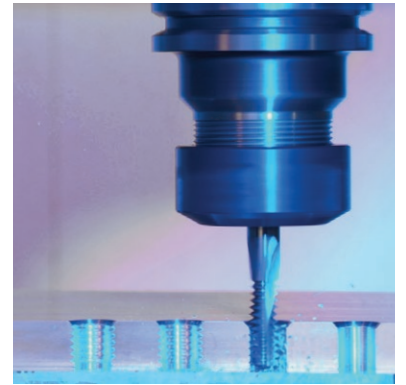
Note: When machining a right-hand thread you will be machining from bottom-to-top for climb cutting. If machining a left-hand thread you will start from top-to-bottom with a right-hand helix tool.

Left-hand threads can be climb cut with a left-hand helix tool starting from the bottom-to-top.

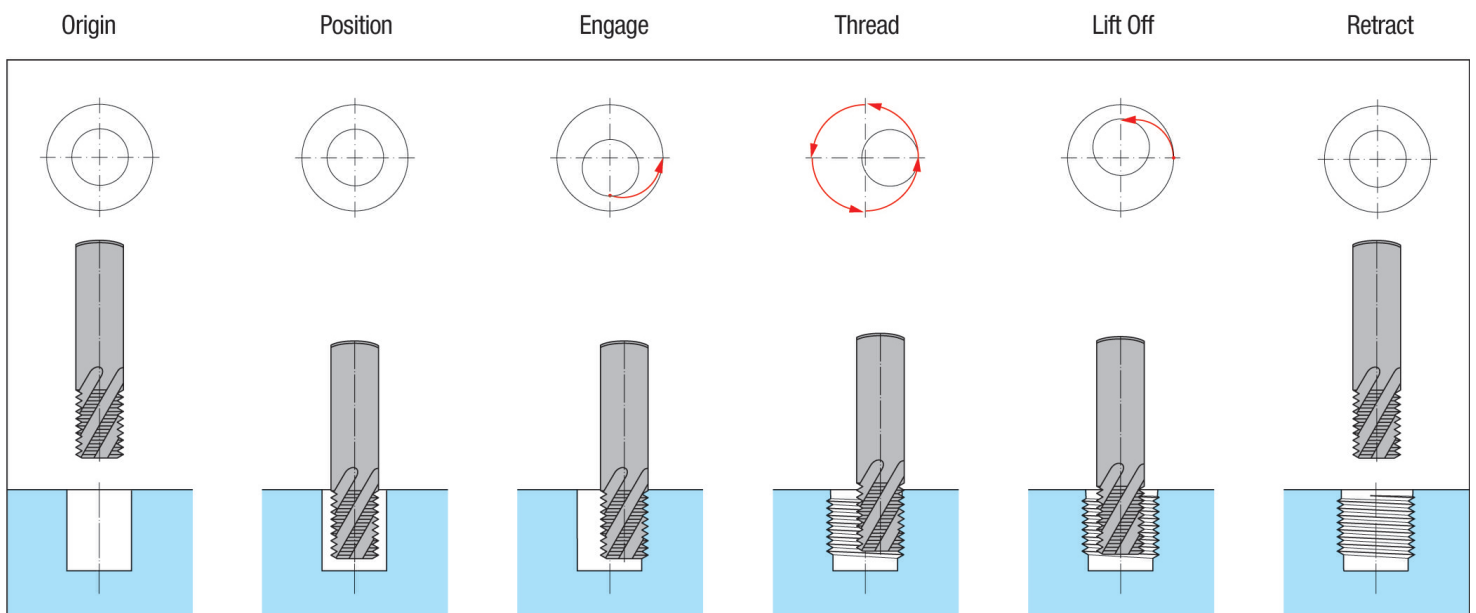
- Climb milling is the preferred method
- Start from the bottom of the hole to avoid re-cutting any chips
- Offset tool from center of the hole to allow a smooth start into the thread
- For difficult materials it may be necessary to make multiple passes

## EXTENDED TOOL LIFE ON THREADMILLS

- Run-out on Threadmill in holder should not exceed .00015"
- Shrinkfit best method to hold cutter
- Arc in at 180 degrees on holes smaller than .375
- Initially use two passes to achieve correct gauge thread then try one pass



## TOOL PATH DURING THREADMILLING





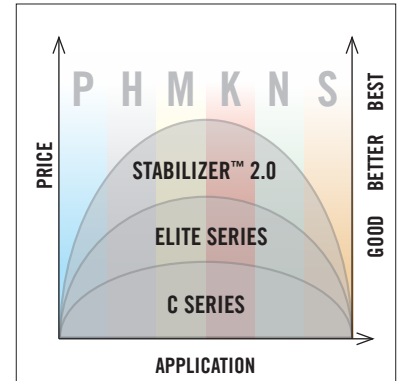
We can help you to increase your productivity, enhance your performance and reduce your costs with the range of products we offer that cover the full spectrum of application and performance requirements. Although every situation is different, we can make some general suggestions on tool selection, per material and machining application. You will need to assess every opportunity and decide which tool is the best fit for your requirements.

## PROVIDING SOLUTIONS FOR ANY APPLICATION

Stabilizer™ series tools provide high performance in the general machining category. These tools should be applied where performance is critical. The Stabilizer family offers high performance and versatility in a variety of materials and operations. The 4 flute Stabilizer 2.0 is available in square, ball and radius ends and an AlTiN coating. The 5 flute Stabilizer is available in square and radius ends with AlCrN coated inch tools and AlTiN coated metric tools.

Elite series tools are a high performance solution for material specific machining applications where performance is important. These tools come with and AlTiN coatings as standard and are available in multiple geometries and number of flutes to provide process optimization in various materials.

Niagara C series should be applied in basic general machining environments. These tools are offered in uncoated or TiAlN coated as standard. Square shoulder and ball end geometries with 2, 3 or 4 flute versions are available.



