

## 2016 Global Product Catalog





KYOCERA SGS Precision Tools (KSPT) is an ISO-certified manufacturer of industry leading round solid carbide cutting tools. State of the art manufacturing and warehouse facilities have the capacity and processes to meet the quality and delivery demands of customers in all markets around the world. Complete inspections performed within its metallurgical lab and manufacturing quality departments ensure the use of high quality carbide and reliable manufacturing consistency regardless of when a cutting tool is produced.

KSPT is proud to have pioneered some of the world's most advanced cutting technologies due to rigorous testing of tools, coatings, and materials within its Global Innovation Center. It is this commitment to innovation that has launched patented products and technologies like the Z-Carb with its variable geometry and cutting edge preparation, Series 43 APR and APF ultra high performance aluminum cutting tools, and the JetStream coolant technology.

SGS has become an important part of the KYOCERA PrecisionTools family, and while the name has changed, one thing has not. Its dedicated people and their relentless commitment to the customer. KSPT Technical Sales Engineers, Application Specialists, and Distribution Partners blanket the globe, delivering reliable service and support to all market segments. It is these people and products that drive innovative application strategies and cutting tool technologies into the end user, continually exceeding expectations and providing the most value at the spindle.



KYOCERA SGS Precision Tools .....	2
KYOCERA SGS Precision Tools Europe Ltd. . . .	4
Global Innovation Center .....	5
Tooling Services .....	6
Tool Wizard .....	7

**OVERVIEW**

Common Legend .....	8
End Mill Legend .....	10
Drill Legend .....	11
Router Legend .....	11

<b>COATINGS</b> .....	12
-----------------------	----

**MILLING**

High Performance End Mills .....	14
End Mill Matrix .....	18
High Performance Aluminum End Mills . . . .	112
General Purpose End Mills .....	160

**HOLE MAKING**

High Performance Drills .....	226
General Purpose Drills .....	268
General Purpose Countersinks .....	294
General Purpose Reamers .....	310

**ROUTING**

High Performance Routers .....	318
General Purpose Routers .....	338

**TECHNICAL INFORMATION**

EDP Index .....	344
SGS Reference Information .....	361
Decimal Equivalent Chart .....	362
Hardness Conversion Chart .....	363







## MORE THAN JUST ANOTHER CUTTING TOOL SUPPLIER

### **KYOCERA SGS PRECISION TOOLS EUROPE, LTD.**

The state of the art KYOCERA SGS Precision Tools Europe facility is located in Wokingham, England and is focused on the manufacture of special cutting tools, high accuracy form tools, tool modifications and regrinds. A highly skilled team of professionals specialize in the supply and support of high performance tools for the Aerospace, Medical, Power Generation and Motorsport markets.

### **KYOCERA SGS Precision Tools Europe also offers a full range of end mill and drill products as follows:**

- Multi-Million Euro Warehouse Stocking Full Range of Catalog Products
- Same Day Shipment on Stock Items
- Multi-Lingual Sales and Technical Support
- Online Portal for Stock Availability, Pricing, Discount Information and 24-Hour Order Placement
- High Performance Product and Application Training, Including the New KYOCERA SGS Tool Clinic

### **Additional services provided at this facility include:**

- A Fast Track for Special Tools Via Our Rapid Response Centre
- Product Research and Development
- Product Engineering and Tool Application Support
- CAD/CAM Software Support





## GLOBAL INNOVATION CENTER

### INNOVATIVE CUTTING TOOL TECHNOLOGIES

The Global Innovation Center is an environment conducive to innovation. Through testing and development, the dedicated KYOCERA SGS Precision Tools Team focuses on the latest technical competence and machining techniques to bring a continuous stream of new products and advancements to market.

- Cutting Edge Equipment
- Highly Engineered Technology
- Incorporation of innovative machine tool technology for Research and Development

### TECHNICAL TRAINING & EDUCATION

Our knowledge-based selling programs are specifically designed to challenge and educate by facilitating programs that mix classroom presentation with hands-on experience. Our own KSPT team members go through the same core training we provide to our valued distribution partners.

- KSPT Campus Tool Clinics
- On-Site Customer Training
- Basic, Advanced and Expert Level Material
- Market-Driven Knowledge

### APPLICATION ENGINEERING

The KSPT expertise and global market knowledge allows us to translate customer needs into a commercial sales strategy. The portfolio of KSPT products and services offer an unparalleled track record in performance, cost savings, quality and value at the spindle.

- Market-Driven Productivity Improvements, including the Z-Carb HPR and S-Carb APR/APF
- Tooling Solutions which include development of new tool geometries, extreme lab testing parameters and extensive field testing
- Technical Support and Troubleshooting
- Research and Development





# TOOLING SERVICES

**KSPT is committed to providing superior tooling services in the areas of Reconditioning, Recoating, Regrinding, Specials and Alterations. These services are offered to provide unique solutions and enhanced tool life with involvement from the KSPT Technical Support Team.**

**KSPT proudly offers Tooling Services in North America, Europe and Asia.**



## KSPT TOOLING SERVICES FACILITIES

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BEFORE

AFTER



# SGSTOOLWIZARD<sup>★</sup>2.0

The ToolWizard is all new for 2016, featuring responsive design, filter based searching and search history tracking.

## USE THE TOOLWIZARD TO:

- Calculate application parameters
- Search the SGS catalog
- Select products based on machining needs

## TO SIGN UP FOR THE TOOLWIZARD:

1. Visit [www.sgstoolwizard.com](http://www.sgstoolwizard.com)
2. Sign up for an account
3. Start calculating
4. Start saving

## TOOL WIZARD

[Create a new wizard](#)

[History](#)

[Logout](#)

TOOL MATERIAL APPLICATION

### New Usage

Endmills  Drills


Cutting Diameter  
1

Radial width  
1 inches  Slot Cut?

Total axial depth  
.9 inches

Maximum rpm  
50000

Cutting Depth  
1.125



SAVE NEXT

 **Common Legend**  
 **Leyenda habitual**  
 **Légende commune**

**TO ORDER:** Please specify quantity and EDP number.  
**PARA SU PEDIDO:** Por favor especifique cantidad y número de EDP.  
**POUR COMMANDER:** Veuillez préciser la quantité et le code article EDP.  
**RETURN POLICY:** An RMA number must accompany all product returns. Contact your Customer Service Representative for an RMA number.  
**DEVOLUCIONES:** Todo material devuelto debe ir acompañado de un número de RMA correspondiente. Para solicitarlo, póngase en contacto con su Representante de Servicio.  
**POLITIQUE DE RETOUR:** Tous les produits retournés doivent être accompagnés d'un numéro RMA. Contacter votre interlocuteur commercial pour obtenir un numéro RMA.

**REGULATION SAFETY GLASSES SHOULD ALWAYS BE WORN WHEN USING HIGH-SPEED CUTTING EQUIPMENT**  
**DEBEN USARSE GAFAS PROTECTORAS CUANDO SE UTILIZA UN EQUIPO DE ALTA VELOCIDAD**  
**DES LUNETTES DE SÉCURITE DOIVENT ÊTRE IMPÉRATIVEMENT PORTÉES LORS D'UTILISATION D'OUTILS À GRANDE VITESSE**



**INDUSTRY**  
**INDUSTRIAS**  
**INDUSTRIES**



Aerospace  
Aeroespacial  
Aérospatiale



Medical  
Médica  
Médical



Power Generation  
Energética  
Production  
d'énergie



Automotive  
Automotriz  
Automobile



Mold & Die  
Moldes y matrices  
Moules et  
coquilles



Castings &  
Foundries  
Fundición  
Moulages et  
fonderies



General  
Engineering  
Ingeniería  
Ingénierie  
générale

These icons indicate for which industry applications KSPT High Performance Products are best suited.  
Estos íconos indican las aplicaciones industriales más adecuadas para los productos KSPT de alto rendimiento.  
Ces icônes indiquent les applications industrielles pour lesquelles les produits haute performance KSPT sont les mieux adaptés.



# Common Legend

## Leyenda habitual

### Légende commune

#### MATERIALS MATERIALES MATÉRIAUX



Steels  
Aceros  
Aciers



Stainless Steels  
Aceros Inoxidables  
Inox



Cast Iron  
Hierro Fundido  
Fonte



High Temp Alloys  
Aleaciones a Altas Temperaturas  
Alliages Haute Temp



Titanium  
Titanio  
Titane



Non-Ferrous  
No Férrico  
Non Ferreux



Plastics/Composites  
Plásticos/Resinas  
Plastiques/Composites



Hardened Steels  
Aceros Endurecidos  
Aciers Trempés

#### TOOL LENGTH LONGITUD FRESA LONGUEUR DE L'OUTIL



Stub  
Corta  
Court



Regular  
Media  
Moyen



Long  
Larga  
Long



Long Reach Neck  
Larga con cuello  
Gorge de dégagement  
longue portée



Extra Long  
Extra-larga  
Extra-long

#### FLUTES FILOS GOUJURES



2 Flutes  
2 Filos  
2 Goujures



3 Flutes  
3 Filos  
3 Goujures



4 Flutes  
4 Filos  
4 Goujures



5 Flutes  
5 Filos  
5 Goujures



6 Flutes  
6 Filos  
6 Goujures



7 Flutes  
7 Filos  
7 Goujures



8 Flutes  
8 Filos  
8 Goujures



9 Flutes  
9 Filos  
9 Goujures



10 Flutes  
10 Filos  
10 Goujures



11 Flutes  
11 Filos  
11 Goujures



12 Flutes  
12 Filos  
12 Goujures

# End Mill Legend

## Leyenda fresas

## Légende fraise

### END CONFIGURATIONS CONFIGURACIONES DE LA PUNTA CONFIGURATIONS TERMINALES



### SHANK TYPE TIPO DE VÁSTAGO TYPE DE TIGE



### HELIX ANGLES ÁNGULOS HELICOIDALES ANGLES DE L'HÉLICE



### COOLANT OPTIONS OPCIONES DE REFRIGERACIÓN OPTIONS DE REFOIDISSEMENT



### RAKE ANGLE ÁNGULO DE ATAQUE ANGLE DE PENTE



### ADDITIONAL GEOMETRY CARACTERÍSTICAS GEOMÉTRICAS ADICIONALES GÉOMÉTRIE SUPPLÉMENTAIRE



All tools are in Right Cut Direction unless noted  
Todas las herramientas son con corte a la derecha a menos que se indique lo contrario  
Tous les outils ont une coupe à droite, sauf indications contraires

# Drill Legend

## Leyenda taladros

### Légende perçage

#### SHANK TYPE TIPO DE VÁSTAGO TYPE DE TIGE



Common  
Normal  
Commune



Straight  
Recto  
Droite

#### REACH ALCANCE LONGUEUR

3xD

>3xD Reach  
Alcance >3xD  
>Longueur 3xD

5xD

5xD Reach  
Alcance 5xD  
Longueur 5xD

8xD

8xD Reach  
Alcance 8xD  
Longueur 8xD

#### HELIX ANGLES ÁNGULOS HELICOIDALES ANGLES DE L'HÉLICE



Right Spiral  
Espiral sentido derecho  
Spirale droite



None  
Ninguno  
Aucun

#### COOLANT OPTIONS OPCIONES DE REFRIGERACIÓN OPTIONS DE REFOIDISSEMENT



Internal Coolant  
Refrigerante externo  
Refrondissement interne



External Coolant  
Refrigerante interno  
Refrondissement  
externe

# Router Legend

## Leyenda ranuradores

### Légende détourage

#### SHANK TYPE TIPO DE VÁSTAGO TYPE DE TIGE



Straight  
Recto  
Droite

#### RAKE ANGLE ÁNGULO DE ATAQUE ANGLE DE PENTE



Positive  
Positivo  
Positif



Neutral  
Neutro  
Neutre



Negative  
Negativo  
Négatif



Variable  
Variable  
Variable

#### HELIX ANGLES ÁNGULOS HELICOIDALES ANGLES DE L'HÉLICE



Right Spiral  
Espiral sentido derecho  
Spirale droite



Left Spiral  
Espiral sentido izquierdo  
Spirale gauche

#### ADDITIONAL GEOMETRY CARACTERÍSTICAS GEOMÉTRICAS ADICIONALES GÉOMÉTRIE SUPPLÉMENTAIRE



Left Hand Cut Direction  
Fresado sentido  
izquierda  
Coupe vers la gauche



Right Hand Cut Direction  
Fresado sentido  
derecha  
Coupe vers la droite



Chip Breaker  
Rompevirutas  
Brise-copeaux



## Coatings

	<b>Ti-NANITE</b>	<b>Ti-NANITE-A</b>	<b>Ti-NANITE-B</b>
<b>Coating</b>	Titanium (TiN)	Aluminum Titanium Nitride (AlTiN)	Titanium DiBoride (TiB <sub>2</sub> )
<b>Identifying Color</b>	gold	dark grey	light grey-silver
<b>Layer Structure</b>	Multilayer	Nano structure	Monolayer
<b>Thickness</b>	1–4 microns	1–4 microns	1–2 microns
<b>Hardness (HV)</b>	2200	3700	4000
<b>Coefficient of Friction (Fretting)</b>	0.4–0.65	0.30	0.45
<b>Thermal Stability</b>	600°C / 1112°F	1100°C / 2010°F	850°C / 1562°F
<b>General Information</b>	A general purpose coating with good adhesion and abrasion resistant properties. Suitable for a wide variety of materials.	Excellent thermal and chemical resistance allows for dry cutting and improvements in performance of carbide. The coating has a high hardness giving great protection against abrasive wear and erosion.	This ceramic based coating ensures a smooth surface and a low affinity to cold welding or edge build up, which makes it optimal for Aluminum and copper applications. It has high toughness and high hardness.



Titanium Carbonitride  
(TiCN)

Proprietary  
(TX)

Crystalline Diamond  
(Diamond)

Proprietary  
(TM)

pink-red

black

black

copper

Multilayer

Nano Composite

Monolayer

Nano Composite

1–4 microns

1–4 microns

6–20 microns

1–4 microns

3000

3600

>8000

3600

0.3–0.45

0.45

0.15–0.2

0.45

400°C / 752°F

1150°C / 2100°F

800°C / 1470°F

1150°C / 2100°F

A very wear resistant coating with high toughness and shock resistance. Good in interrupted cuts found in applications like milling.

The structural design of Ti-Namite-X is adapted to meet a diverse range of applications; everything from high- and low-alloy steels to hardened materials (up to 65 HRC core hardness). Ti-Namite-X is suitable for operations which require high cutting speeds, high temperatures at the cutting edge, and high metal removal rates.

This is the hardest coating available with the best abrasion resistance. It is carbon based so it is limited in application capabilities. It is also the most expensive with the longest processing time.

Features include high wear resistance, reduced friction, and excellent prevention of edge build up. This coating provides superior material removal rates and tool life when used in high performance operations with difficult to machine materials like Titanium.

## High Performance End Mills





# Milling

HIGH PERFORMANCE END MILLS	SERIES	DESCRIPTION	PAGE
Z-Carb-HPR	Z5	5 Flute Rougher Square End Fractional	24
	Z5CR	5 Flute Rougher Corner Radius Fractional	25
	Z5MCR	5 Flute Rougher Corner Radius Metric	29
Z-Carb-AP	Z1PCR	4 Flute Variable Rake Corner Radius Fractional	32
	Z1MPCR	4 Flute Variable Rake Corner Radius Metric	38
	Z1PLC	4 Flute Variable Rake Long Reach Corner Radius Fractional	34
	Z1MPIC	4 Flute Variable Rake Intermediate Reach Corner Radius Metric	39
	Z1MPLC	4 Flute Variable Rake Long Reach Corner Radius Metric	40
	Z1PLB	4 Flute Variable Rake Ball End Long Reach Fractional	35
	Z-Carb	Z1	4 Flute Variable Geometry Square End Fractional
Z1M		4 Flute Variable Geometry Square End Metric	48
Z1B		4 Flute Variable Geometry Ball End Fractional	45
Z1MB		4 Flute Variable Geometry Ball End Metric	49
Z16CR		4 Flute Variable Geometry Corner Radius Fractional	44
Z-Carb-HTA	ZH1CR	4 Flute Variable Geometry High Temp Alloys Corner Radius Fractional	52
	ZH1MCR	4 Flute Variable Geometry High Temp Alloys Corner Radius Metric	54
	ZH1MCRS	4 Flute Variable Geometry High Temp Alloys Stub Corner Radius Metric	54
Z-Carb-MD	ZD1CR	4 Flute Variable Geometry Hard Materials Long Reach Corner Radius Fractional	56
	ZD1MCR	4 Flute Variable Geometry Hard Materials Long Reach Corner Radius Metric	57
Series 7	7	4 Flute Variable Geometry Long Length Square End Fractional	94
	7M	4 Flute Variable Geometry Long Length Square End Metric	97
	7B	4 Flute Variable Geometry Long Length Ball End Fractional	95
	7MB	4 Flute Variable Geometry Long Length Ball End Metric	98
V-Carb	55	5 Flute Finisher & Semi-Finisher Square End Fractional	59
	55CR	5 Flute Finisher & Semi-Finisher Corner Radius Fractional	60
	55M	5 Flute Finisher & Semi-Finisher Square End Metric	64
	55MCR	5 Flute Finisher & Semi-Finisher Corner Radius Metric	65
	55MB	5 Flute Finisher & Semi-Finisher Ball End Metric	67
T-Carb	51	6 Flute High Speed Machining Square End Fractional	71
	51M	6 Flute High Speed Machining Square End Metric	76
	51L	6 Flute High Speed Machining Square End Long Reach Fractional	72
	51ML	6 Flute High Speed Machining Square End Long Reach Metric	77
	51CR	6 Flute High Speed Machining Corner Radius Fractional	71
	51MCR	6 Flute High Speed Machining Corner Radius Metric	76
	51LC	6 Flute High Speed Machining Long Reach Corner Radius Fractional	73
	51MLC	6 Flute High Speed Machining Long Reach Corner Radius Metric	77
Multi-Carb	66	Multi-Flute Finisher Square End Fractional	80
	66M	Multi-Flute Finisher Square End Metric	83
	66CR	Multi-Flute Finisher Corner Radius Fractional	80
	66MCR	Multi-Flute Finisher Corner Radius Metric	84
Turbo-Carb	56B	2 Flute Contouring Long Reach Ball End Fractional	100
	56MB	2 Flute Contouring Long Reach Ball End Metric	102
Power-Carb	57	6 Flute Finisher Square End Fractional	104
	57M	6 Flute Finisher Square End Metric	106
Series 33	33CR	3 Flute Difficult to Machine Materials Corner Radius Fractional	88
	33MCR	3 Flute Difficult to Machine Materials Corner Radius Metric	91
CFRP Slow Helix	27	2 Flute Slow Helix Square End Fractional	108
	27M	2 Flute Slow Helix Square End Metric	110

*Speed & Feed Recommendations listed after each series*

# Fresado

FRESAS DE ALTO RENDIMIENTO	SERIE	DESCRIPCIÓN	PÁGINA
Z-Carb-HPR	Z5	5 filos, desbastador, punta cuadrada, fraccional	24
	Z5CR	5 filos, desbastador, radio angulado, fraccional	25
	Z5MCR	5 filos, desbastador, radio angulado, métrico	29
Z-Carb-AP	Z1PCR	4 filos, inclinación variable, radio angulado, fraccional	32
	Z1MPCR	4 filos, inclinación variable, radio angulado, métrico	38
	Z1PLC	4 filos, inclinación variable, largo alcance, radio angulado, fraccional	34
	Z1MPIC	4 filos, inclinación variable, medio alcance, radio angulado, métrico	39
	Z1MPLC	4 filos, inclinación variable, largo alcance, radio angulado, métrico	40
	Z1PLB	4 filos, inclinación variable, punta esférica, largo alcance, fraccional	35
	Z1	4 filos, geometría variable, punta cuadrada, fraccional	43
Z-Carb	Z1M	4 filos, geometría variable, punta cuadrada, métrico	48
	Z1B	4 filos, geometría variable, punta esférica, fraccional	45
	Z1MB	4 filos, geometría variable, punta esférica, métrico	49
	Z16CR	4 filos, geometría variable, radio angulado, fraccional	44
	Z16CR	4 filos, geometría variable, radio angulado, métrico	44
Z-Carb-HTA	ZH1CR	4 filos, geometría variable, aleaciones a altas temperaturas, radio angulado, fraccional	52
	ZH1MCR	4 filos, geometría variable, aleaciones a altas temperaturas, radio angulado, métrico	54
	ZH1MCRS	4 filos, geometría variable, aleaciones a altas temperaturas, versión corta, radio angulado, métrico	54
Z-Carb-MD	ZD1CR	4 filos, geometría variable, materiales duros, largo alcance, radio angulado, fraccional	56
	ZD1MCR	4 filos, geometría variable, materiales duros, largo alcance, radio angulado, métrico	57
Serie 7	7	4 filos, geometría variable, longitud larga, punta cuadrada, fraccional	94
	7M	4 filos, geometría variable, longitud larga, punta cuadrada, métrico	97
	7B	4 filos, geometría variable, longitud larga, punta esférica, fraccional	95
	7MB	4 filos, geometría variable, longitud larga, punta esférica, métrico	98
V-Carb	55	5 filos, acabador y semiacabador, punta cuadrada, fraccional	59
	55CR	5 filos, acabador y semiacabador, radio angulado, fraccional	60
	55M	5 filos, acabador y semiacabador, punta cuadrada, métrico	64
	55MCR	5 filos, acabador y semiacabador, radio angulado, métrico	65
	55MB	5 filos, acabador y semiacabador, punta esférica, métrico	67
T-Carb	51	6 filos, mecanizado de alta velocidad, punta cuadrada, fraccional	71
	51M	6 filos, mecanizado de alta velocidad, punta cuadrada, métrico	76
	51L	6 filos, mecanizado de alta velocidad, punta cuadrada, largo alcance, fraccional	72
	51ML	6 filos, mecanizado de alta velocidad, punta cuadrada, largo alcance, métrico	77
	51CR	6 filos, mecanizado de alta velocidad, radio angulado, fraccional	71
	51MCR	6 filos, mecanizado de alta velocidad, radio angulado, métrico	76
	51LC	6 filos, mecanizado de alta velocidad, largo alcance, radio angulado, fraccional	73
Multi-Carb	51MLC	6 filos, mecanizado de alta velocidad, largo alcance, radio angulado, métrico	77
	66	Filo múltiple, acabador, punta cuadrada, fraccional	80
	66M	Filo múltiple, acabador, punta cuadrada, métrico	83
	66CR	Filo múltiple, acabador, radio angulado, fraccional	80
Turbo-Carb	66MCR	Filo múltiple, acabador, radio angulado, métrico	84
	56B	2 filos, contorneado, largo alcance, punta esférica, fraccional	100
Power-Carb	56MB	2 filos, contorneado, largo alcance, punta esférica, métrico	102
	57	6 filos, acabador, punta cuadrada, fraccional	104
Serie 33	57M	6 filos, acabador, punta cuadrada, métrico	106
	33CR	3 filos, materiales difíciles de mecanizar, radio angulado, fraccional	88
Helicoidal de avance lento CFRP	33MCR	3 filos, materiales difíciles de mecanizar, radio angulado, métrico	91
	27	2 filos, helicoidal de avance lento, punta cuadrada, fraccional	108
	27M	2 filos, helicoidal de avance lento, punta cuadrada, métrico	110

*Recomendaciones de velocidades y avances mostradas tras cada serie*

# Fraissage

FRAISES A DETOURER UNIVERSELLES	SÉRIES	DESCRIPTION	PAGE
Z-Carb-HPR	Z5	5 dents à bout plat d'ébauche (fractionnel)	24
	Z5CR	5 dents rayon en coin d'ébauche (fractionnel)	25
	Z5MCR	5 dents rayon en coin d'ébauche (métrique)	29
Z-Carb-AP	Z1PCR	4 dents à vague de coupe variable rayon en coin (fractionnel)	32
	Z1MPCR	4 dents à vague de coupe variable rayon en coin (métrique)	38
	Z1PLC	4 dents à vague de coupe variable longue portée rayon en coin (fractionnel)	34
	Z1MPIC	4 dents à vague de coupe variable portée intermédiaire rayon en coin (métrique)	39
	Z1MPLC	4 dents à vague de coupe variable longue portée rayon en coin (métrique)	40
	Z1PLB	4 dents à vague de coupe variable longue portée à bout hémisphérique (fractionnel)	35
	Z-Carb	Z1	4 dents géométrie variable à bout plat (fractionnel)
Z1M		4 dents géométrie variable à bout plat (métrique)	48
Z1B		4 dents géométrie variable à bout hémisphérique (fractionnel)	45
Z1MB		4 dents géométrie variable à bout hémisphérique (métrique)	49
Z16CR		4 dents géométrie variable rayon en coin (fractionnel)	44
Z-Carb-HTA	ZH1CR	4 dents géométrie variable alliages haute température rayon en coin (fractionnel)	52
	ZH1MCR	4 dents géométrie variable alliages haute température rayon en coin (métrique)	54
	ZH1MCRS	4 dents géométrie variable, alliages haute température, longueur de l'outil court, rayon en coin (métrique)	54
Z-Carb-MD	ZD1CR	4 dents géométrie variable matériaux durs longue portée rayon en coin (fractionnel)	56
	ZD1MCR	4 dents géométrie variable matériaux durs longue portée rayon en coin (métrique)	57
Série 7	7	4 dents géométrie variable à queue longue à bout plat (fractionnel)	94
	7M	4 dents géométrie variable à queue longue à bout plat (métrique)	97
	7B	4 dents géométrie variable à queue longue à bout hémisphérique (fractionnel)	95
	7MB	4 dents géométrie variable à queue longue à bout hémisphérique (métrique)	98
V-Carb	55	5 dents en bout de finition et semi-finition plat (fractionnel)	59
	55CR	5 dents en bout finition et semi-finition rayon en coin (fractionnel)	60
	55M	5 dents en bout de finition et semi-finition plat (métrique)	64
	55MCR	5 dents en bout finition et semi-finition rayon en coin (métrique)	65
	55MB	5 dents en bout de finition et semi-finition hémisphérique (métrique)	67
T-Carb	51	6 dents pour usinage grande vitesse à bout plat (fractionnel)	71
	51M	6 dents pour usinage grande vitesse à bout plat (métrique)	76
	51L	6 dents pour usinage grande vitesse à bout plat longue portée (fractionnel)	72
	51ML	6 dents pour usinage grande vitesse à bout plat longue portée (métrique)	77
	51CR	6 dents pour usinage grande vitesse rayon en coin (fractionnel)	71
	51MCR	6 dents pour usinage grande vitesse rayon en coin (métrique)	76
	51LC	6 dents pour usinage grande vitesse longue portée rayon en coin (fractionnel)	73
	51MLC	6 dents pour usinage grande vitesse longue portée rayon en coin (métrique)	77
Multi-Carb	66	Multi-dents en bout de finition plat (fractionnel)	80
	66M	Multi-dents en bout de finition plat (métrique)	83
	66CR	Multi-dents en bout de finition rayon en coin (fractionnel)	80
	66MCR	Multi-dents en bout de finition rayon en coin (métrique)	84
Turbo-Carb	56B	2 dents contournage longue portée à bout hémisphérique (fractionnel)	100
	56MB	2 dents contournage longue portée à bout hémisphérique (métrique)	102
Power-Carb	57	6 dents en bout de finition plat (fractionnel)	104
	57M	6 dents en bout de finition plat (métrique)	106
Série 33	33CR	3 dents usinage des matériaux difficiles rayon en coin (fractionnel)	88
	33MCR	3 dents usinage des matériaux difficiles rayon en coin (métrique)	91
CFRP hélice lente	27	2 dents hélice lente à bout plat (fractionnel)	108
	27M	2 dents hélice lente à bout plat (métrique)	110

*Recommandatивons de vitesse et avance indiquées après chaque série*



# End Mill Matrix

Name	Series	Page No.	Material	# Flutes	Helix °	Flute Index	Rake °	Relief
Z-Carb-HPR	Z5		★ ★ ★ ★ ★	5	37	≠	+	Eccentric
Z-Carb	Z1		★ ★ ★ ☆ ★	4	35 / 38	≠	+	Eccentric
Z-Carb-AP	Z1P		★ ★ ★ ☆ ★	4	35 / 38	≠	+	Eccentric
Z-Carb-HTA	ZH1		☆ ☆ ☆ ☆ ☆	4	38 / 41	≠	+	Eccentric
Z-Carb-MD	ZD1		★ ☆ ☆ ☆ ☆	4	42 / 45	≠	-	Eccentric
Series 33	33		★ ★ ★ ☆ ★	3	32 / 48	≠	++	Eccentric
T-Carb	51		★ ★ ☆ ☆ ★	6	41	≠	+	Eccentric
Series 7	7		★ ★ ★ ☆ ★	4	38	≠	+	Primary / Secondary
V-Carb	55		★ ★ ★ ★ ★	5	45	≠	++	Primary / Secondary
Multi Carb	66		★ ★ ☆ ☆ ★	7, 9, 11	35	=	+	Eccentric
Turbo Carb	56B		★ ☆ ☆ ☆ ☆	2	30	=	+	Eccentric
Power-Carb	57		★ ☆ ☆ ☆ ☆	6	45	=	---	Eccentric
S-Carb 3 Flute	43		★ ☆ ☆ ☆ ☆	3	38	=	+	Circ Land / Eccentric
S-Carb Chipbreaker	43CB		★ ☆ ☆ ☆ ☆	3	38	=	+	Circ Land / Eccentric
S-Carb 2 Flute	47		★ ☆ ☆ ☆ ☆	2	35	=	++	Circ Land / Eccentric
S-Carb APR	43APR		★ ☆ ☆ ☆ ☆	3	38	=	+	Circ Land / Eccentric
S-Carb APF	43APF		★ ☆ ☆ ☆ ☆	4	38 / 41	≠	+	Circ Land / Eccentric
Slow Helix	27		★ ☆ ☆ ☆ ☆	4	10, 12	≠	+	Primary / Secondary
CCR *	20-CCR		★ ☆ ☆ ☆ ☆	5, 8, 10, 12	15	=	++	Primary / Secondary
CCR *	31-CCR		★ ☆ ☆ ☆ ☆	5, 7, 8, 10	15	=	++	Primary / Secondary
PCR *	29-PCR		★ ☆ ☆ ☆ ☆	8, 10, 12	15	=	0	Eccentric
Compression Router	25		★ ☆ ☆ ☆ ☆	4, 6, 8	30	=	++	Primary / Secondary
Up Cut Router	21		★ ☆ ☆ ☆ ☆	2	35	=	+++	Primary / Secondary
Down Cut Router	22		★ ☆ ☆ ☆ ☆	2	35	=	+++	Primary / Secondary
Ski-Carb	44		★ ☆ ☆ ☆ ☆	2	45	=	+++	Circ Land / Pri / Sec

## Main Key

- ★ Primary Function
- ☆ Secondary Function
- 💧 Coolant Required
- 🚫 Plunging NOT Recommended

Material	Coat
Steel	
Stainless Steel	💧🚫
Cast Iron	
High Temp Alloys	💧🚫
Titanium Alloys	💧🚫
Non Ferrous	💧
Plastics, Composites	
Hardened Steels	🚫

## Coating Key

- Ti-Namite-A = AlTiN
- Ti-Namite-X = AlTiN-based nanocomposite
- Ti-Namite-M = AlTiSiN nanocomposite
- Ti-Namite-B = TiB2
- Di-Namite = polycrystalline diamond

# End Mill Matrix

Coating	Finishing					HSM				Profiling						Slotting						Ramping			Plunging		
	Ae %	2	2	5	5	5	5	5	10	10	25	50	25	50	25	50	100	100	100	100	100	100	1°	3°	6°	Ap 50%	Ap 100%
	Ap %	100	200	100	200	300	100	200	100	200	100	100	150	150	200	200	25	50	75	100	150	200					
Ti-Namite-M / Ti-Namite-A	☆	☆	☆	☆		★	★	★	★	★	★	★	★	★	☆	★	★	★	★	★	☆	★	★	★			
Ti-Namite-A	☆	☆	☆	☆		☆	☆	☆	☆	★	★	★	★	★	☆	★	★	★	★	★	☆		★	★	☆		
Ti-Namite-X	☆	☆	☆	☆		☆	☆	☆	☆	★	★	★	★	★	☆	★	★	★	★	★	☆		★	★	★	☆	
Ti-Namite-A	☆	☆	☆	☆		☆	☆	☆	☆	★	★	★	★	★	☆	★	★	★	★	★	☆		★	★	☆		
Ti-Namite-X	☆	☆	☆	☆		☆	☆	☆	☆	★	★	★	★	★	☆	★	★	★	★				★	★	☆		
Ti-Namite-A	☆	☆	☆	☆		☆	☆	☆	☆	★	★	★	★	★	☆	★	★	★	★	★	★	★	★	★	★	★	☆
Ti-Namite-X	☆	☆	☆	☆		★	★	★	★	☆		☆															
Ti-Namite-X	★	★	★	★	★																						
Ti-Namite-A	★	★	★	★		☆	☆			☆		☆				☆	☆										
Ti-Namite-A	★	★	★	★																							
Ti-Namite-X	★	★	★	★		★	★	☆		☆	☆					☆											
Ti-Namite-X	★	★	★	★		★	★	★		★	☆	☆				★	☆										
Ti-Namite-B	★	★	★	★		★	★	★	☆	★	★	★	★	☆		★	★	★	★	☆	☆	★	★	★	★	★	★
Ti-Namite-B						★	★	★	★	★	★	★	★	☆	☆	★	★	★	★	★	★	☆	★	★	★	★	★
Ti-Namite-B	☆	☆	☆	☆		☆	☆	☆	☆	★	★	★	★	☆		★	★	★	★	☆	☆	★	★	★	★	★	★
Ti-Namite-B						★	★	★	★	★	★	★	★	☆	☆	★	★	★	★	★	★	☆	★	★	★	★	★
Ti-Namite-B	★	★	★	★	★	★	★	★	☆																		
Di-Namite (optional)	☆	☆	☆	☆	☆					★	★	★	★	★	☆	★	★	★	★	☆	☆	★	★	☆	☆		
Di-Namite (optional)	☆	☆	☆	☆	☆					★	★	★	★	★	☆	★	★	★	★	☆	☆	★	★	☆			
Di-Namite (optional)	☆	☆	☆	☆	☆					★	★	★	★	★	★	★	★	★	★	★	★	★	★	☆			
Di-Namite (optional)	☆	☆	☆	☆	☆					★	★	★	★	★	☆	★	★	★	★	☆	☆	★	★	★	★	★	★
Di-Namite (optional)	★	★	★	★	★					☆	☆	☆	☆	☆	☆												
various optional	☆	☆	☆	☆	☆					★	★	★	★	★	★	★	★	★	★	★	☆	★	★	★	★	★	★
various optional	☆	☆	☆	☆	☆					★	★	★	★	★	★	★	★	★	★	★	☆	★	★	★	★	★	★
Ti-Namite-B	★	★	★	★		★	★	★	☆	★	★	★	★	☆		★	★	★	★	☆	☆	★	★	★	★	★	☆

### Ramping Basics

Use 100% of slotting feed rates for 1° ramp  
 Use 50% of slotting feed rates for 3° ramp  
 Use 25% of slotting feed rates for 6° ramp

### Plunging Basics

Use 50% of slotting feed rates in Non-Ferrous materials  
 Use 20% of slotting feed rates for all other plungable materials

### Notes

Reduce speed, feed, and cut depths as material hardness increases— see Tool Wizard for recommendations  
 Long flute or long reach tools also require reduced rates and cut depths  
 Machine, tool holding, work holding, and coolant also affect rates and cut depths

### \*For Ramping and Plunging:

Non-end cut version not intended for ramping or plunging  
 End cut version intended for ramping only  
 Drill end intended for plunging only

# Application Tips

- |                     |  |
|---------------------|--|
| <b>Tool</b>         | <ul style="list-style-type: none"><li>• Whenever possible, select an end mill with the largest diameter, shortest flute length, and shortest overall length for the best rigidity</li><li>• Long flute tools are not intended for pocketing, slotting, or heavy profiling – limit <math>R_w</math> to <math>.02D</math></li><li>• High Performance tools minimize cycle time and extend tool life</li></ul>  |
| <b>Tool Holders</b> | <ul style="list-style-type: none"><li>• Holders with adequate gripping pressure and TIR are required</li><li>• Stub holders or zero length collet style holders are recommended for heavy stock removal</li><li>• When using solid holders, hand ground screw flats are not recommended</li></ul>  |
| <b>Workpiece</b>    | <ul style="list-style-type: none"><li>• Secure clamping of the workpiece will reduce chatter and deflection</li></ul>  |
| <b>Machine</b>      | <ul style="list-style-type: none"><li>• Spindle must be in optimum condition for precise TIR and maximum tool life</li><li>• Sufficient horsepower is required to perform at recommended speeds and feeds</li><li>• Reduce rates for low power machines to prevent workpiece and / or tool damage</li></ul>  |
| <b>Coolant</b>      | <ul style="list-style-type: none"><li>• Avoid re-milling chips through use of air blast or liquid coolant as necessary</li><li>• Maintain clean coolant with appropriate concentration</li><li>• General recommendations:<ul style="list-style-type: none"><li>—Water Soluble Oil or Air Blast: Tool Steels, Mold &amp; Die Steels, Carbon or Alloy Steels</li><li>—Water Soluble Oil: Stainless Steels, Titanium, High Temperature Alloys, Non-Ferrous Alloys</li></ul></li></ul> |
| <b>Methods</b>      | <ul style="list-style-type: none"><li>• Climb milling is generally preferred</li><li>• Attention to programming details, tool holders, TIR, balance, fixturing, etc. improve cutting tool performance and extend tool life</li></ul>   |



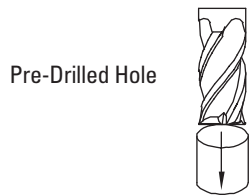
## END MILLING GUIDELINE

$D_1$  = cutting diameter       $L_2$  = flute length

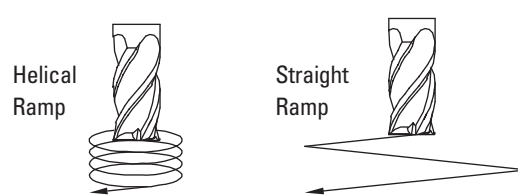
Speeds and Feeds for Cut Types are based on Radial Width ( $ae$ ) and Axial Depth ( $ap$ )

- Reductions to Speeds and Feeds may be necessary when:
- R<sub>w</sub> and A<sub>d</sub> exceed recommendations
  - Using long flute or extended reach tools
  - Using long tool holders
  - Machining materials harder than listed

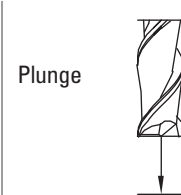
## ENTRY METHODS



Pre-drilling is the preferred entry method for most applications.



Alternative methods are helical and straight ramping. High ramp angles require reduced feed. Lower ramp angles will allow higher feed rates and extend tool life. Use slotting speeds and feeds for ramp angles of 1° to 2°. Reduce feed to 25% when ramp angles approach 6°. General purpose tools and/or difficult to machine materials will require lower ramp angles and reduced feed.



Plunge only in non-ferrous and short-chipping materials using slotting speeds and 25% slotting feeds.

# Puntas para aplicaciones

## Herramientas

- Siempre que sea posible, seleccione el cortador con el mayor diámetro, largo de filo y largo total mas corto posible para obtener una mejor rigidez.
- Las herramientas con filos largos no son recomendadas para operaciones de apertura de cajas en el maquinado, operación de ranurado o perfilado pesado – limitar la profundidad radial (Rw) a  $.02D$
- Las herramientas de alto desempeño minimizan el tiempo de ciclo del maquinado y extienden la vida útil de la herramienta

## Portaherramientas

- Los Portaherramientas deberán tener buena presión de agarre para la sujeción de la herramienta y una concetricidad máxima indicada (TIR)
- Se recomienda usar portaherramientas de agarre directo cortos, o de boquilla con longitud cero para lograr un máximo arranque de viruta
- Cuando se utilicen portaherramientas de agarre directo, no se recomienda hacer manualmente el plano para la sujeción del tornillo en el zanco de la herramienta

## Pieza a maquinar

- La buena sujeción de la pieza a maquinar reducirá la vibración y la desviación de la herramienta

## Máquina

- El usillo de la maquina debe estar en condiciones optimas, para asegurar la concetricidad de giro (TIR) y asegurar el máximo rendimiento de la herramienta
- Para lograr los avances y velocidades recomendados, se necesita suficiente potencia (HP) en la maquina
- Reducir los parámetros de corte en maquinas de baja potencia (HP) para prevenir el daño en la herramienta o pieza de trabajo

## Refrigerante

- Evite el re-maquinado de virutas usando aire a presión o líquido refrigerante según sea necesario
- Mantener limpio el refrigerante con su concentración adecuada
- Recomendaciones generales:
  - Para el maquinado de Aceros Grado Herramienta, para Moldes y Dados o Aleaciones de Bajo Carbón, utilice Aceite Soluble en Agua o aire a presión
  - Para el maquinado de Aleaciones Inoxidables, Aleaciones de Alta Temperatura, Titanio y Aleaciones No Ferrosas, utilice solamente Aceite Soluble en Agua

## Métodos

- Se recomienda el maquinado en sentido ascendente o trepado
- El cuidado en los detalles de la programación, la concetricidad de giro (TIR) el balance de los portaherramientas, la sujeción de la pieza a maquinar, etc. son factores que contribuyen a prolongar la vida de la herramienta

## GUÍAS DE FRESADO

$D_1$  = diámetro de corte       $L_2$  = largo de filo

Las velocidades y avances para cortes están basados en la profundidad radial ( $a_e$ ), y profundidad axial ( $a_p$ )

- Reducciones en velocidades y avances serán necesarias cuando:
- $R_w$  y  $A_d$  exceda las recomendaciones
  - Se utilicen filos largos o herramientas de largo alcance
  - Se utilicen portaherramientas largos
  - Se maquinen materiales más duros que los recomendados

## MÉTODOS DE ENTRADA

Barreno previo



Preferentemente usar un barreno previo como método de entrada para la mayor parte de las aplicaciones.

Rampa helicoidal



Rampa recta



Los métodos alternativos son las rampas helicoidales y rectas. Un ángulo elevado de rampa necesita un avance reducido. Un ángulo de rampa inferior permitirá tasas de avance más elevadas y una mayor duración de la herramienta. Usar velocidades y alcances de ranurado para ángulos de rampa de  $1^\circ$  a  $2^\circ$ . Disminuir el avance un 25% cuando los ángulos de rampa se aproximan a  $6^\circ$ . Las herramientas de uso general y/o materiales difíciles de mecanizar precisarán ángulos de rampa inferiores y un avance reducido.

Agujero o Barrenado



Este método se puede utilizar únicamente en materiales no ferrosos y materiales de formación de virutas cortas, usando la velocidad de ranurado y el 25% de su avance.

<b>Outil</b>	<ul style="list-style-type: none"> <li>• Chaque fois que possible, choisissez une fraise de plus grand diamètre possible, la plus courte possible, elle garantira la meilleure rigidité</li> <li>• Les outils longs ne sont pas optimum pour l'ébauche, le pocketing, le rainurage – ae limité à 0,02 D</li> <li>• Les outils Haute performance optimisent les temps de cycle et de augmentent la durée de vie</li> </ul>
<b>Porte-outils</b>	<ul style="list-style-type: none"> <li>• Des attachements à serrage puissant et à faux rond précis sont recommandés</li> <li>• Attachements à méplats ou pinces à serrage nominale sont recommandées pour les ébauches</li> <li>• Lorsque vous utilisez des attachement rigides, les serrage de l'outil par vis ne sont pas recommandés</li> </ul>
<b>Pièce</b>	<ul style="list-style-type: none"> <li>• Le système de fixation et de bridage de la pièce devra permettre de réduire les vibrations et la déformation</li> </ul>
<b>Machine</b>	<ul style="list-style-type: none"> <li>• Broche doit être en bon état optimal au niveau de son faux rond</li> <li>• Suffisamment puissance est nécessaire pour effectuer à des vitesses recommandées et se nourrit</li> <li>• Réduire les efforts pour les machines de faible puissance pour éviter l'endommagement de la pièce et / ou de l'outil</li> </ul>
<b>Liquide de refroidissement</b>	<ul style="list-style-type: none"> <li>• Évitez les recyclage de copeaux par l'utilisation de soufflage d'air comprimé ou de liquide de refroidissement.</li> <li>• Maintenir le lubrifiant propre à la concentration appropriée</li> <li>• Recommandations générales –             <ul style="list-style-type: none"> <li>–Huile soluble ou Air comprimé: aciers à outils, aciers pour moules, aciers au carbone ou alliés</li> <li>–Huile soluble: aciers inoxydables, titane, alliages à haute température, alliages non ferreux</li> </ul> </li> </ul>
<b>Méthodes</b>	<ul style="list-style-type: none"> <li>• L'usinage en avalant est généralement préconisé</li> <li>• Attention à la programmation, porte-outils, faux rond, équilibrage, fixation, etc améliorent les performances de l'outil en coupe et prolonge la durée de vie</li> </ul>

## GUIDE DU FRAISAGE

$D_1$  = diamètre de coupe       $L_2$  = longueur de coupe


Vitesses & avances pour ces cas d'usinage sont basées sur l'engagement radial ( $ae$ ) et axial ( $ap$ )

La réduction de la vitesse et de l'avance doit être nécessaire quand:

- Les engagements  $ap$  et  $ae$  sont importants
- Des dentures longues ou des séries longues sont utilisées
- Des attachement longs sont utilisés
- Lors d'usinage de matériaux durs

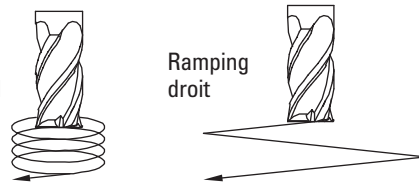
## TYPES D'ENTREE MATIERE

**Preperçage**




Le préperçage est la méthode préférable dans la plupart de applications.