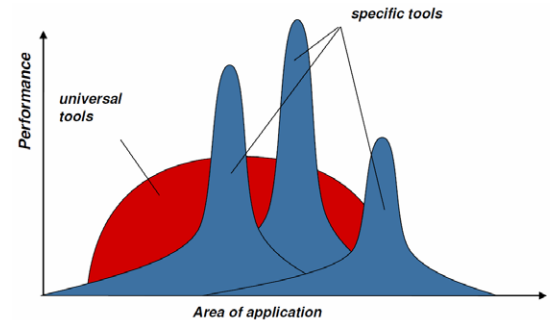
## RECOMMENDED TOOLING

| ISO GROUP | SELECTION  | SLOTTING       |            | PROFILING      |              | COPY MILLING   |             |
|-----------|------------|----------------|------------|----------------|--------------|----------------|-------------|
|           |            | PRODUCT FAMILY | RANGE      | PRODUCT FAMILY | RANGE        | PRODUCT FAMILY | RANGE       |
| P         | 1ST CHOICE | STR430.2       | 1/8 - 1"   | ST540          | 1/8 - 1"     | STB430.2       | 1/8 - 1"    |
|           | 2ND CHOICE | ST540          | 1/8 - 1"   | S638           | 1/8 - 1"     | CB230          | 1/64 - 1"   |
| M         | 1ST CHOICE | STR440.2       | 1/8 - 1"   | S638           | 1/8 - 1"     | STB440.2       | 1/8 - 1"    |
|           | 2ND CHOICE | STR430.2       | 1/8 - 1"   | S738/S938      | 1/4 - 1"     | SB335          | 1/8 - 1"    |
| K         | 1ST CHOICE | STR430.2       | 1/8 - 1"   | S638           | 1/8 - 1"     | STB430.2       | 1/8 - 1"    |
|           | 2ND CHOICE | ST540          | 1/8 - 1"   | S545           | 1/8 - 1 1/4" | CB230          | 1/64 - 1"   |
| N         | 1ST CHOICE | AN340          | 3/16 - 1"  | A345           | 1/8 - 1"     | AB245          | 1/4 - 1"    |
|           | 2ND CHOICE | A245           | 1/8 - 1"   | A345R          | 1/8 - 1"     | CB230          | 1/64 - 1"   |
| S         | 1ST CHOICE | STR440.2       | 1/8 - 1"   | S638           | 1/8 - 1"     | STB440.2       | 1/8 - 1"    |
|           | 2ND CHOICE | STR430.2       | 1/8 - 1"   | S738/S938      | 1/4 - 1"     | MB215          | 1/16 - 1/2" |
| H         | 1ST CHOICE | MZN410R        | 1/8 - 5/8" | MZ645/MZ645R   | 1/8 - 1/2"   | MBZ215         | 1/16 - 1/2" |
|           | 2ND CHOICE | STR440.2       | 1/8 - 1"   | S738/S938      | 1/4 - 1"     | MB215          | 1/16 - 1/2" |

## HIGH PERFORMANCE VS. GENERAL PURPOSE

Both High Performance and General Purpose tools use the highest quality carbide substrate and coatings. The difference between the two categories lies in their geometries.

High performance tools are designed to run exceptionally well in specific applications. General purpose tools are designed with versatility in mind, and run well over a wide application area.



## TOOL MATERIAL TYPES

### COBALT (HSCO)

- Low Cost
- Tough
- Shock Absorbing
- Versatile
- Greater heat and wear resistance than HSS

### SOLID CARBIDE

- Hardest material
- Most wear resistant
- Most brittle
- Most cost (above 1/2")
- Longest life
- High productivity
- Higher SFPM

### POWDER METAL (ASP2030)

- Finer grain size as compared to HSCO yielding increased toughness, superior wear resistance, and more shock resistance
- Great for High Temp Alloys (Inconel, Waspalloy)
- Higher cost than HSS or HSCO

## FACTORS IN CHOOSING THE CORRECT TOOL MATERIAL

- Age, type, strength, condition, hp of machine
- Rigidity of the machine and fixturing
- Spindle speed available
- Manual or power feed
- Workpiece material and condition
- Number of pcs to be produced
- Material removal rate required

## WHAT DO COATINGS DO?

In short, coatings increase tool life. They provide a thermal barrier between the cutting edge & the workpiece. Coatings increase the hardness on the surface of the tool. Coatings also increase lubricity for better chip flow and evacuation, causing less heat. They minimize built-up edge, improving surface finish, and reduce abrasive wear.

## PVD COATINGS

### TiCN - TITANIUM CARBONITRIDE

Incorporation of Carbon into the TiN matrix to increase hardness and abrasion resistance. TiCN is an alternative to TiN for HSS and HSCO applications where additional wear resistance is required. Primary Solid Carbide applications are milling aluminum alloys & cast iron.

### TiAlN - TITANIUM ALUMINUM NITRIDE

TiAlN offers a higher level of thermal stability above TiN and TiCN with abrasion resistance. Ideal for high heat applications found in milling steels, stainless steels and high temp alloys with a hardness 52 Rc and below.

### AlTiN - ALUMINUM TITANIUM NITRIDE

Increased thermal stability when milling high temp alloys and Die/Mold steels with a hardness 52 Rc and above. Excellent for HSM applications, Titanium, and Stainless Steels. HSS/HSCO end mills can't be coated with AlTiN.

### AlCrN - ALUMINUM CHROMIUM NITRIDE

Excellent wear resistance under conventional and extreme conditions when milling Die/Mold steels with a hardness 52 Rc and below. Excellent choice for tool steel, alloy steel, and stainless steel applications.

## CVD COATINGS

### DIAMONDPLUS

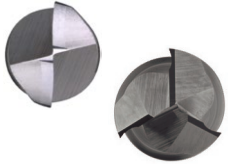
DiamondPlus coatings are made of multiple layers of uniquely structured nano-crystalline diamonds. The 100% ultra fine-grain diamond throughout the coating results in a tool that resists abrasive & adhesive wear and stands up to mechanical shock. The hard, smooth surface provides the best part finish with no built up edges. Primary applications are composite materials, high silicon aluminum, and graphite. When milling graphite, tool life 12-20 times longer than uncoated tungsten carbide is typical.

Do not use DiamondPlus on steels. The high heat generated from milling steels causes the carbon from the diamond to diffuse into the iron, causing chemical wear. Regrinding a DiamondPlus endmill is not recommended. Standard C430's or similar cannot be coated with DiamondPlus.

FLUTE NUMBERS

2 & 3 FLUTE

- For slotting
- Maximum chip evacuation
- Preferred for softer materials



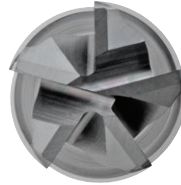
4 FLUTE

- For slotting and profiling
- Transitional tool between 3 flute and Multi Flute



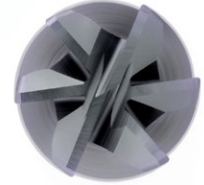
5 FLUTE

- For profiling
- More teeth in cut for greater stability



6 FLUTE

- Profiling in hard milling
- Reduced chip loads
- Larger core diameter for greatest rigidity



END MILL CORNER DESIGN

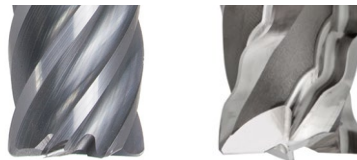
SQUARE

Designed for general machining at a true square angle.



CORNER RADIUS / CORNER CHAMFER

For general machining. Creates corner protection for increased tool life. Good in roughing operations.



BALL NOSE

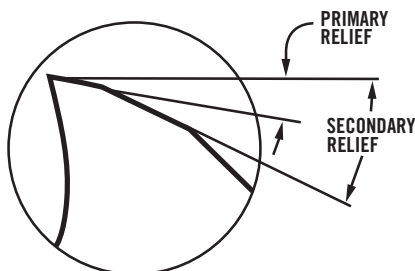
Designed for molds and dies, especially finishing 3d parts. There is zero cutting speed at center.



RADIAL RELIEF

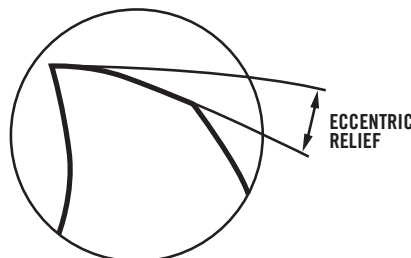
STANDARD

The most common type of radial relief. Regrind primary relief to sharpen cutting edge (caution: radial rake can be affected).



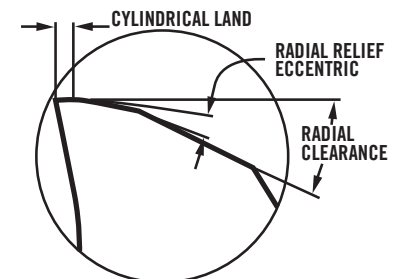
ECCENTRIC

Stronger cutting edge than standard relief. Easier to regrind (face regrind). Constant relief angle.