**Ramping hélicoïdal**      **Ramping droit**



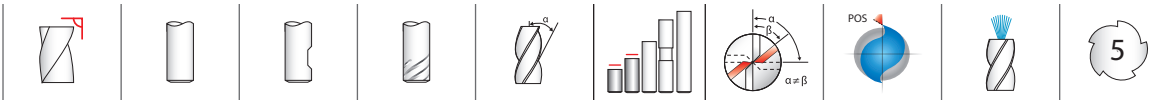
Les autres méthodes sont un ramping hélicoïdal et un ramping droit. Les angles de ramping élevés exigent une avance inférieure. Les angles de ramping inférieurs permettent les taux d'avance supérieurs et prolongeront la vie de l'outil. Utilisez des avances et vitesses de mortaisage pour les angles de ramping de 1° à 2°. Réduisez l'avance à 25 % lorsque les angles de ramping avoisinent 6°. Les outils tout usage et/ou les matériaux difficiles à usiner exigeront des angles de ramping inférieurs et une charge réduite.

**Plongée**

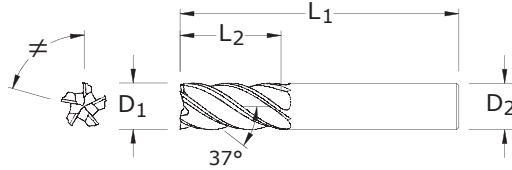


Plongée uniquement dans les non ferreux. Vitesse rainurage et avances réduites de 25%.

# FRACTIONAL Z-Carb-HPR



## Z5 FRACTIONAL SERIES



- An ideal balance of helix, indexing, flute depth, rake and relief
- Variable indexing for chatter suppression and proprietary edge geometry for shearing and strength
- Chatter-free geometry allows deep cutting and high speed machining
- Central coolant hole delivers coolant effectively to the cutting zone enhancing chip removal when pocketing or slotting
- Excels at roughing, ramping, high speed machining and finishing in a variety of materials
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

inch				EDP NO.					STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	TI-NAMITE-A (TA)	TI-NAMITE-A (TA) W/FLAT	TI-NAMITE-M (TM)	TI-NAMITE-M (TM) W/FLAT	TI-NAMITE-M (TM) W/INTERNAL COOLANT	
1/8	1/4	1-1/2	1/8	—	—	37000	—	—	●
1/8	3/8	1-1/2	1/8	37180	—	37002	—	—	●
3/16	5/16	2	3/16	—	—	37004	—	—	●
3/16	1/2	2	3/16	37182	—	37006	—	—	●
1/4	3/8	2-1/2	1/4	—	—	37008	—	—	●
1/4	1/2	2-1/2	1/4	37184	—	37011	—	—	●
5/16	7/16	2-1/2	5/16	—	—	37014	—	—	●
5/16	5/8	2-1/2	5/16	—	—	37016	—	—	●
3/8	1/2	2-1/2	3/8	—	—	37018	—	—	●
3/8	3/4	2-1/2	3/8	37187	—	37021	—	—	●
7/16	5/8	2-1/2	7/16	37168	—	37159	—	—	●
7/16	7/8	2-3/4	7/16	37170	—	37169	—	—	●
1/2	5/8	3	1/2	38506	—	37024	37030	—	●
1/2	1	3	1/2	—	—	37036	37042	—	●
1/2	1-1/4	3-1/4	1/2	37190	37194	37048	37054	—	●
5/8	3/4	3-1/2	5/8	—	—	37060	37067	37260	●
5/8	1-1/4	3-1/2	5/8	37198	37202	37074	37081	37267	●
3/4	7/8	4	3/4	—	—	37088	37095	37274	●
3/4	1-1/2	4	3/4	37206	37210	37102	37109	37281	●
1	1-1/8	4	1	—	—	37116	37123	37288	●
1	1-1/2	4	1	37214	37218	37130	37137	37295	●
1	2	4-1/2	1	—	—	37144	37151	37302	●

Patent Pending Variable Design

### TOLERANCES (inch)

#### 1/8–1/4 DIAMETER

D<sub>1</sub> = +0.0000/–0.0012

D<sub>2</sub> = h<sub>6</sub>

#### >1/4–3/8 DIAMETER

D<sub>1</sub> = +0.0000/–0.0016

D<sub>2</sub> = h<sub>6</sub>

#### >3/8–1 DIAMETER

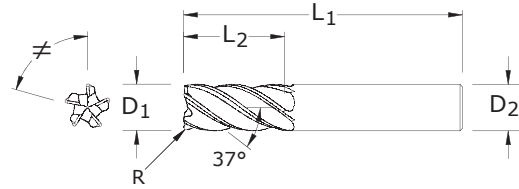
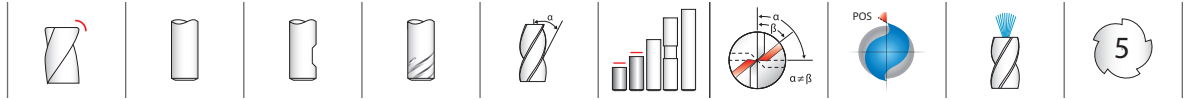
D<sub>1</sub> = +0.0000/–0.0020

D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery





**TOLERANCES (inch)**

**1/8–1/4 DIAMETER**

$D_1 = +0.0000/-0.0012$

$D_2 = h_6$

$R = +0.0000/-0.0020$

**>1/4–3/8 DIAMETER**

$D_1 = +0.0000/-0.0016$

$D_2 = h_6$

$R = +0.0000/-0.0020$

**>3/8–1 DIAMETER**

$D_1 = +0.0000/-0.0020$

$D_2 = h_6$

$R = +0.0000/-0.0020$

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

inch					EDP NO.					STOCK
CUTTING DIA. $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIA. $D_2$	CORNER RADIUS $R$	TI-NAMITE-A (TA)	TI-NAMITE-A (TA) W/FLAT	TI-NAMITE-M (TM)	TI-NAMITE-M (TM) W/FLAT	TI-NAMITE-M (TM) W/INTERNAL COOLANT	
1/8	1/4	1-1/2	1/8	.015	—	—	37001	—	—	●
1/8	3/8	1-1/2	1/8	.015	37181	—	37003	—	—	●
3/16	5/16	2	3/16	.015	—	—	37005	—	—	●
3/16	1/2	2	3/16	.015	37183	—	37007	—	—	●
1/4	3/8	2-1/2	1/4	.015	—	—	37009	—	—	●
1/4	3/8	2-1/2	1/4	.030	—	—	37010	—	—	●
1/4	1/2	2-1/2	1/4	.015	37185	—	37012	—	—	●
1/4	1/2	2-1/2	1/4	.030	37186	—	37013	—	—	●
5/16	7/16	2-1/2	5/16	.015	—	—	37015	—	—	●
5/16	5/8	2-1/2	5/16	.015	—	—	37017	—	—	●
3/8	1/2	2-1/2	3/8	.015	—	—	37019	—	—	●
3/8	1/2	2-1/2	3/8	.030	—	—	37020	—	—	●
3/8	3/4	2-1/2	3/8	.015	37188	—	37022	—	—	●
3/8	3/4	2-1/2	3/8	.030	37189	—	37023	—	—	●
7/16	5/8	2-1/2	7/16	.015	37164	—	37160	—	—	●
7/16	5/8	2-1/2	7/16	.030	37165	—	37161	—	—	●
7/16	7/8	2-3/4	7/16	.015	37166	—	37162	—	—	●
7/16	7/8	2-3/4	7/16	.030	37167	—	37163	—	—	●
1/2	5/8	3	1/2	.015	—	—	37025	37031	—	●
1/2	5/8	3	1/2	.030	—	—	37026	37032	—	●
1/2	5/8	3	1/2	.060	—	—	37027	37033	—	●
1/2	5/8	3	1/2	.090	—	—	37028	37034	—	●
1/2	5/8	3	1/2	.120	—	—	37029	37035	—	●
1/2	1	3	1/2	.015	—	—	37037	37043	—	●
1/2	1	3	1/2	.030	—	—	37038	37044	—	●
1/2	1	3	1/2	.060	—	—	37039	37045	—	●
1/2	1	3	1/2	.090	—	—	37040	37046	—	●
1/2	1	3	1/2	.120	—	—	37041	37047	—	●
1/2	1-1/4	3-1/4	1/2	.015	37191	37195	37049	37055	—	●
1/2	1-1/4	3-1/4	1/2	.030	37192	37196	37050	37056	—	●
1/2	1-1/4	3-1/4	1/2	.060	37193	37197	37051	37057	—	●
1/2	1-1/4	3-1/4	1/2	.090	—	—	37052	37058	—	●
1/2	1-1/4	3-1/4	1/2	.120	—	—	37053	37059	—	●
5/8	3/4	3-1/2	5/8	.015	—	—	37061	37068	37261	●
5/8	3/4	3-1/2	5/8	.030	—	—	37062	37069	37262	●
5/8	3/4	3-1/2	5/8	.060	—	—	37063	37070	37263	●
5/8	3/4	3-1/2	5/8	.090	—	—	37064	37071	37264	●
5/8	3/4	3-1/2	5/8	.120	—	—	37065	37072	37265	●

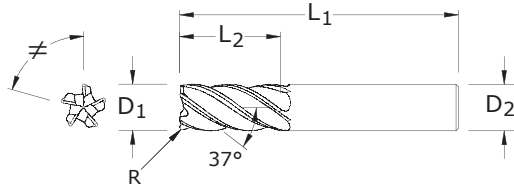
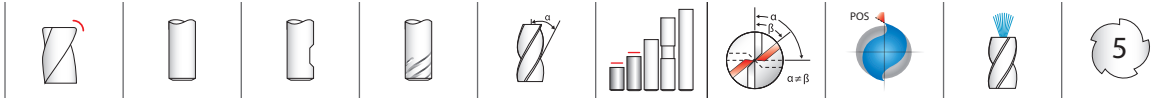
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**Z5CR**  
FRACTIONAL SERIES

- An ideal balance of helix, indexing, flute depth, rake and relief
- Variable indexing for chatter suppression and proprietary edge geometry for shearing and strength
- Chatter-free geometry allows deep cutting and high speed machining
- Central coolant hole delivers coolant effectively to the cutting zone enhancing chip removal when pocketing or slotting
- Enhanced corner geometry with tight tolerance corner radii
- Excels at roughing, ramping, high speed machining and finishing in a variety of materials
- Recommended for materials  $\leq 45$  HRC ( $\leq 420$  Bhn)

Patent Pending Variable Design

# FRACTIONAL Z-Carb-HPR



## Z5CR FRACTIONAL SERIES

CONTINUED

inch					EDP NO.					STOCK
CUTTING DIA. D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIA. D <sub>2</sub>	CORNER RADIUS R	TI-NAMITE-A (TA)	TI-NAMITE-A (TA) W/FLAT	TI-NAMITE-M (TM)	TI-NAMITE-M (TM) W/FLAT	TI-NAMITE-M (TM) W/INTERNAL COOLANT	
5/8	3/4	3-1/2	5/8	.190	—	—	37066	37073	37266	●
5/8	1-1/4	3-1/2	5/8	.015	37199	37203	37075	37082	37268	●
5/8	1-1/4	3-1/2	5/8	.030	37200	37204	37076	37083	37269	●
5/8	1-1/4	3-1/2	5/8	.060	37201	37205	37077	37084	37270	●
5/8	1-1/4	3-1/2	5/8	.090	—	—	37078	37085	37271	●
5/8	1-1/4	3-1/2	5/8	.120	—	—	37079	37086	37272	●
5/8	1-1/4	3-1/2	5/8	.190	—	—	37080	37087	37273	●
3/4	7/8	4	3/4	.030	—	—	37089	37096	37275	●
3/4	7/8	4	3/4	.060	—	—	37090	37097	37276	●
3/4	7/8	4	3/4	.090	—	—	37091	37098	37277	●
3/4	7/8	4	3/4	.120	—	—	37092	37099	37278	●
3/4	7/8	4	3/4	.190	—	—	37093	37100	37279	●
3/4	7/8	4	3/4	.250	—	—	37094	37101	37280	●
3/4	1-1/2	4	3/4	.030	37207	37211	37103	37110	37282	●
3/4	1-1/2	4	3/4	.060	37208	37212	37104	37111	37283	●
3/4	1-1/2	4	3/4	.090	—	—	37105	37112	37284	●
3/4	1-1/2	4	3/4	.120	37209	37213	37106	37113	37285	●
3/4	1-1/2	4	3/4	.190	—	—	37107	37114	37286	●
3/4	1-1/2	4	3/4	.250	—	—	37108	37115	37287	●
1	1-1/8	4	1	.030	—	—	37117	37124	37289	●
1	1-1/8	4	1	.060	—	—	37118	37125	37290	●
1	1-1/8	4	1	.090	—	—	37119	37126	37291	●
1	1-1/8	4	1	.120	—	—	37120	37127	37292	●
1	1-1/8	4	1	.190	—	—	37121	37128	37293	●
1	1-1/8	4	1	.250	—	—	37122	37129	37294	●
1	1-1/2	4	1	.030	37215	37219	37131	37138	37296	●
1	1-1/2	4	1	.060	37216	37220	37132	37139	37297	●
1	1-1/2	4	1	.090	—	—	37133	37140	37298	●
1	1-1/2	4	1	.120	37217	37221	37134	37141	37299	●
1	1-1/2	4	1	.190	—	—	37135	37142	37300	●
1	1-1/2	4	1	.250	—	—	37136	37143	37301	●
1	2	4-1/2	1	.030	—	—	37145	37152	37303	●
1	2	4-1/2	1	.060	—	—	37146	37153	37304	●
1	2	4-1/2	1	.090	—	—	37147	37154	37305	●
1	2	4-1/2	1	.120	—	—	37148	37155	37306	●
1	2	4-1/2	1	.190	—	—	37149	37156	37307	●
1	2	4-1/2	1	.250	—	—	37150	37157	37308	●

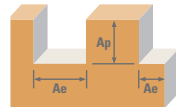
Patent Pending Variable Design

### TOLERANCES (inch)

- 1/8–1/4 DIAMETER**  
D<sub>1</sub> = +0.0000/–0.0012  
D<sub>2</sub> = h<sub>6</sub>  
R = +0.0000/–0.0020
- >1/4–3/8 DIAMETER**  
D<sub>1</sub> = +0.0000/–0.0016  
D<sub>2</sub> = h<sub>6</sub>  
R = +0.0000/–0.0020
- >3/8–1 DIAMETER**  
D<sub>1</sub> = +0.0000/–0.0020  
D<sub>2</sub> = h<sub>6</sub>  
R = +0.0000/–0.0020

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

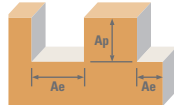
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



Series	Z5, Z5CR	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
						1/8	1/4	3/8	1/2	5/8	3/4	1		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile	≤ 0.5	≤ 1.5	555	RPM	16961	8480	5654	4240	3392	2827	2120
						(444-666)	Fz	0.00046	0.0012	0.0023	0.0031	0.0034	0.0037	0.0043
							Feed (ipm)	39.0	50.9	65.0	65.7	57.7	52.3	45.6
		Slot	1	≤ 1	440	RPM	13446	6723	4482	3362	2689	2241	1681	
					(352-528)	Fz	0.00046	0.0012	0.0023	0.0031	0.0034	0.0037	0.0043	
						Feed (ipm)	30.9	40.3	51.5	52.1	45.7	41.5	36.1	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile	≤ 0.5	≤ 1.5	315	RPM	9626	4813	3209	2407	1925	1604	1203
						(252-378)	Fz	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032
							Feed (ipm)	16.4	21.7	27.3	27.7	25.0	22.5	19.3
		Slot	1	≤ 1	250	RPM	7640	3820	2547	1910	1528	1273	955	
					(200-300)	Fz	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032	
						Feed (ipm)	13.0	17.2	21.6	22.0	19.9	17.8	15.3	
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile	≤ 0.5	≤ 1.5	185	RPM	5654	2827	1885	1413	1131	942	707
						(148-222)	Fz	0.00028	0.0007	0.0014	0.0018	0.0020	0.0022	0.0026
							Feed (ipm)	7.9	9.9	13.2	12.7	11.3	10.4	9.2
		Slot	1	≤ 1	145	RPM	4431	2216	1477	1108	886	739	554	
					(116-174)	Fz	0.00028	0.0007	0.0014	0.0018	0.0020	0.0022	0.0026	
						Feed (ipm)	6.2	7.8	10.3	10.0	8.9	8.1	7.2	
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile	≤ 0.5	≤ 1.5	445	RPM	13599	6800	4533	3400	2720	2267	1700
						(356-534)	Fz	0.00042	0.0011	0.0021	0.0028	0.0031	0.0034	0.0039
							Feed (ipm)	28.6	37.4	47.6	47.6	42.2	38.5	33.1
		Slot	1	≤ 1	355	RPM	10849	5424	3616	2712	2170	1808	1356	
					(284-426)	Fz	0.00042	0.0011	0.0021	0.0028	0.0031	0.0034	0.0039	
						Feed (ipm)	22.8	29.8	38.0	38.0	33.6	30.7	26.4	
M	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile	≤ 0.5	≤ 1.5	340	RPM	10390	5195	3463	2598	2078	1732	1299
						(272-408)	Fz	0.00031	0.0008	0.0016	0.0021	0.0023	0.0025	0.0029
							Feed (ipm)	16.1	21.8	27.7	27.3	23.9	21.6	18.8
		Slot	1	≤ 1	270	RPM	8251	4126	2750	2063	1650	1375	1031	
					(216-324)	Fz	0.00031	0.0008	0.0016	0.0021	0.0023	0.0025	0.0029	
						Feed (ipm)	12.8	17.3	22.0	21.7	19.0	17.2	15.0	
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile	≤ 0.5	≤ 1.5	490	RPM	14974	7487	4991	3744	2995	2496	1872
						(392-588)	Fz	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032
							Feed (ipm)	25.5	33.7	42.4	43.1	38.9	34.9	29.9
		Slot	1	≤ 1	390	RPM	11918	5959	3973	2980	2384	1986	1490	
					(312-468)	Fz	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032	
						Feed (ipm)	20.3	26.8	33.8	34.3	31.0	27.8	23.8	
M	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile	≤ 0.5	≤ 1.5	340	RPM	10390	5195	3463	2598	2078	1732	1299
						(272-408)	Fz	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025
							Feed (ipm)	14.0	18.2	24.2	23.4	20.8	19.0	16.2
		Slot	1	≤ 1	270	RPM	8251	4126	2750	2063	1650	1375	1031	
					(216-324)	Fz	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025	
						Feed (ipm)	11.1	14.4	19.3	18.6	16.5	15.1	12.9	

continued on next page

# FRACTIONAL Z-Carb-HPR



Series Z5, Z5CR Fractional	Hardness	Profile	Ae x D1	Ap x D1	Vc (sfm)	Diameter (D1) (inch)									
						1/8	1/4	3/8	1/2	5/8	3/4	1			
<b>M</b>  STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.5	≤ 1.5	310 (248-372)	RPM	9474	4737	3158	2368	1895	1579	1184		
						Fz	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025		
						Feed (ipm)	12.8	16.6	22.1	21.3	18.9	17.4	14.8		
		Slot 	1	≤ 1	250 (200-300)	RPM	7640	3820	2547	1910	1528	1273	955		
						Fz	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025		
						Feed (ipm)	10.3	13.4	17.8	17.2	15.3	14.0	11.9		
<b>S</b>  SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.5	≤ 1.5	80 (64-96)	RPM	2445	1222	815	611	489	407	306		
						Fz	0.00025	0.00068	0.00128	0.00170	0.00187	0.00204	0.00238		
						Feed (ipm)	3.1	4.2	5.2	5.2	4.6	4.2	3.6		
		Slot 	1	≤ 1	65 (52-78)	RPM	1986	993	662	497	397	331	248		
						Fz	0.00025	0.00068	0.00128	0.00170	0.00187	0.00204	0.00238		
						Feed (ipm)	2.5	3.4	4.2	4.2	3.7	3.4	3.0		
		<b>S</b>  SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.5	≤ 1.5	62 (50-74)	RPM	1895	947	632	474	379	316	237
								Fz	0.00018	0.00048	0.00090	0.00120	0.00130	0.00140	0.00170
								Feed (ipm)	1.7	2.3	2.8	2.8	2.5	2.2	2.0
				Slot 	1	≤ 1	50 (40-60)	RPM	1528	764	509	382	306	255	191
								Fz	0.00018	0.00048	0.00090	0.00120	0.00130	0.00140	0.00170
								Feed (ipm)	1.4	1.8	2.3	2.3	2.0	1.8	1.6
<b>S</b>  TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc			Profile 	≤ 0.5	≤ 1.5	215 (172-258)	RPM	6570	3285	2190	1643	1314	1095	821
								Fz	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028
								Feed (ipm)	9.9	13.1	16.4	16.4	14.5	13.1	11.5
				Slot 	1	≤ 1	170 (136-204)	RPM	5195	2598	1732	1299	1039	866	649
								Fz	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028
								Feed (ipm)	7.8	10.4	13.0	13.0	11.4	10.4	9.1
		<b>S</b>  TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRc	Profile 	≤ 0.5	≤ 1.5	75 (60-90)	RPM	2292	1146	764	573	458	382	287
								Fz	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028
								Feed (ipm)	3.4	4.6	5.7	5.7	5.0	4.6	4.0
				Slot 	1	≤ 1	60 (48-72)	RPM	1834	917	611	458	367	306	229
								Fz	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028
								Feed (ipm)	2.8	3.7	4.6	4.6	4.0	3.7	3.2