CYLINDRICAL LAND

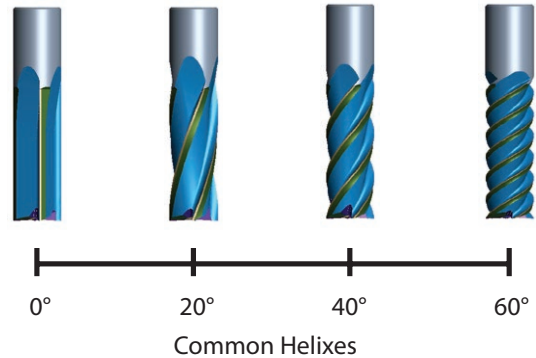
Balances the cutting edge in the cut. Best in aluminum applications. Reduced chatter and vibration. Eccentric relief strengthens the tooth.



## HELIX ANGLES

The helix angle is the angle of the cutting edge in relationship to the centerline. It affects the following:

- Cutting forces or shearing of the material
- Chip evacuation
- Surface finish



## KNUCKLE PITCH

### FINE PITCH



- Moderate chip loads
- Wide range of materials

#### APPLICATION AREAS

Ductile Cast Irons, Alloy Steels, Stainless Steels, Cobalt Alloys, Magnesium Alloys, Nickel Alloys, Titanium Alloys, Super Alloys

### COARSE PITCH



- Higher chip loads
- General purpose

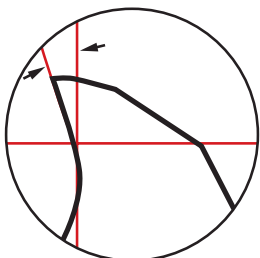
#### APPLICATION AREAS

Plastics, Wood, Aluminum Alloys, Copper Alloys, Lead, Tin, Zinc, Carbon Steel, Gray Cast Iron

## RAKE ANGLE

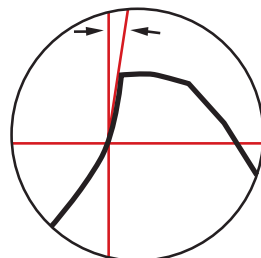
### POSITIVE RAKE ANGLE

Allows for freer machining and reduced cutting pressure. It is effective in softer and ferrous materials such as steels and stainless steels.

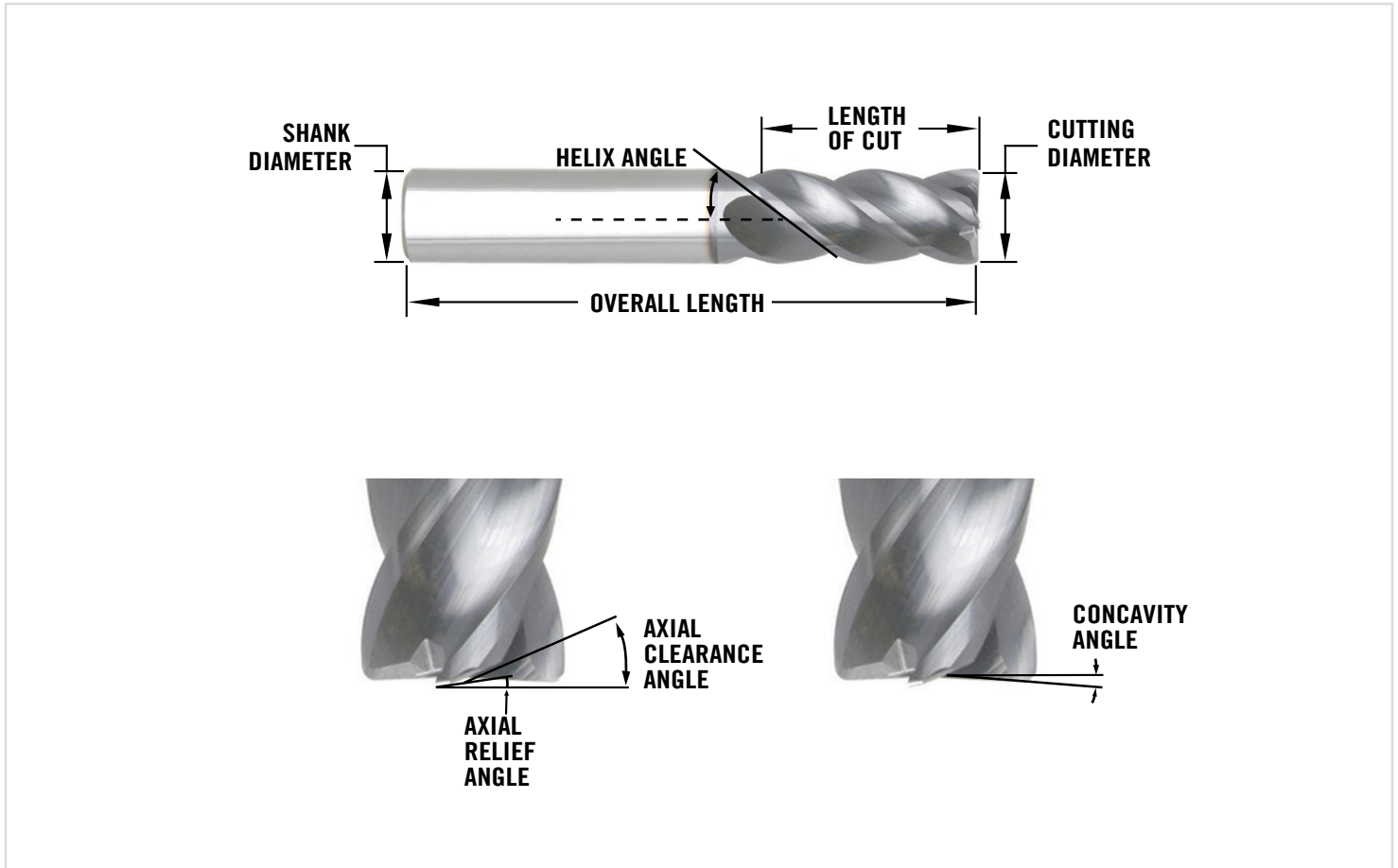


### NEGATIVE RAKE ANGLE

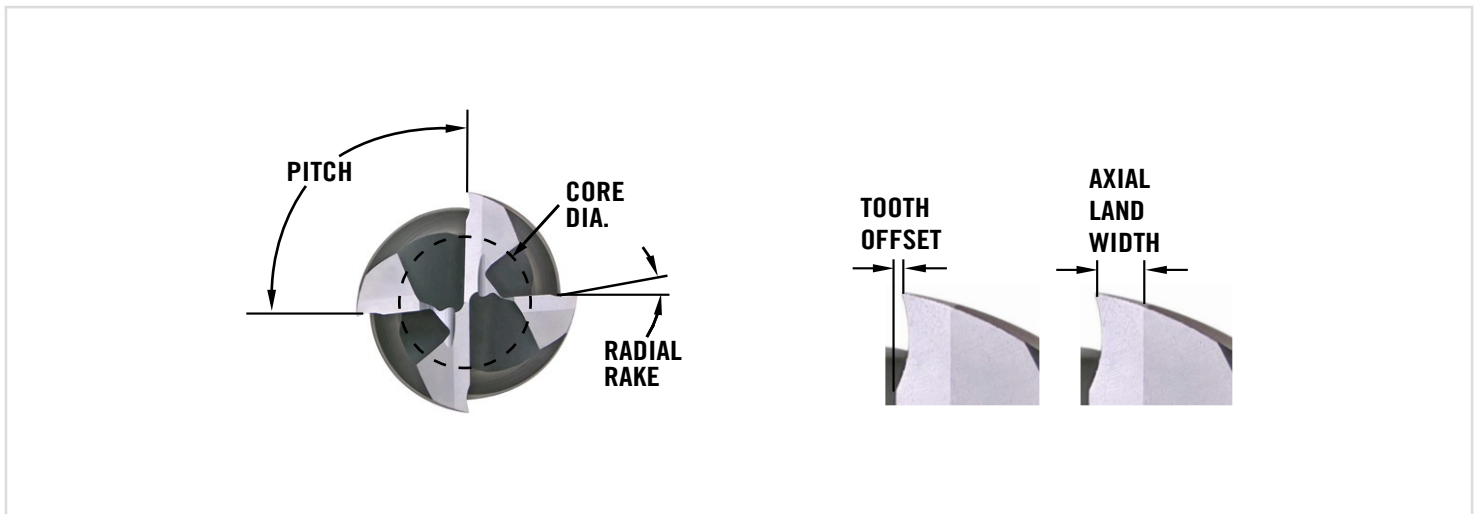
Creates stronger cutting edges optimal for harder to machine materials such as tool steels and hardened steels.



SIDE VIEW



END VIEW

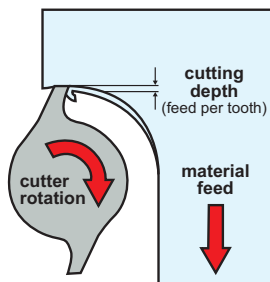


## CLIMB MILLING VS. CONVENTIONAL MILLING

### CLIMB MILLING (1ST CHOICE)

The tooth meets the work at the top of the cut, producing the thickest part of the chip first.

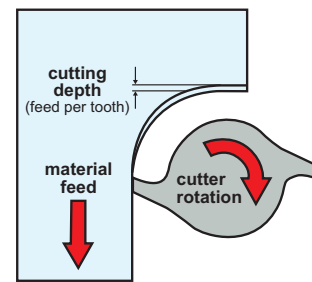
- Efficient cutting
- Long and reliable tool life
- Better surface finish, especially with stainless steels, aluminum or titanium alloys
- Risk tool breakage due to sudden machining backlash if the machine lacks rigidity



### CONVENTIONAL MILLING

The width of the chip starts at zero and increases to a maximum at the end of the cut.

- Use only when the machine tool lacks rigidity or works loosely (old milling machine, low quality machine, worn machine)
- Tendency to push the workpiece away
- Tool edge slides instead of cutting, causing high friction between tool flank face and material



## MILLING CONSIDERATIONS IN STEEL, ALUMINUM, AND STAINLESS STEEL

### STEEL

- Material grade
- Material hardness
- Rigidity is a must (machine, fixturing)
- Chip formation
- Chip evacuation
- Tool overhang must be kept to a minimum

### ALUMINUM

- Chatter
- Minimizing aluminum sticking to the cutting edge
- Chip formation
- Chip evacuation (controlling large amount of chips)
- Tool Rigidity / core strength

### STAINLESS STEEL

- Rigidity is a must (machine, fixturing)
- Tool overhang must be kept to a minimum
- Use flood coolant
- Use sufficient cutting depth so not to work harden the part (avoid rubbing and dwelling)
- Use a tool with a corner radius whenever possible (corner strength)
- Higher chip loads per tooth can be used with end mills that have a corner radius
- Surface finish is improved with a corner radius (larger radius the better the finish)



Good aluminum chips.



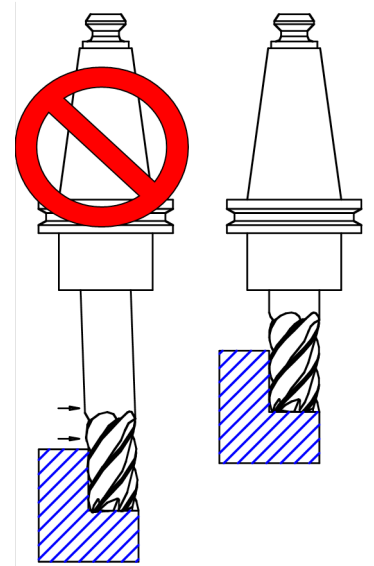
Caution!

**Work Hardening:** The remaining milled surface becomes harder, changing the cutting conditions. This occurs when the radial depth of cut is not sufficient and there is a rubbing action at the cutting interface. Work hardening results in increased cutting forces and increased heat.

## TOOL OVERHANG AND RUN-OUT

Tool Overhang is the distance that the tool extends from the end of toolholder (diameter to length ratio). Cutting forces, which push the tool away from the cut, cause tool deflection when tool overhang is excessive. The rule of thumb is to keep the maximum overhang 8:1 for length of cut and 12:1 for overall length.

Keeping tool overhang to a minimum can lead to the following benefits: increased tool life, reduced chatter and vibration, improved part finish, increased speed and feed, and increased productivity.



## DEFLECTION AND RELATIVE RIGIDITY (CANTILEVER BEAM)

The table below shows the relative rigidity of an endmill based on the diameter and tool overhang\*. In this case the basis is 1/4" x 1". From the table below, a 1/2" x 1" end mill is 16 times more rigid than a 1/4" x 1" end mill.

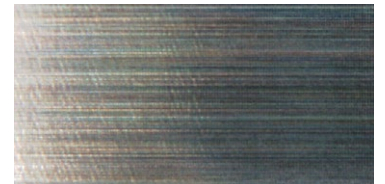
### Quick Tips:

A 20% reduction of length reduces deflection by 50%.

A 20% increase in tool diameter reduces deflection by 50%.

Optimal tool life can only be achieved if run-out is less than 0.0004".

| DIAMETER | OVERHANG | RELATIVE RIGIDITY |
|----------|----------|-------------------|
| 1/4"     | 1"       | 1X                |
| 1/2"     | 1"       | 16X               |
| 1/2"     | 2"       | 2X                |
| 1/2"     | 4"       | .26X              |
| 3/4"     | 1"       | 81X               |
| 3/4"     | 2"       | 10X               |
| 3/4"     | 4"       | 1.3X              |
| 1"       | 1"       | 260X              |
| 1"       | 2"       | 34X               |
| 1"       | 4"       | 4X                |



Smooth surface - rigid setup.



Chatter - unstable setup.