Bhn (Brinell)      HRc (Rockwell C)

$rpm = Vc \times 3.82 / D_1$

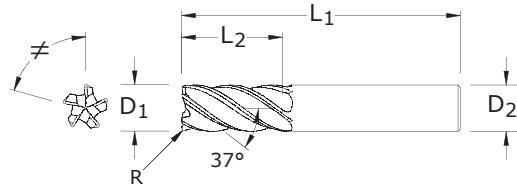
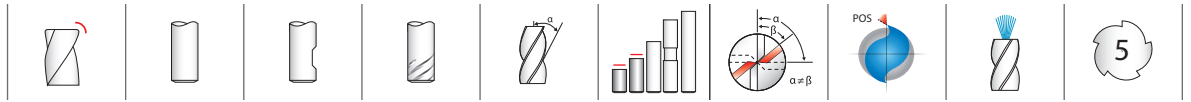
$ipm = Fz \times 5 \times rpm$

ramp at 5 degrees or less, using slotting speed and feed rates (do not plunge)

reduce speed and feed for materials harder than listed

reduce feed and Ae when finish milling (.02 x D1 maximum)

refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



**TOLERANCES (mm)**

**6 DIAMETER**

D<sub>1</sub> = +0,000/-0,030

D<sub>2</sub> = h<sub>6</sub>

R = +0,000/-0,050

**>6-10 DIAMETER**

D<sub>1</sub> = +0,000/-0,040

D<sub>2</sub> = h<sub>6</sub>

R = +0,000/-0,050

**>10-25 DIAMETER**

D<sub>1</sub> = +0,000/-0,050

D<sub>2</sub> = h<sub>6</sub>

R = +0,000/-0,050

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

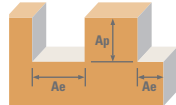
mm					EDP NO.						STOCK
CUTTING DIA. D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIA. D <sub>2</sub>	CORNER RADIUS R	TI-NAMITE-A (TA) EDP NO.	TI-NAMITE-A (TA) W/FLAT	TI-NAMITE-A (TA) EDP NO. W/INTERNAL COOLANT	TI-NAMITE-M (TM) EDP NO.	TI-NAMITE-M (TM) EDP NO. W/FLAT	TI-NAMITE-M (TM) EDP NO. W/INTERNAL COOLANT	
6,0	9,0	54,0	6,0	0,5	—	—	—	47000	—	—	●
6,0	13,0	57,0	6,0	0,3	—	—	—	47001	—	—	●
6,0	13,0	57,0	6,0	0,5	47120	—	—	47002	—	—	●
6,0	13,0	57,0	6,0	1,0	—	—	—	47003	—	—	●
6,0	13,0	57,0	6,0	1,5	—	—	—	47004	—	—	●
8,0	11,0	58,0	8,0	0,5	—	—	—	47005	—	—	●
8,0	18,0	63,0	8,0	0,5	47121	—	—	47006	—	—	●
8,0	18,0	63,0	8,0	1,0	47122	—	—	47007	—	—	●
8,0	18,0	63,0	8,0	1,5	—	—	—	47008	—	—	●
8,0	18,0	63,0	8,0	2,0	—	—	—	47009	—	—	●
10,0	13,0	66,0	10,0	1,0	—	—	—	47010	—	—	●
10,0	22,0	72,0	10,0	0,5	47123	—	—	47011	—	—	●
10,0	22,0	72,0	10,0	1,0	47124	—	—	47012	—	—	●
10,0	22,0	72,0	10,0	1,5	—	—	—	47013	—	—	●
10,0	22,0	72,0	10,0	2,0	—	—	—	47014	—	—	●
10,0	22,0	72,0	10,0	2,5	—	—	—	47015	—	—	●
12,0	15,0	73,0	12,0	1,0	—	—	—	47016	47024	—	●
12,0	26,0	83,0	12,0	0,5	47125	47128	—	47017	47025	—	●
12,0	26,0	83,0	12,0	0,76	47126	47129	—	47018	47026	—	●
12,0	26,0	83,0	12,0	1,0	47127	47130	—	47019	47027	—	●
12,0	26,0	83,0	12,0	1,5	48012	—	—	47020	47028	—	●
12,0	26,0	83,0	12,0	2,0	—	—	—	47021	47029	—	●
12,0	26,0	83,0	12,0	2,5	—	—	—	47022	47030	—	●
12,0	26,0	83,0	12,0	3,0	—	—	—	47023	47031	—	●
16,0	19,0	82,0	16,0	1,0	—	—	—	47032	47039	47046	●
16,0	19,0	82,0	16,0	1,5	48070	—	—	—	—	—	●
16,0	35,0	92,0	16,0	1,0	47131	—	47134	47033	47040	47047	●
16,0	35,0	92,0	16,0	1,5	—	—	—	47034	47041	47048	●
16,0	35,0	92,0	16,0	2,0	47132	—	47135	47035	47042	47049	●
16,0	35,0	92,0	16,0	2,5	—	—	—	47036	47043	47050	●
16,0	35,0	92,0	16,0	3,0	47133	—	47136	47037	47044	47051	●
16,0	35,0	92,0	16,0	4,0	—	—	—	47038	47045	47052	●
20,0	23,0	92,0	20,0	1,0	48020	—	—	47053	47061	47069	●
20,0	43,0	104,0	20,0	1,0	47137	—	47140	47054	47062	47070	●
20,0	43,0	104,0	20,0	1,5	—	—	—	47055	47063	47071	●
20,0	43,0	104,0	20,0	2,0	47138	—	47141	47056	47064	47072	●
20,0	43,0	104,0	20,0	2,5	—	—	—	47057	47065	47073	●
20,0	43,0	104,0	20,0	3,0	47139	—	47142	47058	47066	47074	●
20,0	43,0	104,0	20,0	4,0	—	—	—	47059	47067	47075	●
20,0	43,0	104,0	20,0	5,0	—	—	—	47060	47068	47076	●
25,0	28,0	100,0	25,0	1,0	—	—	—	47077	47084	47091	●
25,0	53,0	121,0	25,0	1,0	47143	—	47146	47078	47085	47092	●
25,0	53,0	121,0	25,0	2,0	47144	—	47147	47079	47086	47093	●
25,0	53,0	121,0	25,0	2,5	—	—	—	47080	47087	47094	●
25,0	53,0	121,0	25,0	3,0	47145	—	47148	47081	47088	47095	●
25,0	53,0	121,0	25,0	4,0	—	—	—	47082	47089	47096	●
25,0	53,0	121,0	25,0	5,0	—	—	—	47083	47090	47097	●

**Z5MCR**  
METRIC SERIES

- An ideal balance of helix, indexing, flute depth, rake and relief
- Variable indexing for chatter suppression and proprietary edge geometry for shearing and strength
- Chatter-free geometry allows deep cutting and high speed machining
- Central coolant hole delivers coolant effectively to the cutting zone enhancing chip removal when pocketing or slotting
- Enhanced corner geometry with tight tolerance corner radii
- Excels at roughing, ramping, high speed machining and finishing in a variety of materials
- Recommended for materials ≤ 45 HRC (≤ 420 Bhn)

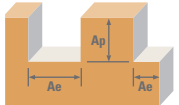












# Z-Carb-HPR



Series Z5MCR	Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
						6	8	10	12	16	20	25		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	169	RPM	8967	6725	5380	4484	3363	2690	2152
						(135-203)	Fz	0.029	0.049	0.061	0.074	0.087	0.099	0.108
						Feed (mm/min)	1291	1650	1650	1668	1463	1327	1157	
			Slot 	1	≤ 1	134	RPM	7109	5332	4265	3555	2666	2133	1706
						(107-161)	Fz	0.029	0.049	0.061	0.074	0.087	0.099	0.108
						Feed (mm/min)	1024	1308	1308	1322	1160	1052	917	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ 1.5	96	RPM	5089	3817	3054	2545	1909	1527	1221
						(77-115)	Fz	0.022	0.036	0.045	0.055	0.067	0.075	0.080
						Feed (mm/min)	550	692	692	702	635	570	489	
			Slot 	1	≤ 1	76	RPM	4039	3029	2424	2020	1515	1212	969
						(61-91)	Fz	0.022	0.036	0.045	0.055	0.067	0.075	0.080
						Feed (mm/min)	436	549	549	557	504	452	388	
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ 1.5	56	RPM	2989	2242	1793	1495	1121	897	717
						(45-68)	Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.065
						Feed (mm/min)	251	335	335	323	287	263	233	
			Slot 	1	≤ 1	44	RPM	2343	1757	1406	1171	879	703	562
						(35-53)	Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.065
						Feed (mm/min)	197	262	262	253	225	206	183	
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.5	≤ 1.5	136	RPM	7190	5392	4314	3595	2696	2157	1726
						(109-163)	Fz	0.026	0.045	0.056	0.067	0.079	0.091	0.098
						Feed (mm/min)	949	1208	1208	1208	1070	978	841	
			Slot 	1	≤ 1	108	RPM	5736	4302	3441	2868	2151	1721	1377
						(87-130)	Fz	0.026	0.045	0.056	0.067	0.079	0.091	0.098
						Feed (mm/min)	757	964	964	964	853	780	671	
CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.5	≤ 1.5	104	RPM	5493	4120	3296	2747	2060	1648	1318	
					(83-124)	Fz	0.020	0.034	0.043	0.050	0.059	0.067	0.073	
					Feed (mm/min)	554	703	703	692	606	549	478		
		Slot 	1	≤ 1	82	RPM	4362	3272	2617	2181	1636	1309	1047	
					(66-99)	Fz	0.020	0.034	0.043	0.050	0.059	0.067	0.073	
					Feed (mm/min)	440	558	558	550	482	436	380		
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	149	RPM	7917	5938	4750	3958	2969	2375	1900
						(119-179)	Fz	0.022	0.036	0.045	0.055	0.067	0.075	0.080
						Feed (mm/min)	855	1077	1077	1092	988	887	760	
			Slot 	1	≤ 1	119	RPM	6301	4726	3781	3151	2363	1890	1512
						(95-143)	Fz	0.022	0.036	0.045	0.055	0.067	0.075	0.080
						Feed (mm/min)	680	857	857	869	786	706	605	
STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	104	RPM	5493	4120	3296	2747	2060	1648	1318	
					(83-124)	Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.063	
					Feed (mm/min)	461	615	615	593	527	483	412		
		Slot 	1	≤ 1	82	RPM	4362	3272	2617	2181	1636	1309	1047	
					(66-99)	Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.063	
					Feed (mm/min)	366	489	489	471	419	384	327		

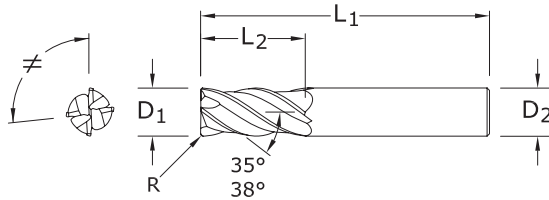
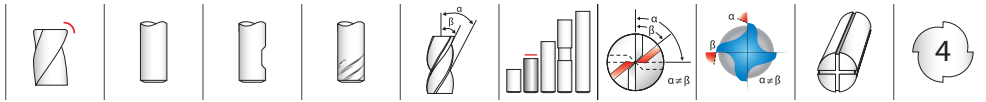
continued on next page



Series Z5MCR	Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)									
						6	8	10	12	16	20	25			
M	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.5	≤ 1.5	94	RPM	5009	3756	3005	2504	1878	1503	1202	
						(76-113)	Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.063	
							Feed (mm/min)	421	561	561	541	481	441	376	
			Slot 	1	≤ 1	76	RPM	4039	3029	2424	2020	1515	1212	969	
						(61-91)	Fz	0.017	0.030	0.037	0.043	0.051	0.059	0.063	
							Feed (mm/min)	339	452	452	436	388	355	303	
	S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.5	≤ 1.5	24	RPM	1293	969	776	646	485	388	310
							(20-29)	Fz	0.0160	0.0272	0.0340	0.0409	0.0478	0.0531	0.0599
								Feed (mm/min)	103	132	132	132	116	103	93
				Slot 	1	≤ 1	20	RPM	1050	788	630	525	394	315	252
(16-24)							Fz	0.0160	0.0272	0.0340	0.0409	0.0478	0.0531	0.0599	
							Feed (mm/min)	84	107	107	107	94	84	75	
SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene		≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.5	≤ 1.5	19	RPM	1002	751	601	501	376	301	240	
						(15-23)	Fz	0.0112	0.0192	0.0239	0.0284	0.0333	0.0371	0.0420	
							Feed (mm/min)	56	72	72	71	63	56	50	
			Slot 	1	≤ 1	15	RPM	808	606	485	404	303	242	194	
	(12-18)					Fz	0.0112	0.0192	0.0239	0.0284	0.0333	0.0371	0.0420		
						Feed (mm/min)	45	58	58	57	50	45	41		
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.5	≤ 1.5	66	RPM	3474	2605	2084	1737	1303	1042	834		
					(52-79)	Fz	0.019	0.032	0.040	0.048	0.056	0.064	0.070		
						Feed (mm/min)	333	417	417	417	367	333	292		
		Slot 	1	≤ 1	52	RPM	2747	2060	1648	1373	1030	824	659		
					(41-62)	Fz	0.019	0.032	0.040	0.048	0.056	0.064	0.070		
						Feed (mm/min)	264	330	330	330	290	264	231		
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRc	Profile 	≤ 0.5	≤ 1.5	23	RPM	1212	909	727	606	454	364	291		
					(18-27)	Fz	0.019	0.032	0.040	0.048	0.056	0.064	0.071		
						Feed (mm/min)	116	145	145	145	128	116	103		
		Slot 	1	≤ 1	18	RPM	969	727	582	485	364	291	233		
					(15-22)	Fz	0.019	0.032	0.040	0.048	0.056	0.064	0.071		
						Feed (mm/min)	93	116	116	116	102	93	83		

Bhn (Brinell)      HRc (Rockwell C)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fz \times 5 \times rpm$   
 ramp at 5 degrees or less, using slotting speed and feed rates (do not plunge)  
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# FRACTIONAL Z-Carb-AP



## Z1PCR FRACTIONAL SERIES

- Patented variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Patented unequal helix design aids in damaging harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			EDP NO.			STOCK
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	CORNER RADIUS R	Ti-NAMITE-X	Ti-NAMITE-X W/FLAT	JetStream*	
1/64	1/32	1-1/2	1/8	.003	36874	—	—	●
1/32	5/64	1-1/2	1/8	.005	36875	—	—	●
3/64	7/64	1-1/2	1/8	.005	36876	—	—	●
1/16	3/16	1-1/2	1/8	.005	36872	—	—	●
5/64	3/16	1-1/2	1/8	.005	36877	—	—	●
3/32	9/32	1-1/2	1/8	.010	36873	—	—	●
7/64	3/8	1-1/2	1/8	.010	36878	—	—	●
1/8	3/8	1-1/2	1/8	.010	36370	—	—	●
1/8	3/8	1-1/2	1/8	.015	36851	—	—	●
3/16	7/16	2	3/16	.010	36371	—	—	●
3/16	7/16	2	3/16	.015	36852	—	—	●
3/16	7/16	2	3/16	.030	36722	—	—	●
1/4	1/2	2-1/2	1/4	.010	36372	—	—	●
1/4	1/2	2-1/2	1/4	.015	36723	—	—	●
1/4	1/2	2-1/2	1/4	.020	36853	—	—	●
1/4	1/2	2-1/2	1/4	.030	36373	—	—	●
1/4	3/4	2-1/2	1/4	.010	36599	—	—	●
1/4	3/4	2-1/2	1/4	.015	36600	—	—	●
1/4	3/4	2-1/2	1/4	.020	36854	—	—	●
1/4	3/4	2-1/2	1/4	.030	36601	—	—	●
5/16	13/16	2-1/2	5/16	.015	36724	—	—	●
5/16	13/16	2-1/2	5/16	.020	36855	—	—	●
5/16	13/16	2-1/2	5/16	.030	36374	—	—	●
3/8	7/8	2-1/2	3/8	.010	36375	36701	—	●
3/8	7/8	2-1/2	3/8	.015	36725	36736	—	●
3/8	7/8	2-1/2	3/8	.020	36856	36864	—	●
3/8	7/8	2-1/2	3/8	.030	36376	36702	—	●
3/8	7/8	2-1/2	3/8	.060	36727	36738	—	●

### TOLERANCES (inch)

#### <1/8 DIAMETER

$D_1 = +0.0005/-0.0005$

$D_2 = h_6$

$R = +0.000/-0.0010$

#### 1/8-1/4 DIAMETER

$D_1 = +0.000/-0.0012$

$D_2 = h_6$

$R = +0.000/-0.0020$

#### >1/4-3/8 DIAMETER

$D_1 = +0.000/-0.0016$

$D_2 = h_6$

$R = +0.000/-0.0020$

#### >3/8-1 DIAMETER

$D_1 = +0.000/-0.0020$

$D_2 = h_6$

$R = +0.000/-0.0020$

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

HARDENED STEELS

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

continued on next page

\*JetStream Patented Coolant Technology  
U.S. Patents 7,306,408 and 7,789,597



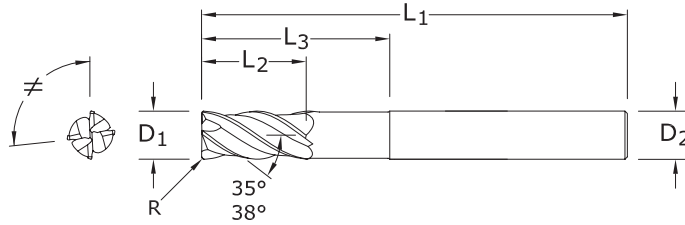
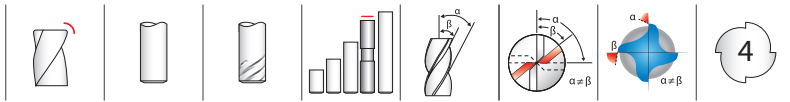
**Z1PCR**  
FRACTIONAL SERIES

CONTINUED

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			EDP NO.			STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R	Ti-NAMITE-X	Ti-NAMITE-X W/FLAT	JetStream*	
7/16	1	2-3/4	7/16	.020	36857	36865	—	●
1/2	1	3	1/2	.010	36378	36704	36804	●
1/2	1	3	1/2	.015	36729	36740	36810	●
1/2	1	3	1/2	.030	36858	36866	36805	●
1/2	1	3	1/2	.060	36380	36706	36811	●
1/2	1	3	1/2	.090	36381	36707	36812	●
1/2	1	3	1/2	.125	36731	36742	36813	●
1/2	1-1/4	3-1/4	1/2	.010	36602	36603	—	●
1/2	1-1/4	3-1/4	1/2	.015	36604	36605	—	●
1/2	1-1/4	3-1/4	1/2	.030	36859	36867	—	●
1/2	1-1/4	3-1/4	1/2	.060	36610	36611	—	●
1/2	1-1/4	3-1/4	1/2	.090	36612	36613	—	●
1/2	1-1/4	3-1/4	1/2	.125	36614	36615	—	●
9/16	1-1/8	3-1/2	9/16	.030	36860	36868	36806	●
5/8	1-1/4	3-1/2	5/8	.030	36383	36709	36814	●
5/8	1-1/4	3-1/2	5/8	.040	36861	36869	36807	●
5/8	1-1/4	3-1/2	5/8	.060	36384	36710	36815	●
5/8	1-1/4	3-1/2	5/8	.090	36385	36711	36816	●
5/8	1-1/4	3-1/2	5/8	.125	36733	36744	36817	●
3/4	1-1/2	4	3/4	.030	36386	36712	36818	●
3/4	1-1/2	4	3/4	.040	36862	36870	36808	●
3/4	1-1/2	4	3/4	.060	36387	36713	36819	●
3/4	1-1/2	4	3/4	.090	36388	36714	36820	●
3/4	1-1/2	4	3/4	.125	36389	36715	36821	●
1	1-1/2	4	1	.030	36390	36716	36822	●
1	1-1/2	4	1	.040	36863	36871	36809	●
1	1-1/2	4	1	.060	36391	36717	36823	●
1	1-1/2	4	1	.090	36392	36718	36824	●
1	1-1/2	4	1	.125	36393	36719	36825	●

\*JetStream Patented Coolant Technology  
U.S. Patents 7,306,408 and 7,789,597

# FRACTIONAL Z-Carb-AP



## Z1PLC FRACTIONAL SERIES

- Patented variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Patented unequal helix design aids in damaging harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Long reach design allows for deeper and faster cuts
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch				CORNER RADIUS $R$	EDP NO. Ti-NAMITE-X	STOCK
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$				
1/4	1/2	2-1/2	1/4	1-1/8	.020	36447	●	
1/4	1/2	3-1/2	1/4	1-5/8	.020	36448	●	
1/4	1/2	4	1/4	1-1/4	.020	36450	●	
1/4	1/2	4	1/4	2-1/8	.020	36449	●	
5/16	13/16	3	5/16	1-3/8	.020	36453	●	
5/16	13/16	4	5/16	2	.020	36454	●	
5/16	13/16	4	5/16	1-5/8	.020	36452	●	
3/8	7/8	3	3/8	1-5/8	.020	36457	●	
3/8	7/8	5	3/8	1-7/8	.020	36456	●	
3/8	7/8	4	3/8	2-3/8	.020	36458	●	
7/16	1	6	7/16	2	.020	36460	●	
1/2	1	4	1/2	2	.030	36463	●	
1/2	1	5	1/2	3	.030	36464	●	
1/2	1	6	1/2	2-1/4	.030	36462	●	
9/16	1-1/8	6	9/16	2-1/2	.030	36466	●	
5/8	1-1/4	5	5/8	2-1/2	.040	36468	●	
5/8	1-1/4	6	5/8	3-3/4	.040	36469	●	
5/8	1-1/4	6	5/8	3	.040	36470	●	
3/4	1-1/2	6	3/4	3-1/2	.040	36472	●	
1	1-1/2	6	1	3	.040	36475	●	
1	1-1/2	6	1	4	.040	36474	●	