## WELDON TOOLHOLDERS - RECOMMENDED SET SCREW TIGHTENING TORQUE

| HOLDER HOLE SIZE | SET SCREW SIZE | MAX FOOT POUNDS |
|------------------|----------------|-----------------|
| 3/16"            | 1/4" - 20      | 6.5             |
| 3/8"             | 3/8" - 16      | 16.7            |
| 1/2"             | 7/16" - 14     | 25              |
| 5/8"             | 9/16" - 12     | 37.5            |
| 3/4"             | 5/8" - 11      | 76.7            |
| 7/8"             | 5/8" - 11      | 76.7            |
| 1"               | 3/4" - 10      | 125             |
| 1 1/4"           | 3/4" - 10      | 125             |
| 2"               | 1" - 14        | 300             |
| 2 1/2"           | 1" - 14        | 300             |







# TROUBLESHOOTING GUIDE

| PROBLEM / CAUSE                            | SOLUTION  |
|--|---|
| <b>TOOL BREAKAGE</b>                       |   |
| Feed rate excessive                        | Reduce feed rate  |
| Depth of cut excessive                     | Decrease width and depth of cut   |
| Overhang of tool is too much               | Hold shank deeper, use shorter end mill   |
| Wear is too much                           | Regrind at earlier stage  |
| <b>EXCESSIVE WEAR</b>                      |   |
| Speed is too fast                          | Decrease spindle speed, use better coolant  |
| Hard work material                         | Use the right coating   |
| Improper speed and feed (usually too slow) | Increase feed and speed   |
| Improper helix angle                       | Change tool to correct helix angle  |
| Primary relief angle is too large          | Change to smaller relief angle  |
| Recutting chips                            | Change feed and speed / Use more coolant or high pressure coolant/air                 |
| <b>REDUCED TOOL LIFE</b>                   |   |
| Cutting friction is excessive              | Regrind at earlier stage  |
| Hard work material                         | Use an appropriate coolant  |
| Improper helix and relief angle            | Change to correct helix angle and primary relief                                      |
| <b>CHIPPED CUTTING EDGES</b>               |   |
| Feed rate excessive                        | Reduce feed rate  |
| Feed too heavy on first cut                | Reduce feed rate on first cut   |
| Lack of rigidity (machine & holder)        | Use better machine or tool holder or change parameters                                |
| Lack of rigidity (tool)                    | Use shorter tool, hold shank deeper, try climb milling                                |
| Tool cutting corner too sharp              | Decrease primary relief and cutting angle, reduce radial width-of-cut                 |
| Single chipped cutting edge                | Reduce run-out to less than .0004"  |
| <b>CHIP PACKING</b>                        |   |
| Cut too heavy                              | Decrease width and depth of cut   |
| Not enough chip clearance                  | Use end mill with fewer flutes  |
| Not enough coolant                         | Use higher coolant pressure and reposition nozzle to point of cut or use air pressure |

| PROBLEM / CAUSE                             | SOLUTION   |
|---|--|
| <b>WORK PIECE BURRS</b>                     |  |
| Wear on primary relief is too much          | Regrind at earlier stage   |
| Incorrect feed and speed rates              | Correct cutting parameters   |
| Improper helix angle                        | Change to correct cutting angle                                      |
| <b>ROUGH SURFACE FINISH</b>                 |  |
| Feed rate too high                          | Reduce feed rate   |
| Cutting speed too slow                      | Increase RPM   |
| Wear is excessive                           | Regrind at earlier stage   |
| Recutting chips                             | Change feed and speed. Use more coolant or high pressure coolant/air |
| <b>SQUEAL AND CHATTERING</b>                |  |
| Feed and speed too fast                     | Correct cutting parameters   |
| Lack of rigidity (machine & holder)         | Use better machine or tool holder or change parameters               |
| Poor set up                                 | Improve clamping rigidity  |
| Cut is too heavy                            | Decrease width and depth of cut                                      |
| Overhang of tool excessive                  | Hold shank deeper, use shorter end mill                              |
| Lack of relief                              | Decrease relief angle  |
| <b>SIDE WALL TAPER IN WORKPIECE</b>         |  |
| Feed rate too heavy                         | Reduce feed rate   |
| Overhang of tool excessive                  | Hold shank deeper, use shorter end mill                              |
| Too few flutes                              | Use multiflute end mill, use end mill with higher rigidity           |
| <b>NO DIMENSIONAL ACCURACY</b>              |  |
| Cut is too heavy                            | Decrease width and depth of cut                                      |
| Lack of accuracy (machine & holder)         | Repair machine or holder   |
| Rigidity is insufficient (machine & holder) | Change machine or tool holder or change parameters                   |
| Too few flutes                              | Use multiflute end mill, use end mill with higher rigidity           |

## WHEN IS IT TIME TO CHANGE A TOOL?

- When the part's surface finish is no longer acceptable
- When accuracy is no longer achievable and constant offset adjustment is required
- When Burrs start to appear on the work piece that were not there before
- When chips change to a blue, purple, black color
- When unusual noises start (increased vibration)
- When the spindle load reaches an unacceptable level (power consumption)
- When a pre-determined number of parts has been reached
- When the wear land reaches a certain level for the diameter and type of end mill (reference only, see right)

| CUTTING DIAMETER | FINISHING END MILL | ROUGHING END MILL |
|------------------|--------------------|-------------------|
| 1/8" - 3/8"      | UP TO 0.004"       | 0.004" - 0.006"   |
| 3/8" - 3/4"      | UP TO 0.006"       | 0.006" - 0.010"   |
| 3/4" - 1"        | UP TO 0.008"       | 0.010" - 0.012"   |
| 1" - 1 1/4"      | UP TO 0.010"       | 0.012" - 0.016"   |

Surface speed, surface footage, surface area are directly related. Cutting speed is the peripheral speed (velocity) at the outside edge of an endmill (surface speed). The faster the spindle speed the higher the SFM. SFM is the distance in feet that the cutting edge travels in one minute. IPM and IPT (The rate at which the cutting tool is advanced into the workpiece). Feed per tooth is the thickness of chip that each cutting edge removes in one pass.

**RPM**

$$n = \frac{v_c \cdot 12}{\pi \cdot D_c} \text{ or } \frac{v_c \cdot 3.82}{D_c} \quad (\text{rev/min})$$

**CUTTING SPEED**

$$v_c = \frac{n \cdot \pi \cdot D_c}{12} \text{ or } \frac{n \cdot D_c}{3.82} \quad (\text{sf/min})$$

**FEED SPEED**

$$v_f = n \cdot Z_n \cdot f_z \quad (\text{inch/min})$$

$$v_f = n \cdot Z_c \cdot f_z$$

**FEED PER REVOLUTION**

$$f = Z_n \cdot f_z \quad (\text{inch/rev})$$

$$f = Z_c \cdot f_z$$

**METAL REMOVAL RATE**

$$Q = a_e \cdot a_p \cdot v_f \quad (\text{inch}^3/\text{min})$$

**CUTTING SPEED AND RPM FOR COPYING**

$$v_c = \frac{n \cdot \pi \cdot D_w}{12} \text{ or } \frac{n \cdot D_w}{3.82} \quad (\text{sf/min})$$

$$n = \frac{v_c \cdot 12}{\pi \cdot D_w} \text{ or } \frac{v_c \cdot 3.82}{D_w} \quad (\text{RPM})$$

$$D_w = 2 \cdot \sqrt{a_p (D_c - a_p)} \quad (\text{inch})$$

**CALCULATION OF  $a_p$  VS. OVERHANG LENGTH:**

If the overhang length (XS) is longer than  $4 \times D_c$  and Cylindrical shanks are used it is important to adopt another depth of cut ( $a_p$ ) value than that indicated in the table. Use the following formula to calculate the new  $a_p$  value

$$a_p = a_p \cdot (4 \cdot D_c / xs) 2$$

**PROFILE HEIGHT**

$$H = \frac{D_c}{2} - \sqrt{\frac{D_c^2 - a_e^2}{2}}$$

$$D_w = 2 \cdot \sqrt{a_p (D_c - a_p)}$$

**Profile height H (um)**

| D <sub>c</sub> | Pitch a <sub>p</sub> (μm) |      |      |      |       |       |       |
|----------------|---------------------------|------|------|------|-------|-------|-------|
|                | 0.06                      | 0.08 | 0.11 | 0.15 | 0.20  | 0.30  | 0.45  |
| 1              | 0.90                      | 1.60 | 3.00 | 5.70 | 10.00 | 23.00 | 53.00 |
| 2              | 0.45                      | 0.80 | 1.50 | 2.80 | 5.00  | 11.00 | 26.00 |
| 4              | 0.23                      | 0.40 | 0.76 | 1.40 | 2.50  | 5.60  | 13.00 |
| 6              | 0.15                      | 0.27 | 0.50 | 0.94 | 1.70  | 3.80  | 8.40  |
| 8              | 0.11                      | 0.20 | 0.38 | 0.70 | 1.30  | 2.80  | 6.30  |
| 10             | 0.09                      | 0.16 | 0.30 | 0.56 | 1.00  | 2.30  | 5.10  |
| 12             | 0.08                      | 0.13 | 0.25 | 0.47 | 0.83  | 1.90  | 4.20  |