U.S. Patents 7,306,408 and 7,789,597

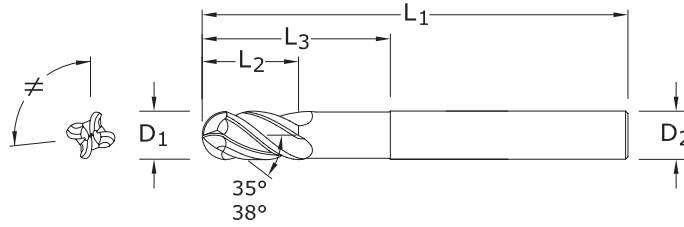
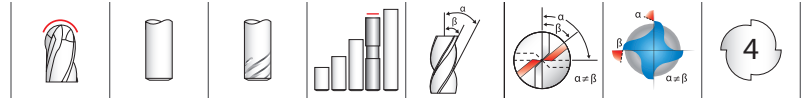
### TOLERANCES (inch)

- 1/4 DIAMETER**  
 $D_1 = +0.0000/-0.0012$   
 $D_2 = h_6$   
 $R = +0.0000/-0.0020$
- >1/4-3/8 DIAMETER**  
 $D_1 = +0.0000/-0.0016$   
 $D_2 = h_6$   
 $R = +0.0000/-0.0020$
- >3/8-1 DIAMETER**  
 $D_1 = +0.0000/-0.0020$   
 $D_2 = h_6$   
 $R = +0.0000/-0.0020$

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery





**TOLERANCES (inch)**

**1/4 DIAMETER**

$D_1 = +0.0000/-0.0012$

$D_2 = h_6$

**>1/4-3/8 DIAMETER**

$D_1 = +0.0000/-0.0016$

$D_2 = h_6$

**>3/8-1 DIAMETER**

$D_1 = +0.0000/-0.0020$

$D_2 = h_6$

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

HARDENED STEELS

● U.S. Stock Standard

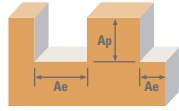
■ NOT STOCKED—  
Call for Delivery







**Z1PLB**  
FRACTIONAL SERIES

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			EDP NO.	STOCK
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	Ti-NAMITE-X	
1/4	1/2	4	1/4	1-1/4	36480	●
5/16	13/16	4	5/16	1-5/8	36482	●
3/8	7/8	5	3/8	1-7/8	36486	●
7/16	1	6	7/16	2	38490	●
1/2	1	6	1/2	2-1/4	38492	●
9/16	1-1/8	6	9/16	2-1/2	38496	●
5/8	1-1/4	6	5/8	3	36500	●
3/4	1-1/2	6	3/4	3-1/2	36502	●
1	1-1/2	6	1	4	36504	●

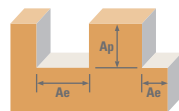
- Patented variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Patented unequal helix design aids in damping harmonics by changing the angle at which each cutting edge enters and exits the material
- Long reach design allows for deeper and faster cuts
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 45$  HRC ( $\leq 420$  Bhn)

# FRACTIONAL Z-Carb-AP



Series Z1PCR, Z1PLC, Z1PLB Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)										
					1/64	1/8	1/4	3/8	1/2	5/8	3/4	1			
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	555	RPM	135904	16961	8480	5654	4240	3392	2827	2120	
					(444-666)	Fz	0.00005	0.00046	0.0012	0.0023	0.0031	0.0034	0.0037	0.0043	
					Feed (ipm)	27.2	31.2	40.7	52.0	52.6	46.1	41.8	36.5		
					440	RPM	107744	13446	6723	4482	3362	2689	2241	1681	
					(352-528)	Fz	0.00005	0.00046	0.0012	0.0023	0.0031	0.0034	0.0037	0.0043	
					Feed (ipm)	21.5	24.7	32.3	41.2	41.7	36.6	33.2	28.9		
	≤ 375 Bhn or ≤ 40 HRc	Slot 	1	≤ 1	315	RPM	77135	9626	4813	3209	2407	1925	1604	1203	
					(252-378)	Fz	0.00004	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032	
					Feed (ipm)	12.3	13.1	17.3	21.8	22.1	20.0	18.0	15.4		
					250	RPM	61218	7640	3820	2547	1910	1528	1273	955	
					(200-300)	Fz	0.00004	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032	
					Feed (ipm)	9.8	10.4	13.8	17.3	17.6	15.9	14.3	12.2		
<b>H</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ 1.5	185	RPM	45301	5654	2827	1885	1413	1131	942	707	
					(148-222)	Fz	0.00003	0.00028	0.0007	0.0014	0.0018	0.0020	0.0022	0.0026	
					Feed (ipm)	5.4	6.3	7.9	10.6	10.2	9.0	8.3	7.3		
					145	RPM	35506	4431	2216	1477	1108	886	739	554	
					(116-174)	Fz	0.00003	0.00028	0.0007	0.0014	0.0018	0.0020	0.0022	0.0026	
					Feed (ipm)	4.3	5.0	6.2	8.3	8.0	7.1	6.5	5.8		
	<b>K</b>  <b>CAST IRONS</b> (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.5	≤ 1.5	445	RPM	108968	13599	6800	4533	3400	2720	2267	1700
						(356-534)	Fz	0.00005	0.00042	0.0011	0.0021	0.0028	0.0031	0.0034	0.0039
						Feed (ipm)	21.8	22.8	29.9	38.1	38.1	33.7	30.8	26.5	
						355	RPM	86929	10849	5424	3616	2712	2170	1808	1356
						(284-426)	Fz	0.00005	0.00042	0.0011	0.0021	0.0028	0.0031	0.0034	0.0039
						Feed (ipm)	17.4	18.2	23.9	30.4	30.4	26.9	24.6	21.2	
≤ 260 Bhn or ≤ 26 HRc		Slot 	1	≤ 1	340	RPM	83256	10390	5195	3463	2598	2078	1732	1299	
					(272-408)	Fz	0.00004	0.00031	0.0008	0.0016	0.0021	0.0023	0.0025	0.0029	
					Feed (ipm)	13.3	12.9	17.5	22.2	21.8	19.1	17.3	15.1		
					270	RPM	66115	8251	4126	2750	2063	1650	1375	1031	
					(216-324)	Fz	0.00004	0.00031	0.0008	0.0016	0.0021	0.0023	0.0025	0.0029	
					Feed (ipm)	10.6	10.2	13.9	17.6	17.3	15.2	13.8	12.0		
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	490	RPM	119987	14974	7487	4991	3744	2995	2496	1872	
					(392-588)	Fz	0.00004	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032	
					Feed (ipm)	19.2	20.4	27.0	33.9	34.4	31.1	28.0	24.0		
					390	RPM	95500	11918	5959	3973	2980	2384	1986	1490	
					(312-468)	Fz	0.00004	0.00034	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032	
					Feed (ipm)	15.3	16.2	21.5	27.0	27.4	24.8	22.2	19.1		

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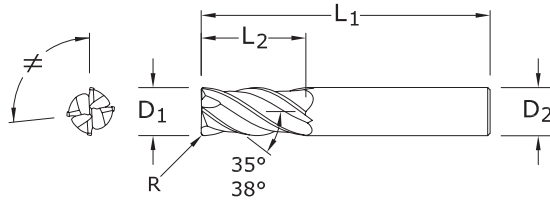
Series Z1PCR, Z1PLC, Z1PLB Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)										
					1/64	1/8	1/4	3/8	1/2	5/8	3/4	1			
M	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	340	RPM	83256	10390	5195	3463	2598	2078	1732	1299
						(272-408)	Fz	0.00003	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025
						Feed (ipm)	10.0	11.2	14.5	19.4	18.7	16.6	15.2	13.0	
			Slot 	1	≤ 1	270	RPM	66115	8251	4126	2750	2063	1650	1375	1031
						(216-324)	Fz	0.00003	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025
						Feed (ipm)	7.9	8.9	11.6	15.4	14.9	13.2	12.1	10.3	
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.5	≤ 1.5	310	RPM	75910	9474	4737	3158	2368	1895	1579	1184
						(248-372)	Fz	0.00003	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025
						Feed (ipm)	9.1	10.2	13.3	17.7	17.1	15.2	13.9	11.8	
			Slot 	1	≤ 1	250	RPM	61218	7640	3820	2547	1910	1528	1273	955
						(200-300)	Fz	0.00003	0.00027	0.0007	0.0014	0.0018	0.0020	0.0022	0.0025
						Feed (ipm)	7.3	8.3	10.7	14.3	13.8	12.2	11.2	9.6	
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.5	≤ 1.5	80	RPM	19590	2445	1222	815	611	489	407	306
						(64-96)	Fz	0.00003	0.00025	0.0007	0.0013	0.0017	0.0019	0.0020	0.0024
						Feed (ipm)	2.4	2.4	3.3	4.2	4.2	3.7	3.3	2.9	
			Slot 	1	≤ 1	65	RPM	15917	1986	993	662	497	397	331	248
						(52-78)	Fz	0.00003	0.00025	0.0007	0.0013	0.0017	0.0019	0.0020	0.0024
						Feed (ipm)	1.9	2.0	2.7	3.4	3.4	3.0	2.7	2.4	
	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.5	≤ 1.5	62	RPM	15182	1895	947	632	474	379	316	237
						(50-74)	Fz	0.00002	0.00018	0.0005	0.0009	0.0012	0.0013	0.0014	0.0017
						Feed (ipm)	1.2	1.4	1.8	2.3	2.3	2.0	1.8	1.6	
			Slot 	1	≤ 1	50	RPM	12244	1528	764	509	382	306	255	191
						(40-60)	Fz	0.00002	0.00018	0.0005	0.0009	0.0012	0.0013	0.0014	0.0017
						Feed (ipm)	1.0	1.1	1.5	1.8	1.8	1.6	1.4	1.3	
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.5	≤ 1.5	215	RPM	52647	6570	3285	2190	1643	1314	1095	821	
					(172-258)	Fz	0.00003	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028	
					Feed (ipm)	6.3	7.9	10.5	13.1	13.1	11.6	10.5	9.2		
		Slot 	1	≤ 1	170	RPM	41628	5195	2598	1732	1299	1039	866	649	
					(136-204)	Fz	0.00003	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028	
					Feed (ipm)	5.0	6.2	8.3	10.4	10.4	9.1	8.3	7.3		
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRc	Profile 	≤ 0.5	≤ 1.5	75	RPM	18365	2292	1146	764	573	458	382	287	
					(60-90)	Fz	0.00003	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028	
					Feed (ipm)	2.2	2.8	3.7	4.6	4.6	4.0	3.7	3.2		
		Slot 	1	≤ 1	60	RPM	14692	1834	917	611	458	367	306	229	
					(48-72)	Fz	0.00003	0.0003	0.0008	0.0015	0.0020	0.0022	0.0024	0.0028	
					Feed (ipm)	1.8	2.2	2.9	3.7	3.7	3.2	2.9	2.6		

Bhn (Brinell)      HRc (Rockwell C)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fz \times 4 \times rpm$   
 maximum Slotting Ap for Z1PCR <1/8 diameter and all Z1PLC / Z1PLB is .25 x D<sub>1</sub>  
 maximum Profile Ae for Z1PCR <1/8 diameter and all Z1PLC / Z1PLB is .20 x D<sub>1</sub>  
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# METRIC Z-Carb-AP



## Z1MPCR METRIC SERIES

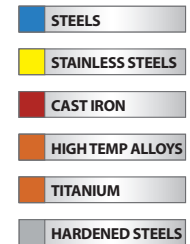


- Patented variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Patented unequal helix design aids in damaging harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

mm					EDP NO.			
CUTTING DIA. D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIA. D <sub>2</sub>	CORNER RADIUS R	Ti-NAMITE-X	Ti-NAMITE-X W/FLAT	JetStream*	
					STOCK	STOCK	STOCK	STOCK
1,0	3,0	57,0	6,0	0,1	46873	●	—	—
1,5	4,5	57,0	6,0	0,1	46849	●	—	—
2,0	6,0	57,0	6,0	0,2	46850	●	—	—
2,5	7,0	57,0	6,0	0,2	46874	●	—	—
3,0	8,0	57,0	6,0	0,3	46851	●	—	—
3,0	8,0	57,0	6,0	0,5	46880	●	—	—
4,0	11,0	57,0	6,0	0,3	46852	●	—	—
4,0	11,0	57,0	6,0	0,5	46881	●	—	—
5,0	13,0	57,0	6,0	0,3	46853	●	—	—
6,0	13,0	57,0	6,0	0,25	46882	●	—	—
6,0	13,0	57,0	6,0	0,5	46854	●	—	—
6,0	13,0	57,0	6,0	1,0	46855	●	—	—
6,0	13,0	57,0	6,0	1,5	46884	●	—	—
8,0	19,0	63,0	8,0	0,5	46856	●	—	—
8,0	19,0	63,0	8,0	1,0	46857	●	—	—
8,0	19,0	63,0	8,0	1,5	46886	●	—	—
8,0	19,0	63,0	8,0	2,0	46887	●	—	—
10,0	22,0	72,0	10,0	0,5	46858	●	—	—
10,0	22,0	72,0	10,0	1,0	46859	●	—	—
10,0	22,0	72,0	10,0	1,5	46889	●	—	—
10,0	22,0	72,0	10,0	2,0	46890	●	—	—
10,0	22,0	72,0	10,0	2,5	46891	●	—	—
12,0	26,0	83,0	12,0	0,5	46860	●	46909	●
12,0	26,0	83,0	12,0	0,75	46861	●	46910	●
12,0	26,0	83,0	12,0	1,0	46893	●	46911	●
12,0	26,0	83,0	12,0	1,5	46894	●	46912	●
12,0	26,0	83,0	12,0	2,0	46895	●	46913	●
12,0	26,0	83,0	12,0	2,5	46896	●	46914	●
12,0	26,0	83,0	12,0	3,0	42718	●	46915	●
14,0	26,0	83,0	14,0	1,0	46862	●	46916	●
16,0	32,0	92,0	16,0	1,0	46863	●	46917	●
16,0	32,0	92,0	16,0	1,5	46898	●	46918	●
16,0	32,0	92,0	16,0	2,0	46899	●	46919	●
16,0	32,0	92,0	16,0	2,5	46900	●	46920	●
16,0	32,0	92,0	16,0	3,0	46864	●	46921	●
16,0	32,0	92,0	16,0	4,0	46867	■	46944	■
20,0	38,0	104,0	20,0	1,0	46865	●	46922	●
20,0	38,0	104,0	20,0	1,5	46903	●	46923	●
20,0	38,0	104,0	20,0	2,0	46904	●	46924	●
20,0	38,0	104,0	20,0	2,5	46905	●	46925	●
20,0	38,0	104,0	20,0	3,0	42722	●	46926	●
20,0	38,0	104,0	20,0	4,0	46868	■	46945	■
20,0	38,0	104,0	20,0	5,0	46869	■	46946	■
25,0	38,0	104,0	25,0	1,0	46866	●	46927	●

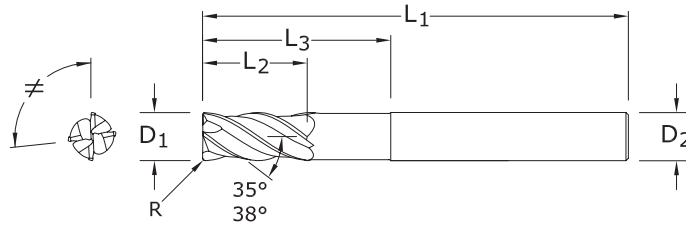
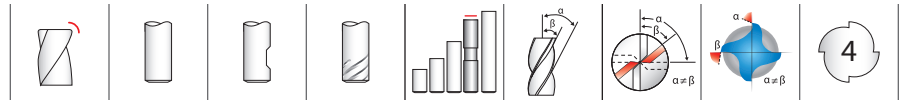
### TOLERANCES (mm)

- <3 DIAMETER**  
D<sub>1</sub> = +0,012/-0,012  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/-0,025
- 3-6 DIAMETER**  
D<sub>1</sub> = +0,000/-0,030  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/-0,050
- >6-10 DIAMETER**  
D<sub>1</sub> = +0,000/-0,040  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/-0,050
- >10-25 DIAMETER**  
D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/-0,050



- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

U.S. Patents 7,306,408 and 7,789,597  
\*JetStream Patented Coolant Technology



**Z1MPIC**  
METRIC SERIES

**TOLERANCES (mm)**

**6 DIAMETER**

$D_1 = +0,000/-0,030$

$D_2 = h_6$

$R = +0,000/-0,050$

**>6-10 DIAMETER**

$D_1 = +0,000/-0,040$

$D_2 = h_6$

$R = +0,000/-0,050$

**>10-20 DIAMETER**

$D_1 = +0,000/-0,050$

$D_2 = h_6$

$R = +0,000/-0,050$

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

● U.S. Stock Standard

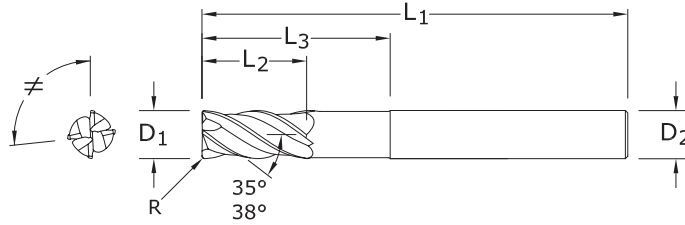
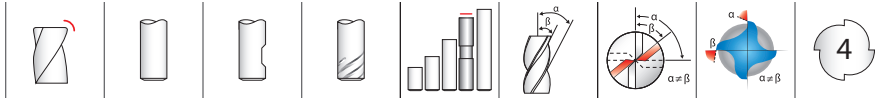
■ NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	CORNER RADIUS $R$	EDP NO.	STOCK
						Ti-NAMITE-X W/FLAT	
12,0	26,0	83,0	12,0	36,0	2,5	42731	■
12,0	26,0	83,0	12,0	36,0	3,0	42732	■
12,0	26,0	83,0	12,0	36,0	4,0	42733	■
16,0	32,0	92,0	16,0	42,0	2,5	42734	■
16,0	32,0	92,0	16,0	42,0	4,0	42735	■
16,0	32,0	92,0	16,0	42,0	6,0	42736	■
20,0	38,0	104,0	20,0	52,0	2,5	42737	■
20,0	38,0	104,0	20,0	52,0	4,0	42738	■
20,0	38,0	104,0	20,0	52,0	6,0	42739	■

- Patented variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Patented unequal helix design aids in damping harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Long reach design allows for deeper and faster cuts
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRC ( $\leq 420$  Bhn)



# METRIC Z-Carb-AP



## Z1MPLC METRIC SERIES

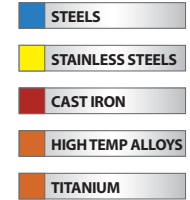
- Patented variable rake geometry alters and controls the cutting dynamic taking chatter suppression to an unprecedented level
- Patented unequal helix design aids in damping harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Long reach design allows for deeper and faster cuts
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

CUTTING DIA. D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIA. D <sub>2</sub>	REACH L <sub>3</sub>	CORNER RADIUS R	EDP NO.		
						Ti-NAMITE-X	Ti-NAMITE-X W/FLAT	STOCK
6,0	8,0	75,0	6,0	24,0	0,5	46821	●	—
8,0	10,0	75,0	8,0	32,0	1,0	46822	●	—
8,0	10,0	75,0	8,0	32,0	2,0	46823	●	—
10,0	12,0	100,0	10,0	40,0	1,0	46824	●	—
10,0	12,0	100,0	10,0	40,0	2,0	46825	●	—
12,0	15,0	100,0	12,0	48,0	1,0	46826	●	46928 ■
12,0	15,0	100,0	12,0	48,0	1,5	46827	●	46929 ■
12,0	15,0	100,0	12,0	48,0	2,0	46828	●	46930 ■
12,0	15,0	100,0	12,0	48,0	3,0	46829	●	46931 ■
16,0	20,0	115,0	16,0	65,0	1,0	46830	●	46932 ■
16,0	20,0	115,0	16,0	65,0	1,5	46831	●	46933 ■
16,0	20,0	115,0	16,0	65,0	2,0	46832	●	46934 ■
16,0	20,0	115,0	16,0	65,0	3,0	46833	●	46935 ■
16,0	20,0	115,0	16,0	65,0	4,0	46834	●	46936 ■
16,0	20,0	115,0	16,0	65,0	5,0	46835	●	46937 ■
20,0	24,0	140,0	20,0	80,0	1,0	46836	●	46938 ■
20,0	24,0	140,0	20,0	80,0	1,5	46737	●	46939 ■
20,0	24,0	140,0	20,0	80,0	2,0	46838	●	46940 ■
20,0	24,0	140,0	20,0	80,0	3,0	46839	●	46941 ■
20,0	24,0	140,0	20,0	80,0	4,0	46840	●	46942 ■
20,0	24,0	140,0	20,0	80,0	5,0	46841	●	46943 ■

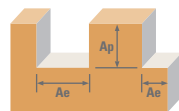
U.S. Patents 7,306,408 and 7,789,597  
\*JetStream Patented Coolant Technology

### TOLERANCES (mm)

- 6 DIAMETER**  
D<sub>1</sub> = +0,000/-0,030  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/-0,050
- >6-10 DIAMETER**  
D<sub>1</sub> = +0,000/-0,040  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/-0,050
- >10-20 DIAMETER**  
D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/-0,050



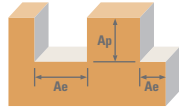
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



Series Z1MPCR, Z1MPIC, Z1MPLC Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)											
					1	3	6	8	10	12	16	20	25			
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	169	RPM	53803	17934	8967	6725	5380	4484	3363	2690	2152
						(135-203)	Fz	0.0030	0.0109	0.029	0.049	0.061	0.074	0.087	0.099	0.108
						Feed (mm/min)	646	782	1040	1318	1313	1327	1170	1065	930	
			Slot 	1	≤ 1	134	RPM	42654	14218	7109	5332	4265	3555	2666	2133	1706
						(107-161)	Fz	0.0030	0.0109	0.029	0.049	0.061	0.074	0.087	0.099	0.108
						Feed (mm/min)	512	620	825	1045	1041	1052	928	845	737	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ 1.5	96	RPM	30537	10179	5089	3817	3054	2545	1909	1527	1221
						(77-115)	Fz	0.0023	0.0081	0.022	0.036	0.045	0.055	0.067	0.075	0.080
						Feed (mm/min)	281	330	448	550	550	560	511	458	391	
			Slot 	1	≤ 1	76	RPM	24235	8078	4039	3029	2424	2020	1515	1212	969
						(61-91)	Fz	0.0023	0.0081	0.022	0.036	0.045	0.055	0.067	0.075	0.080
						Feed (mm/min)	223	262	355	436	436	444	406	364	310	
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ 1.5	56	RPM	17934	5978	2989	2242	1793	1495	1121	897	717
						(45-68)	Fz	0.0018	0.0066	0.017	0.030	0.037	0.043	0.051	0.059	0.065
						Feed (mm/min)	129	158	203	269	265	257	229	212	187	
			Slot 	1	≤ 1	44	RPM	14057	4686	2343	1757	1406	1171	879	703	562
						(35-53)	Fz	0.0018	0.0066	0.017	0.030	0.037	0.043	0.051	0.059	0.065
						Feed (mm/min)	101	124	159	211	208	201	179	166	146	
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.5	≤ 1.5	136	RPM	43139	14380	7190	5392	4314	3595	2696	2157	1726
						(109-163)	Fz	0.0028	0.0099	0.026	0.045	0.056	0.067	0.079	0.091	0.098
						Feed (mm/min)	483	569	748	971	966	963	852	785	676	
			Slot 	1	≤ 1	108	RPM	34414	11471	5736	4302	3441	2868	2151	1721	1377
						(87-130)	Fz	0.0028	0.0099	0.026	0.045	0.056	0.067	0.079	0.091	0.098
						Feed (mm/min)	385	454	597	774	771	769	680	626	540	
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.5	≤ 1.5	104	RPM	32960	10987	5493	4120	3296	2747	2060	1648	1318
						(83-124)	Fz	0.0020	0.0074	0.020	0.034	0.043	0.050	0.059	0.067	0.074
						Feed (mm/min)	264	325	439	560	567	549	486	442	390	
			Slot 	1	≤ 1	82	RPM	26174	8725	4362	3272	2617	2181	1636	1309	1047
						(66-99)	Fz	0.0020	0.0074	0.020	0.034	0.043	0.050	0.059	0.067	0.074
						Feed (mm/min)	209	258	349	445	450	436	386	351	310	
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	149	RPM	47501	15834	7917	5938	4750	3958	2969	2375	1900
						(119-179)	Fz	0.0023	0.0081	0.022	0.036	0.045	0.055	0.067	0.075	0.080
						Feed (mm/min)	437	513	697	855	855	871	796	713	608	
			Slot 	1	≤ 1	119	RPM	37807	12602	6301	4726	3781	3151	2363	1890	1512
						(95-143)	Fz	0.0023	0.0081	0.022	0.036	0.045	0.055	0.067	0.075	0.080
						Feed (mm/min)	348	408	555	681	681	693	633	567	484	

continued on next page

# Z-Carb-AP



Series Z1MPCR, Z1MPIC, Z1MPLC Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)											
					1	3	6	8	10	12	16	20	25			
<b>M</b>	<b>STAINLESS STEELS (DIFFICULT)</b> 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	104	RPM	32960	10987	5493	4120	3296	2747	2060	1648	1318
						(83-124)	Fz	0.0018	0.0064	0.017	0.030	0.037	0.043	0.051	0.059	0.063
						Feed (mm/min)	237	281	374	494	488	472	420	389	332	
			Slot 	1	≤ 1	82	RPM	26174	8725	4362	3272	2617	2181	1636	1309	1047
						(66-99)	Fz	0.0018	0.0064	0.017	0.030	0.037	0.043	0.051	0.059	0.063
						Feed (mm/min)	188	223	297	393	387	375	334	309	264	
	<b>STAINLESS STEELS (PH)</b> 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.5	≤ 1.5	94	RPM	30052	10017	5009	3756	3005	2504	1878	1503	1202
						(76-113)	Fz	0.0018	0.0064	0.017	0.030	0.037	0.043	0.051	0.059	0.063
						Feed (mm/min)	216	256	341	451	445	431	383	355	303	
			Slot 	1	≤ 1	76	RPM	24235	8078	4039	3029	2424	2020	1515	1212	969
						(61-91)	Fz	0.0018	0.0064	0.017	0.030	0.037	0.043	0.051	0.059	0.063
						Feed (mm/min)	174	207	275	364	359	347	309	286	244	
<b>S</b>	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE)</b> Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.5	≤ 1.5	24	RPM	7755	2585	1293	969	776	646	485	388	310
						(20-29)	Fz	0.0018	0.0061	0.016	0.027	0.034	0.041	0.048	0.053	0.060
						Feed (mm/min)	56	63	83	105	105	106	93	82	74	
			Slot 	1	≤ 1	20	RPM	6301	2100	1050	788	630	525	394	315	252
						(16-24)	Fz	0.0018	0.0061	0.016	0.027	0.034	0.041	0.048	0.053	0.060
						Feed (mm/min)	45	51	67	85	86	86	76	67	60	
	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE)</b> Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.5	≤ 1.5	19	RPM	6010	2003	1002	751	601	501	376	301	240
						(15-23)	Fz	0.0013	0.0043	0.011	0.019	0.024	0.028	0.033	0.037	0.042
						Feed (mm/min)	31	34	44	57	58	56	50	44	40	
			Slot 	1	≤ 1	15	RPM	4847	1616	808	606	485	404	303	242	194
						(12-18)	Fz	0.0013	0.0043	0.011	0.019	0.024	0.028	0.033	0.037	0.042
						Feed (mm/min)	25	28	36	46	47	45	40	36	33	
<b>TITANIUM ALLOYS</b> Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.5	≤ 1.5	66	RPM	20842	6947	3474	2605	2084	1737	1303	1042	834	
					(52-79)	Fz	0.0020	0.0071	0.019	0.032	0.040	0.048	0.056	0.064	0.070	
					Feed (mm/min)	167	197	264	333	333	333	292	267	233		
		Slot 	1	≤ 1	52	RPM	16480	5493	2747	2060	1648	1373	1030	824	659	
					(41-62)	Fz	0.0020	0.0071	0.019	0.032	0.040	0.048	0.056	0.064	0.070	
					Feed (mm/min)	132	156	209	264	264	264	231	211	185		
<b>TITANIUM ALLOYS (DIFFICULT)</b> Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRc	Profile 	≤ 0.5	≤ 1.5	23	RPM	7271	2424	1212	909	727	606	454	364	291	
					(18-27)	Fz	0.0020	0.0071	0.019	0.032	0.040	0.048	0.056	0.064	0.070	
					Feed (mm/min)	58	69	92	116	116	116	102	93	81		
		Slot 	1	≤ 1	18	RPM	5816	1939	969	727	582	485	364	291	233	
					(15-22)	Fz	0.0020	0.0071	0.019	0.032	0.040	0.048	0.056	0.064	0.070	
					Feed (mm/min)	47	55	74	93	93	93	81	74	65		

Bhn (Brinell)      HRc (Rockwell C)

$rpm = (Vc \times 1000) / (D_1 \times 3.14)$

$ipm = Fz \times 4 \times rpm$

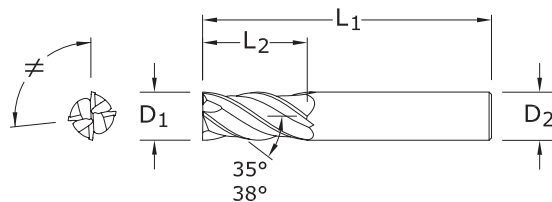
maximum Slotting Ap for Z1PCR <3mm diameter and all Z1MPLC / Z1MPLB is .25 x D<sub>1</sub>

maximum Profile Ae for Z1PCR <3mm diameter and all Z1MPLC / Z1MPLB is .20 x D<sub>1</sub>

reduce speed and feed for materials harder than listed

reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)

refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



### TOLERANCES (inch)

#### 1/8–1/4 DIAMETER

$D_1 = +0.0000/-0.0012$

$D_2 = h_6$

#### >1/4–3/8 DIAMETER

$D_1 = +0.0000/-0.0016$

$D_2 = h_6$

#### >3/8–1 DIAMETER

$D_1 = +0.0000/-0.0020$

$D_2 = h_6$

#### STEELS

#### STAINLESS STEELS

#### CAST IRON

#### HIGH TEMP ALLOYS

#### TITANIUM

#### HARDENED STEELS

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

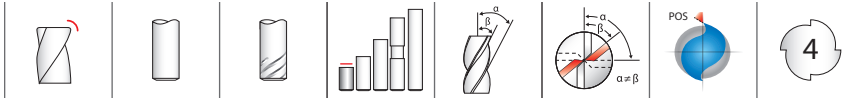
## Z1 FRACTIONAL SERIES

inch				EDP NO.			STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	Ti-NAMITE-A (AITiN)	Ti-NAMITE-A (AITiN) W/FLAT	JetStream*	
1/8	3/8	1-1/2	1/8	36404	—	—	●
5/32	7/16	2	3/16	36406	—	—	●
3/16	7/16	2	3/16	36408	—	—	●
7/32	7/16	2-1/2	1/4	36410	—	—	●
1/4	1/2	2-1/2	1/4	36416	—	—	●
1/4	3/4	2-1/2	1/4	36596	—	—	●
9/32	5/8	2-1/2	5/16	36418	—	—	●
5/16	13/16	2-1/2	5/16	36420	—	—	●
11/32	13/16	2-1/2	3/8	36422	—	—	●
3/8	7/8	2-1/2	3/8	36424	36530	—	●
13/32	15/16	2-3/4	7/16	36426	36531	—	●
7/16	1	2-3/4	7/16	36428	36532	—	●
15/32	1	3	1/2	36430	36533	—	●
1/2	1	3	1/2	36432	36534	36826	●
1/2	1-1/4	3-1/4	1/2	36597	36598	—	●
9/16	1-1/8	3-1/2	9/16	36436	36535	36827	●
5/8	1-1/4	3-1/2	5/8	36440	36536	36828	●
3/4	1-1/2	4	3/4	36442	36537	36829	●
1	1-1/2	4	1	36444	36538	36830	●

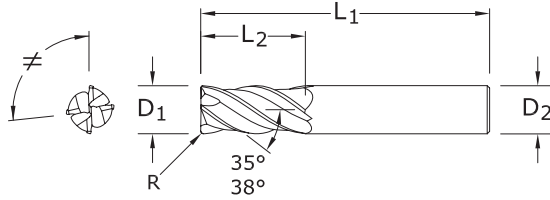
\*JetStream Patented Coolant Technology

- Patented unequal helix design aids in damaging harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Optimal material removal rates through increased feed and depths of cut
- Recommended for materials  $\leq 45$  HRC ( $\leq 420$  Bhn)

# FRACTIONAL Z-Carb



## Z16CR FRACTIONAL SERIES



- Patented unequal helix design aids in damping harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Optimal material removal rates through increased feed and depths of cut
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			EDP NO.	STOCK
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	CORNER RADIUS R	Ti-NAMITE-A (AlTiN)	
1/8	1/4	1-1/2	1/8	.015	36505	●
5/32	5/16	2	3/16	.015	36506	●
3/16	3/8	2	3/16	.015	36507	●
7/32	3/8	2	1/4	.020	36508	●
1/4	7/16	2	1/4	.020	36509	●
5/16	1/2	2	5/16	.020	36511	●
3/8	5/8	2	3/8	.020	36513	●
7/16	5/8	2-1/2	7/16	.020	36515	●
1/2	5/8	2-1/2	1/2	.030	36517	●
5/8	3/4	3	5/8	.040	36519	●
3/4	1	3	3/4	.040	36520	●

### TOLERANCES (inch)

#### 1/8–1/4 DIAMETER

$D_1 = +0.0000/-0.0012$

$D_2 = h_6$

$R = +0.0000/-0.005$

#### >1/4–3/8 DIAMETER

$D_1 = +0.0000/-0.0016$

$D_2 = h_6$

$R = +0.0000/-0.005$

#### >3/8–3/4 DIAMETER

$D_1 = +0.0000/-0.0020$

$D_2 = h_6$

$R = +0.0000/-0.005$

● STEELS

■ STAINLESS STEELS

■ CAST IRON

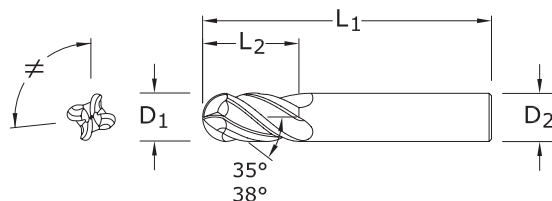
■ HIGH TEMP ALLOYS

■ TITANIUM

■ HARDENED STEELS

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



### TOLERANCES (inch)

#### 1/8–1/4 DIAMETER

$D_1 = +0.0000/-0.0012$

$D_2 = h_6$

#### >1/4–3/8 DIAMETER

$D_1 = +0.0000/-0.0016$

$D_2 = h_6$

#### >3/8–1 DIAMETER

$D_1 = +0.0000/-0.0020$

$D_2 = h_6$

#### STEELS

#### STAINLESS STEELS

#### CAST IRON

#### HIGH TEMP ALLOYS

#### TITANIUM

#### HARDENED STEELS

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

CUTTING DIA. $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIA. $D_2$	EDP NO.			STOCK
				Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT	JetStream*	
1/8	3/8	1-1/2	1/8	36358	—	—	●
5/32	7/16	2	3/16	36357	—	—	●
3/16	7/16	2	3/16	36359	—	—	●
7/32	7/16	2-1/2	1/4	36361	—	—	●
1/4	1/2	2-1/2	1/4	36344	—	—	●
1/4	3/4	2-1/2	1/4	36590	—	—	●
9/32	5/8	2-1/2	5/16	36353	—	—	●
5/16	13/16	2-1/2	5/16	36345	—	—	●
11/32	13/16	2-1/2	3/8	36354	—	—	●
3/8	7/8	2-1/2	3/8	36346	36539	—	●
13/32	15/16	2-3/4	7/16	36355	36540	—	●
7/16	1	2-3/4	7/16	36347	36541	—	●
15/32	1	3	1/2	36356	36542	—	●
1/2	1	3	1/2	36348	36543	36846	●
1/2	1-1/4	3-1/4	1/2	36591	36592	—	●
9/16	1-1/8	3-1/2	9/16	36349	36544	36847	●
5/8	1-1/4	3-1/2	5/8	36350	36545	36848	●
3/4	1-1/2	4	3/4	36351	36546	36849	●
1	1-1/2	4	1	36352	36547	36850	●

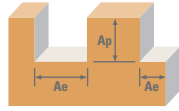
\*JetStream Patented Coolant Technology














## Z1B FRACTIONAL SERIES

- Patented unequal helix design aids in damaging harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Optimal material removal rates through increased feed and depths of cut
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

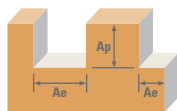


# FRACTIONAL Z-Carb



Series Z1, Z1B, Z16CR Fractional	Hardness	Profile 	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)							
						1/8	1/4	3/8	1/2	5/8	3/4	1	
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	555	RPM	16961	8480	5654	4240	3392	2827	2120
					(444-666)	Fz	0.0004	0.0010	0.0019	0.0025	0.0031	0.0032	0.0035
						Feed (ipm)	25.8	33.9	43.0	42.4	42.1	36.5	29.7
		Slot 	1	≤ 1	440	RPM	13446	6723	4482	3362	2689	2241	1681
					(352-528)	Fz	0.0004	0.0010	0.0019	0.0025	0.0031	0.0032	0.0035
						Feed (ipm)	20.4	26.9	34.1	33.6	33.3	29.0	23.5
<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ 1.5	315	RPM	9626	4813	3209	2407	1925	1604	1203
					(252-378)	Fz	0.0003	0.0008	0.0014	0.0019	0.0024	0.0025	0.0027
						Feed (ipm)	10.8	15.4	18.0	18.3	18.5	16.0	13.0
		Slot 	1	≤ 1	250	RPM	7640	3820	2547	1910	1528	1273	955
					(200-300)	Fz	0.0003	0.0008	0.0014	0.0019	0.0024	0.0025	0.0027
						Feed (ipm)	8.6	12.2	14.3	14.5	14.7	12.7	10.3
<b>H</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ 1.5	185	RPM	5654	2827	1885	1413	1131	942	707
					(148-222)	Fz	0.0002	0.0005	0.0010	0.0013	0.0016	0.0017	0.0018
						Feed (ipm)	4.5	5.7	7.5	7.3	7.2	6.4	5.1
		Slot 	1	≤ 1	145	RPM	4431	2216	1477	1108	886	739	554
					(116-174)	Fz	0.0002	0.0005	0.0010	0.0013	0.0016	0.0017	0.0018
						Feed (ipm)	3.5	4.4	5.9	5.8	5.7	5.0	4.0
<b>K</b>  <b>CAST IRONS</b> (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.5	≤ 1.5	445	RPM	13599	6800	4533	3400	2720	2267	1700
					(356-534)	Fz	0.0004	0.0010	0.0018	0.0024	0.0030	0.0031	0.0034
						Feed (ipm)	19.0	27.2	32.6	32.6	32.6	28.1	23.1
		Slot 	1	≤ 1	355	RPM	10849	5424	3616	2712	2170	1808	1356
					(284-426)	Fz	0.0004	0.0010	0.0018	0.0024	0.0030	0.0031	0.0034
						Feed (ipm)	15.2	21.7	26.0	26.0	26.0	22.4	18.4
<b>CAST IRONS</b> (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.5	≤ 1.5	340	RPM	10390	5195	3463	2598	2078	1732	1299
					(272-408)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0025
						Feed (ipm)	12.5	14.5	19.4	18.7	19.1	16.6	13.0
		Slot 	1	≤ 1	270	RPM	8251	4126	2750	2063	1650	1375	1031
					(216-324)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0025
						Feed (ipm)	9.9	11.6	15.4	14.9	15.2	13.2	10.3
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	490	RPM	14974	7487	4991	3744	2995	2496	1872
					(392-588)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0025
						Feed (ipm)	18.0	21.0	28.0	27.0	27.6	24.0	18.7
		Slot 	1	≤ 1	390	RPM	11918	5959	3973	2980	2384	1986	1490
					(312-468)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0025
						Feed (ipm)	14.3	16.7	22.2	21.5	21.9	19.1	14.9

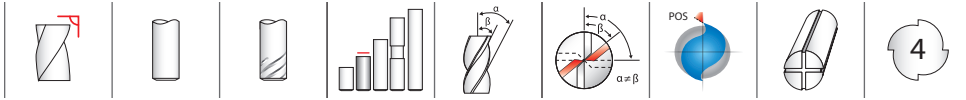
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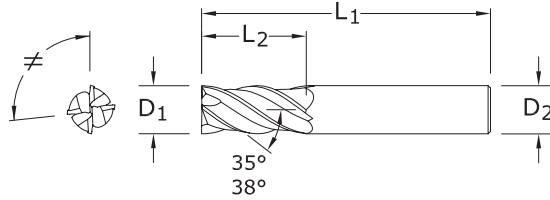
Series Z1, Z1B, Z16CR Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)									
					1/8	1/4	3/8	1/2	5/8	3/4	1			
<b>M</b>	<b>STAINLESS STEELS (DIFFICULT)</b> 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	340	RPM	10390	5195	3463	2598	2078	1732	1299
						(272-408)	Fz	0.0002	0.0006	0.0011	0.0014	0.0018	0.0019	0.0020
							Feed (ipm)	8.3	12.5	15.2	14.5	15.0	13.2	10.4
			Slot 	1	≤ 1	270	RPM	8251	4126	2750	2063	1650	1375	1031
						(216-324)	Fz	0.0002	0.0006	0.0011	0.0014	0.0018	0.0019	0.0020
							Feed (ipm)	6.6	9.9	12.1	11.6	11.9	10.5	8.3
	<b>STAINLESS STEELS (PH)</b> 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.5	≤ 1.5	310	RPM	9474	4737	3158	2368	1895	1579	1184
						(248-372)	Fz	0.0002	0.0006	0.0011	0.0014	0.0018	0.0019	0.0020
							Feed (ipm)	7.6	11.4	13.9	13.3	13.6	12.0	9.5
			Slot 	1	≤ 1	250	RPM	7640	3820	2547	1910	1528	1273	955
						(200-300)	Fz	0.0002	0.0006	0.0011	0.0014	0.0018	0.0019	0.0020
							Feed (ipm)	6.1	9.2	11.2	10.7	11.0	9.7	7.6
<b>S</b>	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE)</b> Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.5	≤ 1.5	80	RPM	2445	1222	815	611	489	407	306
						(64-96)	Fz	0.0002	0.0004	0.0008	0.0010	0.0013	0.0014	0.0015
							Feed (ipm)	2.2	2.0	2.6	2.4	2.5	2.3	1.8
			Slot 	1	≤ 1	65	RPM	1986	993	662	497	397	331	248
						(52-78)	Fz	0.0002	0.0004	0.0008	0.0010	0.0013	0.0014	0.0015
							Feed (ipm)	1.6	1.6	2.1	2.0	2.1	1.9	1.5
	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE)</b> Inconel 718, 750-X, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.5	≤ 1.5	62	RPM	1895	947	632	474	379	316	237
						(50-74)	Fz	0.0001	0.0003	0.0005	0.0007	0.0008	0.0009	0.0010
							Feed (ipm)	0.8	1.1	1.3	1.3	1.2	1.1	0.9
			Slot 	1	≤ 1	49	RPM	1497	749	499	374	299	250	187
						(39-59)	Fz	0.0001	0.0003	0.0005	0.0007	0.0008	0.0009	0.0010
							Feed (ipm)	0.6	0.9	1.0	1.0	1.0	0.9	0.7
<b>TITANIUM ALLOYS</b> Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.5	≤ 1.5	215	RPM	6570	3285	2190	1643	1314	1095	821	
					(172-258)	Fz	0.0002	0.0005	0.0010	0.0013	0.0016	0.0017	0.0018	
						Feed (ipm)	5.3	6.6	8.8	8.5	8.4	7.4	5.9	
		Slot 	1	≤ 1	170	RPM	5195	2598	1732	1299	1039	866	649	
					(136-204)	Fz	0.0002	0.0005	0.0010	0.0013	0.0016	0.0017	0.0018	
						Feed (ipm)	4.2	5.2	6.9	6.8	6.6	5.9	4.7	
<b>TITANIUM ALLOYS (DIFFICULT)</b> Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRc	Profile 	≤ 0.5	≤ 1.5	75	RPM	2292	1146	764	573	458	382	287	
					(60-90)	Fz	0.0002	0.0005	0.0010	0.0013	0.0016	0.0017	0.0018	
						Feed (ipm)	1.8	2.3	3.1	3.0	2.9	2.6	2.1	
		Slot 	1	≤ 1	60	RPM	1834	917	611	458	367	306	229	
					(48-72)	Fz	0.0002	0.0005	0.0010	0.0013	0.0016	0.0017	0.0018	
						Feed (ipm)	1.5	1.8	2.4	2.4	2.3	2.1	1.7	