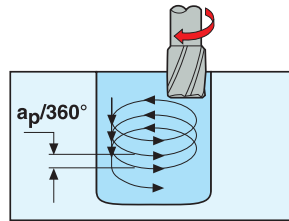
- a<sub>p</sub> = Depth of cut mm/axial depth of cut (in)
- a<sub>e</sub> = Width of cut mm/radial depth of cut (in)
- D<sub>c</sub> = Cutter diameter
- f = Feed per revolution (in/rev)
- f<sub>z</sub> = Feed per tooth (in/tooth)
- z<sub>n</sub> = No. of teeth
- n = RPM (rev/min)
- Q = Material removal rate (in<sup>3</sup>/min)
- v<sub>c</sub> = Cutting speed (sf/min)
- v<sub>f</sub> = Feed speed (in/min)
- D<sub>w</sub> = Working diameter

## HELICAL INTERPOLATION

The table below shows the minimum hole diameter that should be made per the diameter of the end mill being used.

### RECOMMENDED DIAMETER OF HOLE FOR HELICAL INTERPOLATION RAMPING

| DIAMETER OF END MILL $D_c$ | DIAMETER OF HOLE  |
|----------------------------|-------------------|
| 1/32 - 3/32                | $1.4 \times D_c$  |
| 1/8 - 1/4                  | $1.3 \times D_c$  |
| 3/8 - 1/2                  | $1.2 \times D_c$  |
| 5/8 - 1 1/4                | $1.15 \times D_c$ |

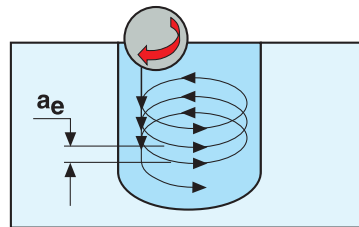


## TROCHOIDAL METHOD

The figure below shows a method often called the trochoidal method for milling slots.

### RECOMMENDED WIDTH OF SLOT

| DIAMETER OF END MILL $D_c$ | SLOT WIDTH       |
|----------------------------|------------------|
| 1/32 - 3/32                | $1.8 \times D_c$ |
| 1/8 - 1/4                  | $1.6 \times D_c$ |
| 3/8 - 1/2                  | $1.4 \times D_c$ |
| 5/8 - 1 1/4                | $1.2 \times D_c$ |



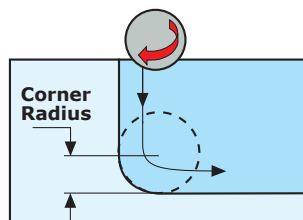
## CORNER CONTACT

Generate component corners to optimize tool life.

- Use maximum diameter of cutting tool, but have maximum difference between the radius of the tool and the radius in the corner of the component.
- In a corner the contact arc of the tool increases rapidly according to the difference in radius between the tool and the component. This results in more forces on the tool, resulting in deflection and increased temperature in the corner, which means a reduction in tool life.

### RECOMMENDATIONS

| END MILL DIAMETER | MINIMUM CORNER RADIUS |
|-------------------|-----------------------|
| 1/64 - 3/32       | $D_c / 2 \times 1.4$  |
| 1/8 - 1/4         | $D_c / 2 \times 1.3$  |
| 3/8 - 1/2         | $D_c / 2 \times 1.2$  |
| 5/8 - 1 1/4       | $D_c / 2 \times 1.15$ |



Ex: 1/4 tool, minimum corner radius to be generated is .1625.

## SOLID CARBIDE END MILLS

| END MILL STYLE  | NUMBER OF FLUTES | NIAGARA CUT DIAMETER TOLERANCE                    | CORRESPONDING LIST NUMBERS   |
|---|------------------|---|--|
| SINGLE-END<br>DOUBLE-END<br>FINISHERS                       | ALL              | + .000 / - .002                                   | STS430.2, STR430.2, STB430.2, STRN430.2, STBN430.2, STS430M.2, STR430M.2, STB430M.2, STR440.2, STB440.2, STRN440.2, STBN440.2, STR440M.2, STB440M.2, STS540, STR540, STS540M, STSN540, STRN540, STRCS540, STR540M, A245, A245R, AB245, AN230, AN230R, AN335, AN335R, AN245, ANB245, AN340, A345, A345R, AN345, AN345R, A345M, S335, SB335, SN335, S545, S545R, S638, S638R, SB638, SBN638, SN638, SN638R, SCS638, SCS638R, S738, S738R, SCS738R, S938, S938R, SCS938R, S545M, S645M, SN200R, SN400R, SN500R C230, C230R, C330, C360, C430, C430R, CB230, CB330, CB430, C430M, CB430M, CD230, CD430, CSD230, CSD430, CSDB230, CSDB430 |
| SINGLE-END & DOUBLE-END<br>FINISHERS<br>(FLUTE DIA ≤ 7/64") | ALL              | + / - .0005                                       | C230, CB230, CSD230, CSDB230, C330, CB330, C430, CB430, CSD430, CSDB430, C430M, CB430M   |
| HIGH FEED<br>(FLUTE DIA < 1/8")                             | 2                | + / - .0005                                       | SN200R   |
| SINGLE-END<br>FINISHERS<br>NC TOLERANCE                     | 2 & 4            | + .001 / - .000                                   | CNC230, CNC430   |
| SINGLE-END<br>ROUGHERS                                      | 3, 4 & 5         | + .000 / - .003                                   | AR330, SR420, SR545, SR420M  |
| THREAD MILLS  | ALL              | + .000 / - .002                                   | NTM100UN, NTM120UN, NTM160UN, NTM200NPT, NTM300NPT, NTM400MI   |
| COMPOSITE<br>CUTTING TOOLS                                  | ALL              | + .000 / - .002                                   | DIARTREM, DIARTRBE, DIACC, DIAEPB, DIAPPB, DIABEB  |
| DIAMOND COATED<br>END MILLS                                 | 2 & 4            | + / - .001  | DIA230, DIA430, DIAB230, DIAB430, DIACR430, DIAL230, DIAL430, DIALB430, DIAXRB430, DIAXRR430, DIAXS430, DIA230M, DIAB230M, DIA430M   |
| MOLD AND DIE  | 6                | + .000 / - .002                                   | MZ645, MZ645R, MZN410R, MZN510R, MZN410RM, MZN510RM  |
| MOLD AND DIE<br>(FLUTE DIA < SHANK DIA)                     | 2                | + / - .0005                                       | MB215, MB215M, MBZ215, MBZ215M   |
| MOLD AND DIE<br>(FLUTE DIA = SHANK DIA)                     | 2                | + .000 / - .001                                   | MB215, MB215M, MBZ215, MBZ215M   |
| BALL-END  | ALL              | BALL RADIUS TOLERANCE: FLUTE<br>DIA TOLERANCE / 2 | ALL  |
| CORNER RADIUS   | ALL              | + / - .001  | ALL SERIES   |