Bhn (Brinell)      HRc (Rockwell C)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fz \times 4 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# METRIC Z-Carb



## Z1M METRIC SERIES



- Patented unequal helix design aids in damping harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Optimal material removal rates through increased feed and depths of cut
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.		STOCK
				Ti-NAMITE-A (AlTiN)	JetStream*	
3,0	8,0	57,0	6,0	46357	—	●
4,0	11,0	57,0	6,0	46358	—	●
5,0	13,0	57,0	6,0	46359	—	●
6,0	13,0	57,0	6,0	46360	—	●
8,0	19,0	63,0	8,0	46362	—	●
10,0	22,0	72,0	10,0	46364	—	●
12,0	26,0	83,0	12,0	46366	—	●
14,0	26,0	83,0	14,0	46368	46506	●
16,0	32,0	92,0	16,0	46370	46507	●
18,0	32,0	92,0	18,0	46372	46508	●
20,0	38,0	104,0	20,0	46374	46509	●
25,0	38,0	104,0	25,0	46376	46510	●

\*JetStream Patented Coolant Technology

### TOLERANCES (mm)

#### 3–6 DIAMETER

$D_1 = +0,000/-0,030$

$D_2 = h_6$

#### >6–10 DIAMETER

$D_1 = +0,000/-0,040$

$D_2 = h_6$

#### >10–25 DIAMETER

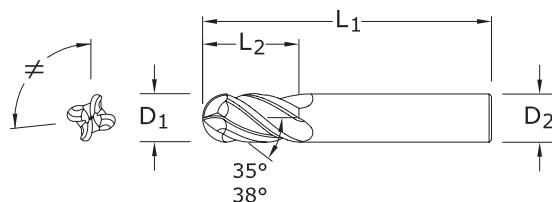
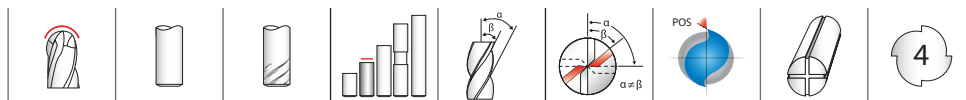
$D_1 = +0,000/-0,050$

$D_2 = h_6$

STEELS
STAINLESS STEELS
CAST IRON
HIGH TEMP ALLOYS
TITANIUM
HARDENED STEELS

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



**TOLERANCES (mm)**

**3–6 DIAMETER**

$D_1 = +0,000/-0,030$

$D_2 = h_6$

**>6–10 DIAMETER**

$D_1 = +0,000/-0,040$

$D_2 = h_6$

**>10–25 DIAMETER**

$D_1 = +0,000/-0,050$

$D_2 = h_6$

**STEELS**

**STAINLESS STEELS**

**CAST IRON**

**HIGH TEMP ALLOYS**

**TITANIUM**

**HARDENED STEELS**

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

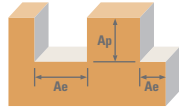
**Z1MB**  
METRIC SERIES

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.		STOCK
				Ti-NAMITE-A (AlTiN)	JetStream*	
3,0	8,0	57,0	6,0	46354	—	●
4,0	11,0	57,0	6,0	46355	—	●
5,0	13,0	57,0	6,0	46356	—	●
6,0	13,0	57,0	6,0	46343	—	●
8,0	19,0	63,0	8,0	46344	—	●
10,0	22,0	72,0	10,0	46345	—	●
12,0	26,0	83,0	12,0	46346	—	●
14,0	26,0	83,0	14,0	46347	46518	●
16,0	32,0	92,0	16,0	46348	46519	●
18,0	32,0	92,0	18,0	46349	46520	●
20,0	38,0	104,0	20,0	46350	46521	●
25,0	38,0	104,0	25,0	46351	46522	●

\*JetStream Patented Coolant Technology

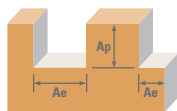
- Patented unequal helix design aids in damping harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Optimal material removal rates through increased feed and depths of cut
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 45$  HRC ( $\leq 420$  Bhn)

# METRIC Z-Carb



Series Z1M, Z1MB Metric	Hardness	Profile Ae x D <sub>1</sub>	Slot Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)									
					3	6	8	10	12	16	20	25		
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	Profile 	≤ 0.5	≤ 1.5	169	RPM	17934	8967	6725	5380	4484	3363	2690	2152
					(135-203)	Fz	0.009	0.024	0.041	0.051	0.060	0.079	0.086	0.088
					Feed (mm/min)	654	861	1091	1090	1076	1067	927	753	
		Slot 	1	≤ 1	134	RPM	14218	7109	5332	4265	3555	2666	2133	1706
					(107-161)	Fz	0.009	0.024	0.041	0.051	0.060	0.079	0.086	0.088
					Feed (mm/min)	519	682	865	864	853	846	735	597	
	<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	Profile 	≤ 0.5	≤ 1.5	96	RPM	10179	5089	3817	3054	2545	1909	1527	1221
					(77-115)	Fz	0.007	0.019	0.030	0.037	0.046	0.061	0.067	0.068
					Feed (mm/min)	274	391	456	456	464	469	407	330	
		Slot 	1	≤ 1	76	RPM	8078	4039	3029	2424	2020	1515	1212	969
					(61-91)	Fz	0.007	0.019	0.030	0.037	0.046	0.061	0.067	0.068
					Feed (mm/min)	217	310	362	362	368	372	323	262	
<b>H</b>	Profile 	≤ 0.5	≤ 1.5	56	RPM	5978	2989	2242	1793	1495	1121	897	717	
				(45-68)	Fz	0.005	0.012	0.021	0.027	0.031	0.041	0.045	0.045	
				Feed (mm/min)	115	143	191	191	186	184	163	129		
	Slot 	1	≤ 1	44	RPM	4686	2343	1757	1406	1171	879	703	562	
				(35-53)	Fz	0.005	0.012	0.021	0.027	0.031	0.041	0.045	0.045	
				Feed (mm/min)	90	112	150	150	146	144	127	101		
<b>K</b>	<b>CAST IRONS (LOW &amp; MEDIUM ALLOY)</b> Gray, Malleable, Ductile	Profile 	≤ 0.5	≤ 1.5	136	RPM	14380	7190	5392	4314	3595	2696	2157	1726
					(109-163)	Fz	0.008	0.024	0.038	0.048	0.058	0.077	0.083	0.085
					Feed (mm/min)	483	690	828	828	828	828	713	587	
		Slot 	1	≤ 1	108	RPM	11471	5736	4302	3441	2868	2151	1721	1377
					(87-130)	Fz	0.008	0.024	0.038	0.048	0.058	0.077	0.083	0.085
					Feed (mm/min)	385	551	661	661	661	661	569	468	
	<b>CAST IRONS (HIGH ALLOY)</b> Gray, Malleable, Ductile	Profile 	≤ 0.5	≤ 1.5	104	RPM	10987	5493	4120	3296	2747	2060	1648	1318
					(83-124)	Fz	0.007	0.017	0.030	0.037	0.043	0.059	0.064	0.063
					Feed (mm/min)	316	369	492	492	475	485	422	330	
		Slot 	1	≤ 1	82	RPM	8725	4362	3272	2617	2181	1636	1309	1047
					(66-99)	Fz	0.007	0.017	0.030	0.037	0.043	0.059	0.064	0.063
					Feed (mm/min)	251	293	391	391	377	385	335	262	
<b>M</b>	Profile 	≤ 0.5	≤ 1.5	149	RPM	15834	7917	5938	4750	3958	2969	2375	1900	
				(119-179)	Fz	0.007	0.017	0.030	0.037	0.043	0.059	0.064	0.063	
				Feed (mm/min)	456	532	709	709	684	699	608	475		
	Slot 	1	≤ 1	119	RPM	12602	6301	4726	3781	3151	2363	1890	1512	
				(95-143)	Fz	0.007	0.017	0.030	0.037	0.043	0.059	0.064	0.063	
				Feed (mm/min)	363	423	565	565	544	557	484	378		

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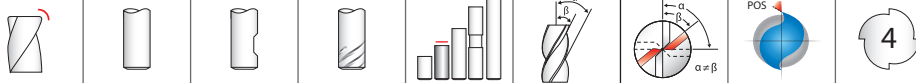


Series Z1M, Z1MB Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)										
					3	6	8	10	12	16	20	25			
M	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	104	RPM	10987	5493	4120	3296	2747	2060	1648	1318
						(83-124)	Fz	0.005	0.014	0.023	0.029	0.034	0.046	0.051	0.050
							Feed (mm/min)	211	316	387	387	369	380	334	264
						82	RPM	8725	4362	3272	2617	2181	1636	1309	1047
						(66-99)	Fz	0.005	0.014	0.023	0.029	0.034	0.046	0.051	0.050
							Feed (mm/min)	168	251	307	307	293	302	265	209
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.5	≤ 1.5	94	RPM	10017	5009	3756	3005	2504	1878	1503	1202
						(76-113)	Fz	0.005	0.014	0.023	0.029	0.034	0.046	0.051	0.050
							Feed (mm/min)	192	288	353	353	337	346	305	240
						76	RPM	8078	4039	3029	2424	2020	1515	1212	969
						(61-91)	Fz	0.005	0.014	0.023	0.029	0.034	0.046	0.051	0.050
							Feed (mm/min)	155	233	284	284	271	279	246	194
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.5	≤ 1.5	24	RPM	2585	1293	969	776	646	485	388	310
						(20-29)	Fz	0.005	0.010	0.017	0.021	0.024	0.033	0.037	0.038
							Feed (mm/min)	55	50	66	53	62	65	58	47
						20	RPM	2100	1050	788	630	525	394	315	252
						(16-24)	Fz	0.005	0.010	0.017	0.021	0.024	0.033	0.037	0.038
							Feed (mm/min)	40	40	54	54	50	52	47	38
	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.5	≤ 1.5	19	RPM	2003	1002	751	601	501	376	301	240
						(15-23)	Fz	0.002	0.007	0.011	0.013	0.017	0.020	0.024	0.025
							Feed (mm/min)	19	29	32	32	34	31	29	24
						15	RPM	1583	792	594	475	396	297	238	190
						(12-18)	Fz	0.002	0.007	0.011	0.013	0.017	0.020	0.024	0.025
							Feed (mm/min)	15	23	25	25	27	24	23	19
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.5	≤ 1.5	66	RPM	6947	3474	2605	2084	1737	1303	1042	834	
					(52-79)	Fz	0.005	0.012	0.021	0.027	0.031	0.041	0.045	0.045	
						Feed (mm/min)	133	167	222	222	217	213	189	150	
					52	RPM	5493	2747	2060	1648	1373	1030	824	659	
					(41-62)	Fz	0.005	0.012	0.021	0.027	0.031	0.041	0.045	0.045	
						Feed (mm/min)	105	132	176	176	171	169	149	119	
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRc	Profile 	≤ 0.5	≤ 1.5	23	RPM	2424	1212	909	727	606	454	364	291	
					(18-27)	Fz	0.005	0.012	0.021	0.027	0.031	0.041	0.045	0.045	
						Feed (mm/min)	47	58	78	78	76	74	66	52	
					18	RPM	1939	969	727	582	485	364	291	233	
					(15-22)	Fz	0.005	0.012	0.021	0.027	0.031	0.041	0.045	0.045	
						Feed (mm/min)	37	47	62	62	60	60	53	42	

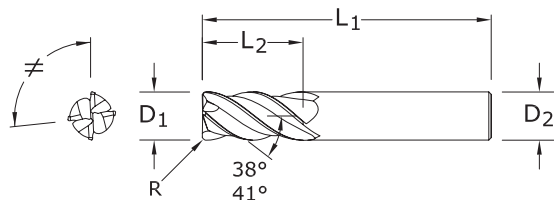
Bhn (Brinell)      HRc (Rockwell C)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $ipm = Fz \times 4 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



# FRACTIONAL Z-Carb-HTA



## ZH1CR FRACTIONAL SERIES



- The original Z-Carb design with an enhanced core and higher helix suited for the demands of high temperature alloys
- Patented unequal helix design aids in damaging harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Optimal material removal rates through increased feed and depths of cut for difficult to machine materials
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRC ( $\leq 420$  Bhn)

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			EDP NO.		STOCK
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	CORNER RADIUS R	Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT	
1/4	1/2	2-1/2	1/4	.020	36570	—	●
1/4	3/4	2-1/2	1/4	.020	36616	—	●
5/16	13/16	2-1/2	5/16	.020	36571	—	●
3/8	7/8	2-1/2	3/8	.020	36572	36555	●
7/16	1	2-3/4	7/16	.020	36573	36556	●
1/2	1	3	1/2	.030	36574	36557	●
1/2	1-1/4	3-1/4	1/2	.030	36618	36617	●
9/16	1-1/8	3-1/2	9/16	.030	36575	36558	●
5/8	1-1/4	3-1/2	5/8	.040	36576	36559	●
3/4	1-1/2	4	3/4	.040	36577	36560	●
1	1-1/2	4	1	.040	36578	36561	●

### TOLERANCES (inch)

#### 1/4 DIAMETER

$D_1 = +0.0000/-0.0012$

$D_2 = h_6$

#### >1/4-3/8 DIAMETER

$D_1 = +0.0000/-0.0016$

$D_2 = h_6$

#### >3/8-1 DIAMETER

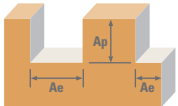
$D_1 = +0.0000/-0.0020$

$D_2 = h_6$

**HIGH TEMP ALLOYS**

**TITANIUM**

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



Series ZH1CR Fractional	Hardness	Profile	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)						
						1/4	3/8	1/2	3/4	1		
<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400</b>	≤ 300 Bhn or ≤ 32 HRc	Profile	≤ 0.5	≤ 1.5	85	RPM	1299	866	649	433	325	
					(68-102)	Fz	0.0007	0.0012	0.0017	0.0020	0.0023	
		Slot	1	≤ 1	70	RPM	1070	713	535	357	267	
		(56-84)			Fz	0.0007	0.0012	0.0017	0.0020	0.0023		
						Feed (ipm)	3.0	3.4	3.6	2.9	2.5	
	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene</b>	≤ 400 Bhn or ≤ 43 HRc	Profile	≤ 0.5	≤ 1.5	70	RPM	1070	713	535	357	267
						(56-84)	Fz	0.0005	0.0009	0.0012	0.0014	0.0016
			Slot	1	≤ 1	55	RPM	840	560	420	280	210
			(44-66)			Fz	0.0005	0.0009	0.0012	0.0014	0.0016	
							Feed (ipm)	1.7	2.0	2.0	1.6	1.3
<b>TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si</b>		≤ 350 Bhn or ≤ 38 HRc	Profile	≤ 0.5	≤ 1.5	215	RPM	3285	2190	1643	1095	821
			(172-258)			Fz	0.0008	0.0015	0.0020	0.0024	0.0028	
		Slot	1	≤ 1	170	RPM	2598	1732	1299	866	649	
		(136-204)			Fz	0.0008	0.0015	0.0020	0.0024	0.0028		
						Feed (ipm)	8.3	10.4	10.4	8.3	7.3	
	<b>TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al</b>	≤ 440 Bhn or ≤ 47 HRc	Profile	≤ 0.5	≤ 1.5	75	RPM	1146	764	573	382	287
			(60-90)			Fz	0.0008	0.0015	0.0020	0.0024	0.0028	
		Slot	1	≤ 1	60	RPM	917	611	458	306	229	
		(48-72)			Fz	0.0008	0.0015	0.0020	0.0024	0.0028		
						Feed (ipm)	2.9	3.7	3.7	2.9	2.6	

Bhn (Brinell)      HRc (Rockwell C)

rpm = Vc x 3.82 / D<sub>1</sub>

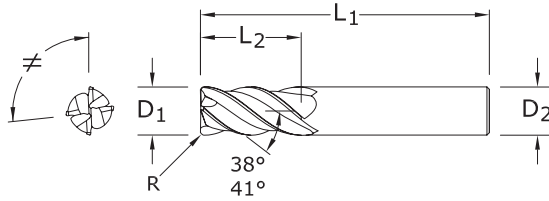
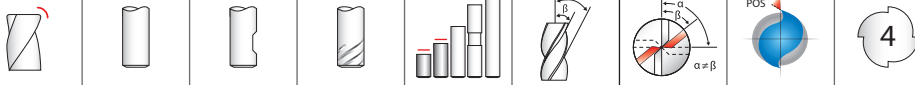
ipm = Fz x 4 x rpm

reduce speed and feed for materials harder than listed

reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)

refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# Z-Carb-HTA



## ZH1MCRS METRIC SERIES

- The original Z-Carb design with an enhanced core and higher helix suited for the demands of high temperature alloys
- Patented unequal helix design aids in damaging harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Optimal material removal rates through increased feed and depths of cut for difficult to machine materials
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRC ( $\leq 420$  Bhn)

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	mm			CORNER RADIUS R	EDP NO. Ti-NAMITE-A (AITiN)	STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>				
6,0	10,0	54,0	6,0	0,50	42712	■	
8,0	12,0	58,0	8,0	0,50	42713	■	
10,0	14,0	66,0	10,0	0,50	42714	■	
12,0	16,0	73,0	12,0	0,75	42715	■	
16,0	22,0	82,0	16,0	1,00	42716	■	
20,0	26,0	92,0	20,0	1,00	42717	■	

### TOLERANCES (mm)

#### 6 DIAMETER

D<sub>1</sub> = +0,000/-0,030  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/-0,050

#### >6-10 DIAMETER

D<sub>1</sub> = +0,000/-0,040  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/-0,050

#### >10-20 DIAMETER

D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/-0,050

HIGH TEMP ALLOYS

TITANIUM

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

## ZH1MCR METRIC SERIES

- The original Z-Carb design with an enhanced core and higher helix suited for the demands of high temperature alloys
- Patented unequal helix design aids in damaging harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Optimal material removal rates through increased feed and depths of cut for difficult to machine materials
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRC ( $\leq 420$  Bhn)

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	mm			CORNER RADIUS R	EDP NO.		STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	Ti-NAMITE-A (AITiN)		Ti-NAMITE-A (AITiN) W/FLAT		
6,0	13,0	57,0	6,0	0,5	46450	—	●	
6,0	13,0	57,0	6,0	1,0	46451	—	●	
6,0	13,0	57,0	6,0	1,5	46452	—	●	
8,0	19,0	63,0	8,0	0,5	46453	—	●	
8,0	19,0	63,0	8,0	1,0	46454	—	●	
8,0	19,0	63,0	8,0	1,5	46455	—	●	
10,0	22,0	72,0	10,0	0,5	46456	—	●	
10,0	22,0	72,0	10,0	1,0	46457	—	●	
10,0	22,0	72,0	10,0	1,5	46458	—	●	
10,0	22,0	72,0	10,0	2,0	46459	—	●	
12,0	26,0	83,0	12,0	0,5	46460	46471	●	
12,0	26,0	83,0	12,0	1,0	46461	46472	●	
12,0	26,0	83,0	12,0	1,5	46462	46473	●	
12,0	26,0	83,0	12,0	2,0	46463	46474	●	
12,0	26,0	83,0	12,0	3,0	46464	46475	●	
16,0	32,0	92,0	16,0	1,5	46465	46476	●	
16,0	32,0	92,0	16,0	2,0	46466	46477	●	
16,0	32,0	92,0	16,0	3,0	46467	46478	●	
20,0	38,0	104,0	20,0	3,0	46468	46479	●	
20,0	38,0	104,0	20,0	4,0	46469	46480	●	
20,0	38,0	104,0	20,0	5,0	46470	46481	●	

### TOLERANCES (mm)

#### 6 DIAMETER

D<sub>1</sub> = +0,000/-0,030  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/-0,050

#### >6-10 DIAMETER

D<sub>1</sub> = +0,000/-0,040  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/-0,050

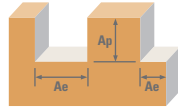
#### >10-20 DIAMETER





D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/-0,050

HIGH TEMP ALLOYS

TITANIUM

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



Series ZH1MCRS, ZH1MCR Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)						
					6	10	12	20			
<b>S</b>	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.5	≤ 1.5	26	RPM	1373	824	687	412
						(21-31)	Fz	0.017	0.032	0.041	0.053
							Feed (mm/min)	93	105	113	87
						21	RPM	1131	679	565	339
						(17-26)	Fz	0.017	0.032	0.041	0.053
							Feed (mm/min)	77	87	93	72
	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.5	≤ 1.5	21	RPM	1131	679	565	339
						(17-26)	Fz	0.012	0.024	0.029	0.037
							Feed (mm/min)	54	65	66	50
						17	RPM	889	533	444	267
						(13-20)	Fz	0.012	0.024	0.029	0.037
							Feed (mm/min)	43	51	52	39
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.5	≤ 1.5	66	RPM	3474	2084	1737	1042	
					(52-79)	Fz	0.019	0.041	0.049	0.057	
						Feed (mm/min)	264	342	340	238	
					52	RPM	2747	1648	1373	824	
					(41-62)	Fz	0.019	0.041	0.049	0.057	
						Feed (mm/min)	209	270	269	188	
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRc	Profile 	≤ 0.5	≤ 1.5	23	RPM	1212	727	606	364	
					(18-27)	Fz	0.019	0.041	0.049	0.057	
						Feed (mm/min)	92	119	119	83	
					18	RPM	969	582	485	291	
					(15-22)	Fz	0.019	0.041	0.049	0.057	
						Feed (mm/min)	74	95	95	66	

Bhn (Brinell)      HRc (Rockwell C)

rpm = (Vc x 1000) / (D<sub>1</sub> x 3.14)