| SHANK DIAMETER TOLERANCES | END MILL STYLE   | NIAGARA TOLERANCE |
|---------------------------|------------------|-------------------|
|                           | ALL INCH SHANK   | - .0001 / - .0004 |
|                           | ALL METRIC SHANK | H6                |
| LENGTH OF CUT TOLERANCES  | END MILL STYLE   | NIAGARA TOLERANCE |
|                           | ALL              | + .030 / - 0      |
| OVERALL LENGTH TOLERANCES | END MILL STYLE   | NIAGARA TOLERANCE |
|                           | ALL              | + / - .060        |

| TIR CONDITION | END MILL STYLE         | CUTTING DIAMETER | NIAGARA TOLERANCE |
|---------------|------------------------|------------------|-------------------|
|               |                        | .005 - .030      | .0001 MAX         |
|               | ALL EXCEPT<br>ROUGHERS | .031 - .060      | .0002 MAX         |
|               |                        | .061 - .111      | .0003 MAX         |
|               |                        | .112 AND ABOVE   | .0005 MAX         |
|               | ROUGHERS               | ALL              | .0010 MAX         |

| BACK TAPER | END MILL STYLE | NIAGARA TOLERANCE   |
|------------|----------------|---|
|            | ALL            | .0005 MAX BACK TAPER PER INCH PERMISSIBLE.<br>NOT TO EXCEED THE CUTTING DIAMETER TOLERANCE. |

NOTE: ALL DIMENSIONS IN INCH UNLESS OTHERWISE NOTED

## COBALT END MILLS

| END MILL STYLE                               | NUMBER OF FLUTES | TYPE OR RANGE                           | ANSI* TOLERANCE   | NIAGARA CUT DIAMETER TOLERANCE                   | CORRESPONDING LIST NUMBERS  |
|--|------------------|---|-------------------|--|---|
| SINGLE-END FINISHERS                         | 2, 4, & 6        | ALL SIZES                               | + .003 / - .000   | + .001 / - .000                                  | SP205 , SPC408, SPB540  |
| MULTI FLUTE COARSE & FINE PITCH ROUGHERS     | 4, 5, 6, & 8     | 1" FLUTE & UNDER<br>1-1/8" FLUTE & OVER | + .025 / - .005   | + .003 / - .000<br>+ .006 / - .000               | EXR350 , RMB700 , RMB449 , REM710 , REC700 ,<br>RXC753, REM445 , REC448                                 |
| ALL 3 FLUTE COARSE & FINE PITCH ROUGHERS     | 3                | ALL SIZES                               | + .025 / - .005   | + .005 / - .000                                  | RTM713, RHC752, RHLC754, RTM447   |
| TRUNCATED ROUGHER/FINISHERS AND CHIPBREAKERS | 4, 5, 6, & 8     | ALL SIZES                               | NO SPECIFICATIONS | + .001 / - .000                                  | RFM440 , RFM441 , RFCB444   |
| METRIC FINISHERS WITH INCH SHANK             | 4                | ALL SIZES                               | NO SPECIFICATIONS | + .001 / - .000                                  | SMM845  |
| VFP  | 4 & 6            | ALL SIZES                               | NO SPECIFICATIONS | + .002 / - .000                                  | VFP435, VFP635, VFP <sup>2</sup> 435, VFP <sup>2</sup> 635, VFP435SB,<br>VFP635SB, VFP435SBR, VFP635SBR |
| BALL-END                                     | ALL              | ALL SIZES                               | NO SPECIFICATIONS | BALL RADIUS TOLERANCES: FLUTE DIA TOLERANCES / 2 |   |

| SHANK DIAMETER TOLERANCES | END MILL STYLE   | OTHER SPECIFICATION               | ANSI* TOLERANCE   | NIAGARA TOLERANCE |
|---------------------------|------------------|-----------------------------------|-------------------|-------------------|
|                           | ALL INCH SHANK   |                                   | - .0001 / - .0005 | - .0001 / - .0005 |
|                           | ALL METRIC SHANK | SPECIFICATION PER DIN 1835 FORM B | NO SPECIFICATION  | DIN (H6)MM        |

| LENGTH OF CUT TOLERANCES | END MILL STYLE           | OTHER SPECIFICATION       | ANSI* TOLERANCE  | NIAGARA TOLERANCE |
|--------------------------|--------------------------|---------------------------|------------------|-------------------|
|                          | ALL EXCLUDING HEAVY DUTY |                           | + .031 / - .031  | + .031 / - .000   |
|                          | HEAVY DUTY               |                           | + .062 / - .062  | + .062 / - .000   |
|                          | ALL METRIC SHANK         | SPECIFICATION PER DIN ANS | NO SPECIFICATION | + 0.7MM / - 0     |

| OVERALL LENGTH TOLERANCES | END MILL STYLE                     | OTHER SPECIFICATION       | ANSI* TOLERANCE  | NIAGARA TOLERANCE |
|---------------------------|------------------------------------|---------------------------|------------------|-------------------|
|                           | ALL EXCEPT HEAVY DUTY 3" DIA FLUTE |                           | + .062 / - .062  | + .062 / - .000   |
|                           | 3" DIA HEAVY DUTY                  |                           | + .125 / - .125  | + .125 / - .000   |
|                           | ALL METRIC SHANK                   | SPECIFICATION PER DIN ANS | NO SPECIFICATION | + 0.7MM / - 0     |

| TIR CONDITION | END MILL STYLE      | CUTTING DIAMETER | NIAGARA TOLERANCE |
|---------------|---------------------|------------------|-------------------|
|               | ALL EXCEPT ROUGHERS | ALL SIZES        | .0010 MAX         |
|               |                     | LESS THAN .750   | .0010 MAX         |
|               | ROUGHERS            | .750 - 1.249     | .0020 MAX         |
|               |                     | 1.250 AND ABOVE  | .0030 MAX         |

| BACK TAPER | END MILL STYLE | NIAGARA TOLERANCE  |
|------------|----------------|--|
|            | ALL            | .0005 MAX BACK TAPER PER INCH PERMISSIBLE. NOT TO EXCEED THE CUTTING DIAMETER TOLERANCE. |

\*TAKEN FROM TABLE 77 OF THE USA STANDARDS FOR MILLING CUTTERS AND END MILLS, ANSI B94.19-1985 PUBLISHED BY THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

NOTE: ALL DIMENSIONS IN INCH UNLESS OTHERWISE NOTED.

**MECHANICAL/PHYSICAL HAZARD**

Cutting tools and holders may fragment in use. Metal chips can be very hot with sharp edges and should not be moved by hand. Chips can cause burns to the skin and damage to the eyes.

Make sure the insert and component are correctly secured in their holder before use, to prevent them coming loose during the process operation. Too much overhang can result in vibration and lead to tool damage/breakage.

Always wear appropriate safety equipment at all times and ensure all machine guards and safety interlocks are in place prior and during the operation. **DO NOT USE** any tool or product that shows signs of damage. Return the product to the appropriate location for repair, replacement or recycling.

Use all appropriate safety guards or machine encapsulations to securely collect particles such as chips or cutting elements that may spin off. Always use appropriate personal protective equipment.

**DUST AND MIST HAZARD**

Hardmetal products and tools should not be reground or sharpened without taking appropriate safety measures to contain dust and to prevent exposure to dust (e.g. ventilation and personal protection equipment). Operations such as grinding, cutting, burning and welding of hardmetal products may produce dust or fumes, which can be inhaled, swallowed or come in contact with the skin and eyes. Dust/mist may cause inflammation of the airways and irritate nose, throat, skin and eyes. Repeatedly inhaling high levels of hardmetal dust has been reported in publications to cause hardmetal disease (interstitial lung fibrosis). In a two-year study on rats and mice, inhalation of cobalt was shown to cause cancer.

**SENSITIZING HAZARD**

Uncoated hardmetal products may cause an allergic skin reaction as a result of prolonged skin contact with the product. Handle in a way that avoids direct skin contact or use gloves to minimize the risk of an allergic skin reaction when handling hardmetal products and tools. Cobalt and hardmetal are known sensitizers having potential to cause allergy through repeated exposure. A sensitized person could react with asthmatic symptoms or eczema.

Always review and understand the Safety Data Sheet or Safety Information Sheet for the product you are using, before using the product.

**PREVENTIVE MEASURES**

- Avoid formation and inhalation of dust. Use adequate local exhaust ventilation to keep personal exposure below the nationally allowed limits.
- If ventilation is not available or adequate, use nationally approved respirators for the purpose.
- Avoid skin contact. Wear suitable gloves. Wash skin thoroughly after handling.
- Use suitable protective clothing. Launder clothing as needed.
- Do not eat, drink, or smoke in the working area. Wash skin thoroughly before eating, drinking or smoking.
- Use safety goggles or glasses with side shields when necessary.
- Always wear appropriate safety equipment.
- Only operate machinery when all necessary guards, interlocks and other safety devices are in place and functional.
- **DO NOT** use or operate damaged tools or products.

Revised May 25, 2017. For more information and documents, visit [niagaracutter.com/safety](http://niagaracutter.com/safety) and [P65Warnings.ca.gov](http://P65Warnings.ca.gov).

## **CEMENTED CARBIDE END MILLS**

Cemented carbide end mills from Niagara Cutter are not included in the product range intended for the following requirements. Nevertheless Niagara Cutter can make the following declaration.

These products meet all requirements in RoHS (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment), WEEE (Waste Electrical & Electronic Equipment) and ELV (End of Life Vehicles) requirements. Products do not contain mercury, lead, hexavalent chromium, cadmium, CFC, HCFC, flame retardants or solvents in concentrations that exceed specifications in the regulations.

## **REGRINDING**

Wet or dry grinding can produce potentially hazardous dusts or mists that can irritate skin, eyes, nose, throat and result in lung damage or disease. To avoid injury use proper safety precautions and protective equipment.

## **DISPOSAL**

Niagara Cutter will buy back solid carbide tools for recycling. Solid carbide tools should be separated from other metal waste (steel, aluminium, copper etc). All packing material is fully recyclable.

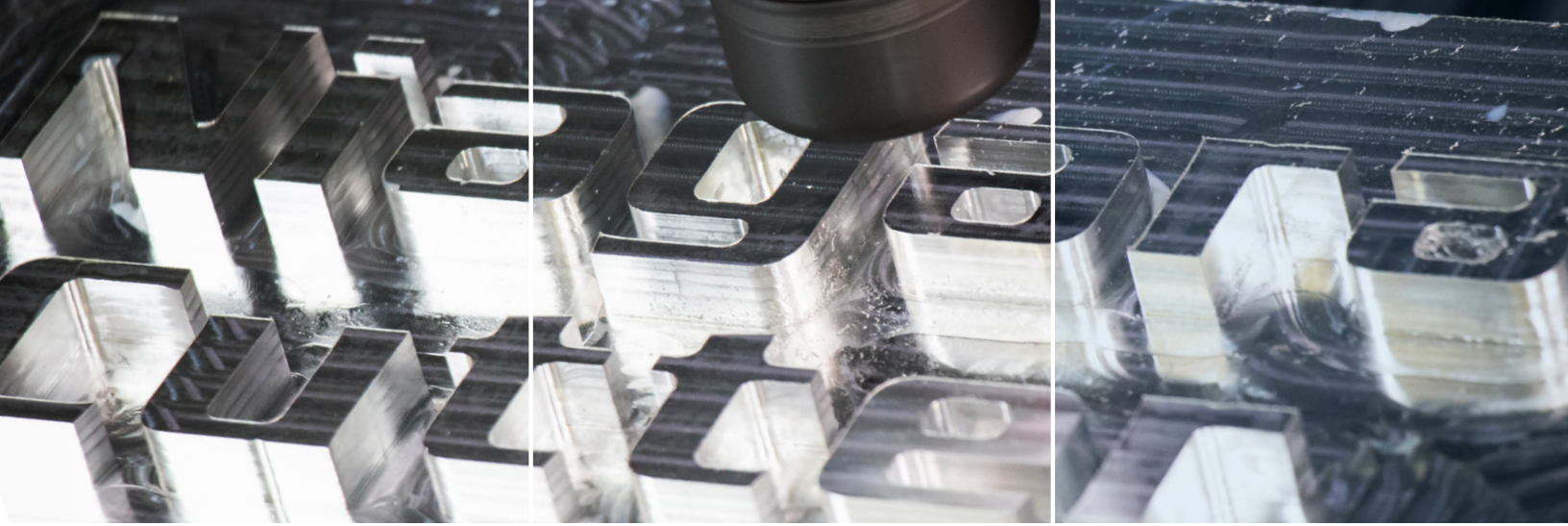
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### **CUSTOMIZED TOOLING**

A significant portion of Niagara Cutter's offering is in the form of customized tools. Our engineers work in close cooperation with you to provide the best possible solution to specific machining challenges where the demands stretch beyond standard tools. We also offer a quick delivery solution for standard tools requiring simple modifications to meet specific dimensional requirements. Fast turnaround from quotation to product delivery is a hallmark of our modified tool program.

### **RECONDITIONING CUTS COST & TOOL INVENTORY**

Niagara Cutter's modern carbide tools offer remarkable performance by utilizing the best combinations of carbide substrates with high wear resistant coatings, optimized cutting geometry and controlled edge preparation.

However good a tool is, as part of its function, it will eventually show signs of wear on the cutting edge. Controlling this wear and the timely replacement of the tool will allow the used tool to be reconditioned, thus reducing tool investment costs.

We recondition your solid carbide tools using the same advanced technology and care that we use to manufacture our new products. These tools are remanufactured to our normal high standards with the original Niagara Cutter geometry, edge preparation and coating processes.

### **RECYCLING**

Tungsten carbide is a valuable and limited resource. Estimations of the existing reserves of tungsten suggest that with present consumption resources will be depleted within 40 - 100 years. For the last few years demand has been higher than production and a general trend toward higher consumption can clearly be seen.

Recycling of used material compared to the mining of virgin material reduces the environmental impact. By recycling we can prolong the time before the resources are at an end and reduce energy consumption by approximately 35%. At the same time, recycling tungsten carbide reduces CO2 emissions by approximately 40%.

**For further information on custom, modified, reconditioned tools or to set-up your recycling program please contact your local Authorized Distributor.**

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To find an Authorized SECO/Niagara  
Cutter Distributor near you, please refer  
to our Distributor Locator:

**SECOLOCATOR.COM**

For customer service, call:  
**1-248-528-5220**

For technical assistance, call:  
**1-800-TEC-TEAM (1-800-832-8326)**

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