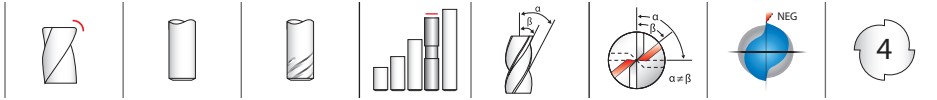
ipm = Fz x 4 x rpm

reduce speed and feed for materials harder than listed

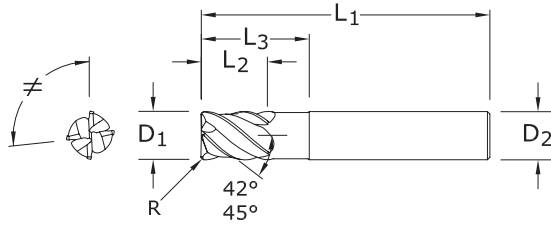
reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)

refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# FRACTIONAL Z-Carb-MD



## ZD1CR FRACTIONAL SERIES



- The original Z-Carb design with negative rake, heavy core, and higher helix for strength and shearing of hard mold & die materials
- Patented unequal helix design aids in damping harmonics by changing the angle at which each cutting edge enters and exits the material
- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	CORNER RADIUS $R$	EDP NO.	STOCK
						Ti-NAMITE-X	
1/8	5/32	2-1/2	1/4	1/2	.010	36780	●
3/16	7/32	2-1/2	1/4	3/4	.020	36781	●
1/4	9/32	2-1/2	1/4	3/4	.020	36782	●
5/16	13/32	2-1/2	5/16	1	.040	36783	●
3/8	15/32	2-1/2	3/8	1	.040	36784	●
7/16	9/16	2-3/4	7/16	1	.040	36785	●
1/2	5/8	3	1/2	1-1/4	.040	36786	●
1/2	5/8	4-1/2	1/2	2-1/4	.040	36787	●
5/8	3/4	3-1/2	5/8	1-1/2	.040	36788	●
5/8	3/4	4-1/2	5/8	2-1/4	.040	36789	●
5/8	3/4	5-1/2	5/8	3-1/4	.040	36790	●
3/4	15/16	4	3/4	1-3/4	.060	36791	●
3/4	15/16	4-1/2	3/4	2-1/4	.060	36792	●
3/4	15/16	5-1/2	3/4	3-1/4	.060	36793	●

### TOLERANCES (inch)

#### 1/8-1/4 DIAMETER

$D_1 = +0.0000/-0.0012$

$D_2 = h_6$

$R = +0.0000/-0.0020$

#### >1/4-3/8 DIAMETER

$D_1 = +0.0000/-0.0016$

$D_2 = h_6$

$R = +0.0000/-0.0020$

#### >3/8-3/4 DIAMETER

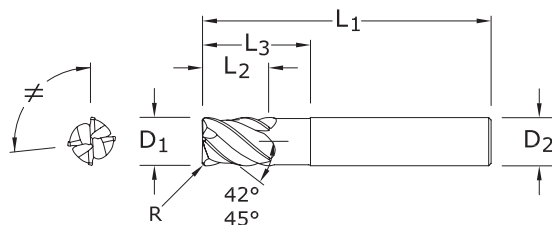
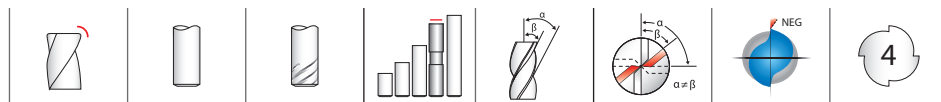
$D_1 = +0.0000/-0.002$

$D_2 = h_6$

$R = +0.0000/-0.0020$

### HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



**ZD1MCR**  
METRIC SERIES

**TOLERANCES (mm)**

**3–6 DIAMETER**

$D_1 = +0,000/-0,030$

$D_2 = h_6$

$R = +0,000/-0,050$

**>6–10 DIAMETER**

$D_1 = +0,000/-0,040$

$D_2 = h_6$

$R = +0,000/-0,050$

**>10–20 DIAMETER**

$D_1 = +0,000/-0,050$

$D_2 = h_6$

$R = +0,000/-0,050$

**HARDENED STEELS**

● U.S. Stock Standard

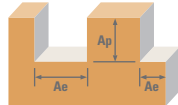
■ NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	CORNER RADIUS $R$	EDP NO.	STOCK
						Ti-NAMITE-X	
3,0	4,0	57,0	6,0	15,0	0,2	46560	●
4,0	5,0	57,0	6,0	15,0	0,3	46561	●
5,0	6,0	57,0	6,0	15,0	0,5	46562	●
6,0	7,0	57,0	6,0	15,0	1,0	46563	●
8,0	10,0	63,0	8,0	25,0	1,0	46564	●
10,0	12,0	72,0	10,0	30,0	1,0	46565	●
12,0	15,0	83,0	12,0	35,0	1,0	46566	●
16,0	20,0	92,0	16,0	45,0	1,5	46567	●
20,0	24,0	104,0	20,0	55,0	2,0	46568	●

- The original Z-Carb design with negative rake, heavy core, and higher helix for strength and shearing of hard mold & die materials
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- Unequal flute spacing helps to disrupt the rhythmic pattern created by the cutting edge helping to suppress damaging harmonics
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRC ( $\leq 420$  Bhn)

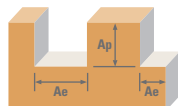


# FRACTIONAL & METRIC Z-Carb-MD



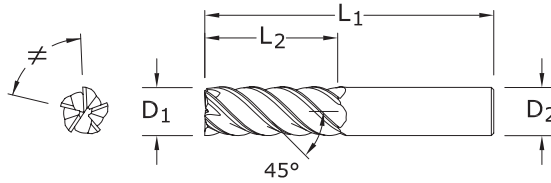
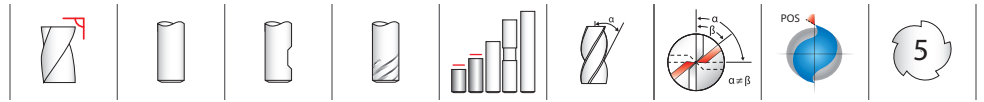
Series ZD1CR Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)							
					1/8	1/4	3/8	1/2	5/8	3/4		
TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.4	≤ 1	405	RPM	12377	6188	4126	3094	2475	2063
					(324-486)	Fz	0.0005	0.0012	0.0023	0.0030	0.0039	0.0042
						Feed (ipm)	24.8	29.7	38.0	37.1	38.6	34.7
	Slot 	1	≤ 0.4	320	RPM	9779	4890	3260	2445	1956	1630	
				(256-384)	Fz	0.0005	0.0012	0.0023	0.0030	0.0039	0.0042	
					Feed (ipm)	19.6	23.5	30.0	29.3	30.5	27.4	
H TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	Profile 	≤ 0.4	≤ 1	210	RPM	6418	3209	2139	1604	1284	1070
					(168-252)	Fz	0.0004	0.0010	0.0019	0.0025	0.0032	0.0035
						Feed (ipm)	10.3	12.8	16.3	16.0	16.4	15.0
	Slot 	1	≤ 0.4	170	RPM	5195	2598	1732	1299	1039	866	
				(136-204)	Fz	0.0004	0.0010	0.0019	0.0025	0.0032	0.0035	
					Feed (ipm)	8.3	10.4	13.2	13.0	13.3	12.1	
TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 655 Bhn or ≤ 60 HRc	Profile 	≤ 0.4	≤ 1	90	RPM	2750	1375	917	688	550	458
					(72-108)	Fz	0.0002	0.0005	0.0010	0.0013	0.0017	0.0018
						Feed (ipm)	2.2	2.8	3.7	3.6	3.7	3.3
	Slot 	1	≤ 0.4	70	RPM	2139	1070	713	535	428	357	
				(56-84)	Fz	0.0002	0.0005	0.0010	0.0013	0.0017	0.0018	
					Feed (ipm)	1.7	2.1	2.9	2.8	2.9	2.6	

Bhn (Brinell)    HRc (Rockwell C)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fz \times 4 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



Series ZD1MCR Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
					3	6	8	10	12	16	20		
TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.4	≤ 1	123	RPM	13087	6544	4908	3926	3272	2454	1963
					(99-148)	Fz	0.012	0.029	0.049	0.061	0.072	0.083	0.112
						Feed (mm/min)	628	754	963	963	942	817	879
	Slot 	1	≤ 0.4	98	RPM	10340	5170	3878	3102	2585	1939	1551	
				(78-117)	Fz	0.012	0.029	0.049	0.061	0.072	0.083	0.112	
					Feed (mm/min)	496	596	761	761	744	645	695	
H TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 475 Bhn or ≤ 50 HRc	Profile 	≤ 0.4	≤ 1	64	RPM	6786	3393	2545	2036	1696	1272	1018
					(51-77)	Fz	0.010	0.024	0.041	0.051	0.060	0.068	0.093
						Feed (mm/min)	261	326	413	413	407	347	380
	Slot 	1	≤ 0.4	52	RPM	5493	2747	2060	1648	1373	1030	824	
				(41-62)	Fz	0.010	0.024	0.041	0.051	0.060	0.068	0.093	
					Feed (mm/min)	211	264	334	334	330	281	308	
TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 655 Bhn or ≤ 60 HRc	Profile 	≤ 0.4	≤ 1	27	RPM	2908	1454	1091	872	727	545	436
					(22-33)	Fz	0.005	0.012	0.021	0.027	0.031	0.036	0.048
						Feed (mm/min)	56	70	93	93	91	79	84
	Slot 	1	≤ 0.4	21	RPM	2262	1131	848	679	565	424	339	
				(17-26)	Fz	0.005	0.012	0.021	0.027	0.031	0.036	0.048	
					Feed (mm/min)	43	54	72	72	71	62	65	

Bhn (Brinell)    HRc (Rockwell C)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $ipm = Fz \times 4 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



### TOLERANCES (inch)

$D_1 = +0.0000/-0.0020$

$D_2 = h_6$

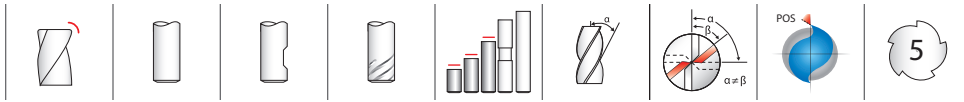
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

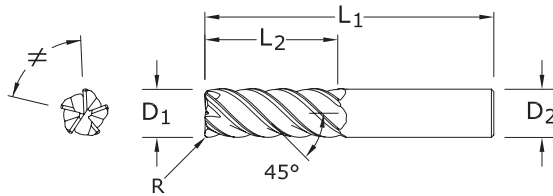
inch				EDP NO.		STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT	
1/8	1/4	1-1/2	1/8	32672	—	●
1/8	1/2	1-1/2	1/8	32655	—	●
5/32	9/16	2	3/16	32656	—	●
3/16	5/16	2	3/16	32673	—	●
3/16	5/8	2	3/16	32657	—	●
7/32	3/4	2-1/2	1/4	32658	—	●
1/4	3/8	2	1/4	32674	—	●
1/4	3/4	2-1/2	1/4	32659	—	●
5/16	7/16	2	5/16	32675	—	●
5/16	13/16	2-1/2	5/16	32660	—	●
3/8	1/2	2	3/8	32676	32677	●
3/8	1	2-1/2	3/8	32661	32662	●
7/16	1	2-3/4	7/16	32663	—	●
1/2	5/8	2-1/2	1/2	32678	32679	●
1/2	1-1/4	3	1/2	32664	32665	●
5/8	3/4	3	5/8	32680	32681	●
5/8	1-5/8	3-1/2	5/8	32666	32667	●
3/4	1	3	3/4	32682	32683	●
3/4	1-5/8	4	3/4	32668	32669	●
1	1-1/2	4	1	32670	32671	●

## 55 FRACTIONAL SERIES

- Unequal indexing, high helix and an ideal rake and relief combination for unmatched finishing capability
- The choice when peak finish quality is the requirement
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)



**55CR**  
FRACTIONAL SERIES



- Unequal indexing, high helix and an ideal rake and relief combination for unmatched finishing capability
- The choice when peak finish quality is the requirement
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			EDP NO.		STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R	Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT	
1/8	1/4	1-1/2	1/8	.010	32606	—	●
1/8	1/2	1-1/2	1/8	.010	32607	—	●
5/32	5/16	2	3/16	.010	32608	—	●
5/32	9/16	2	3/16	.010	32609	—	●
3/16	5/16	2	3/16	.010	32610	—	●
3/16	5/8	2	3/16	.010	32611	—	●
7/32	3/8	2	1/4	.015	32612	—	●
7/32	3/4	2-1/2	1/4	.015	32613	—	●
1/4	3/8	2	1/4	.015	32614	—	●
1/4	3/4	2-1/2	1/4	.015	32615	—	●
1/4	1-1/4	4	1/4	.015	32616	—	●
5/16	7/16	2	5/16	.015	32619	—	●
5/16	13/16	2-1/2	5/16	.015	32620	—	●
5/16	1-1/4	4	5/16	.015	32621	—	●
3/8	1/2	2	3/8	.015	32625	32591	●
3/8	1/2	2	3/8	.030	32592	32593	●
3/8	1	2-1/2	3/8	.015	32626	32628	●
3/8	1	2-1/2	3/8	.030	32573	32574	●
3/8	1-1/2	4	3/8	.015	32627	—	●
3/8	1-1/2	4	3/8	.030	32569	—	●
7/16	1	2-3/4	7/16	.015	32632	—	●
7/16	2	4	7/16	.015	32633	—	●

continued on next page

**TOLERANCES (inch)**

D<sub>1</sub> = +0.0000/−0.0020

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/−0.0020

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

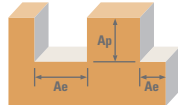
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery














**55CR**  
FRACTIONAL SERIES

CONTINUED

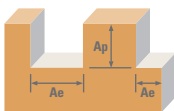
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			EDP NO.		STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R	Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT	
1/2	5/8	2-1/2	1/2	.030	32594	32595	●
1/2	5/8	2-1/2	1/2	.060	32596	32597	●
1/2	1-1/4	3	1/2	.030	32575	32576	●
1/2	1-1/4	3	1/2	.060	32577	32578	●
1/2	2	4	1/2	.030	32685	—	●
1/2	2	4	1/2	.060	32686	—	●
5/8	3/4	3	5/8	.030	32598	32599	●
5/8	3/4	3	5/8	.060	32600	32601	●
5/8	1-5/8	3-1/2	5/8	.030	32579	32580	●
5/8	1-5/8	3-1/2	5/8	.060	32581	32582	●
5/8	2-1/2	5	5/8	.030	32570	—	●
5/8	2-1/2	5	5/8	.060	32687	—	●
3/4	1	3	3/4	.030	32602	32603	●
3/4	1	3	3/4	.060	32604	32605	●
3/4	1-5/8	4	3/4	.030	32583	32584	●
3/4	1-5/8	4	3/4	.060	32585	32586	●
3/4	3-1/4	6	3/4	.030	32571	—	●
3/4	3-1/4	6	3/4	.060	32688	—	●
1	1-1/2	4	1	.030	32587	32588	●
1	1-1/2	4	1	.060	32589	32590	●
1	2-5/8	6	1	.030	32572	—	●
1	2-5/8	6	1	.060	32689	—	●

# FRACTIONAL V-Carb



Series 55, 55CR Fractional	Hardness	Profile 	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)							
						1/8	1/4	3/8	1/2	5/8	3/4	1	
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	Profile 	≤ 0.25	≤ 1.5	385	RPM	11766	5883	3922	2941	2353	1961	1471
					(308-462)	Fz	0.0004	0.0009	0.0017	0.0023	0.0029	0.0028	0.0032
					Feed (ipm)	20.6	26.5	33.3	33.8	34.1	27.5	23.5	
		HSM 	≤ 0.05	≤ 2	630	RPM	19253	9626	6418	4813	3851	3209	2407
					(504-756)	Fz	0.0007	0.0018	0.0034	0.0046	0.0057	0.0055	0.0064
					Feed (ipm)	67.4	86.6	109.1	110.7	109.7	88.2	77.0	
	<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	Profile 	≤ 0.25	≤ 1.5	325	RPM	9932	4966	3311	2483	1986	1655	1242
					(260-390)	Fz	0.0003	0.0007	0.0013	0.0017	0.0022	0.0021	0.0024
					Feed (ipm)	12.9	17.4	21.5	21.1	21.9	17.4	14.9	
		HSM 	≤ 0.05	≤ 2	530	RPM	16197	8098	5399	4049	3239	2699	2025
					(424-636)	Fz	0.0005	0.0014	0.0026	0.0034	0.0043	0.0041	0.0048
					Feed (ipm)	42.1	56.7	70.2	68.8	69.6	55.3	48.6	
<b>H</b>	<b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	Profile 	≤ 0.25	≤ 1.5	175	RPM	5348	2674	1783	1337	1070	891	669
					(140-210)	Fz	0.0002	0.0005	0.0010	0.0013	0.0016	0.0017	0.0018
					Feed (ipm)	5.3	6.7	8.9	8.7	8.6	7.6	6.0	
		HSM 	≤ 0.05	≤ 2	290	RPM	8862	4431	2954	2216	1772	1477	1108
					(232-348)	Fz	0.0004	0.0010	0.0019	0.0025	0.0032	0.0033	0.0035
					Feed (ipm)	17.7	22.2	28.1	27.7	28.4	24.4	19.4	
<b>K</b>	<b>CAST IRONS (LOW &amp; MEDIUM ALLOY)</b> Gray, Malleable, Ductile	Profile 	≤ 0.25	≤ 1.5	470	RPM	14363	7182	4788	3591	2873	2394	1795
					(376-564)	Fz	0.0004	0.0009	0.0017	0.0023	0.0029	0.0030	0.0032
					Feed (ipm)	25.1	32.3	40.7	41.3	41.7	35.9	28.7	
		HSM 	≤ 0.05	≤ 2	705	RPM	21545	10772	7182	5386	4309	3591	2693
					(564-846)	Fz	0.0007	0.0018	0.0034	0.0046	0.0057	0.0059	0.0064
					Feed (ipm)	75.4	97.0	122.1	123.9	122.8	105.9	86.2	
	<b>CAST IRONS (HIGH ALLOY)</b> Gray, Malleable, Ductile	Profile 	≤ 0.25	≤ 1.5	360	RPM	11002	5501	3667	2750	2200	1834	1375
					(288-432)	Fz	0.0003	0.0007	0.0013	0.0017	0.0022	0.0023	0.0024
					Feed (ipm)	14.3	19.3	23.8	23.4	24.2	21.1	16.5	
		HSM 	≤ 0.05	≤ 2	540	RPM	16502	8251	5501	4126	3300	2750	2063
					(432-648)	Fz	0.0005	0.0014	0.0026	0.0034	0.0043	0.0044	0.0048
					Feed (ipm)	42.9	57.8	71.5	70.1	71.0	60.5	49.5	
<b>M</b>	<b>STAINLESS STEELS (FREE MACHINING)</b> 303, 416, 420F, 430F, 440F	Profile 	≤ 0.25	≤ 1.5	370	RPM	11307	5654	3769	2827	2261	1885	1413
					(296-444)	Fz	0.0003	0.0007	0.0013	0.0017	0.0022	0.0023	0.0024
					Feed (ipm)	14.7	19.8	24.5	24.0	24.9	21.7	17.0	
		HSM 	≤ 0.05	≤ 2	560	RPM	17114	8557	5705	4278	3423	2852	2139
					(448-672)	Fz	0.0005	0.0014	0.0026	0.0034	0.0043	0.0044	0.0048
					Feed (ipm)	44.5	59.9	74.2	72.7	73.6	62.7	51.3	

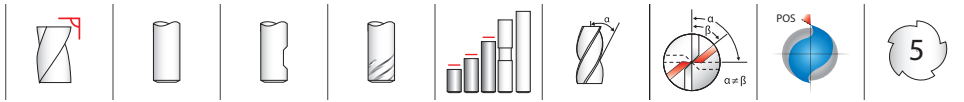
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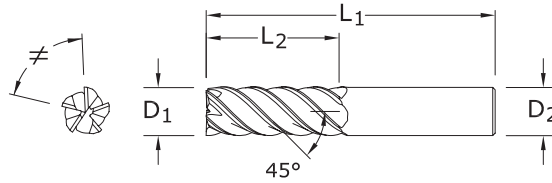
Series	Hardness	Profile	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)							
						1/8	1/4	3/8	1/2	5/8	3/4	1	
M <b>Series 55, 55CR Fractional</b>	<b>STAINLESS STEELS (DIFFICULT)</b> 304, 304L, 316, 316L	Profile	≤ 0.25	≤ 1.5	255	RPM	7793	3896	2598	1948	1559	1299	974
					(204-306)	Fz	0.0002	0.0006	0.0012	0.0016	0.0020	0.0021	0.0023
					Feed (ipm)	9.4	11.7	15.6	15.6	15.6	13.6	11.2	
		HSM	≤ 0.05	≤ 2	385	RPM	11766	5883	3922	2941	2353	1961	1471
					(308-462)	Fz	0.0005	0.0013	0.0024	0.0032	0.0040	0.0041	0.0045
					Feed (ipm)	28.2	38.2	47.1	47.1	47.1	40.2	33.1	
	<b>STAINLESS STEELS (PH)</b> 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	Profile	≤ 0.25	≤ 1.5	235	RPM	7182	3591	2394	1795	1436	1197	898
					(188-282)	Fz	0.0002	0.0006	0.0010	0.0014	0.0017	0.0018	0.0019
					Feed (ipm)	7.5	10.8	12.0	12.6	12.2	10.8	8.5	
		HSM	≤ 0.05	≤ 2	355	RPM	10849	5424	3616	2712	2170	1808	1356
					(284-426)	Fz	0.0004	0.0011	0.0021	0.0028	0.0034	0.0036	0.0039
					Feed (ipm)	22.2	29.8	38.0	38.0	36.9	32.5	26.4	
S	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE)</b> Inconel 601, 617, 625, Incoloy, Monel 400	Profile	≤ 0.25	≤ 1.5	70	RPM	2139	1070	713	535	428	357	267
					(56-84)	Fz	0.0002	0.0006	0.0010	0.0014	0.0017	0.0018	0.0019
					Feed (ipm)	2.2	3.2	3.6	3.7	3.6	3.2	2.5	
		HSM	≤ 0.05	≤ 2	107	RPM	3270	1635	1090	817	654	545	409
					(86-128)	Fz	0.0004	0.0011	0.0021	0.0028	0.0034	0.0036	0.0039
					Feed (ipm)	6.7	9.0	11.4	11.4	11.1	9.8	8.0	
	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE)</b> Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	Profile	≤ 0.25	≤ 1.5	55	RPM	1681	840	560	420	336	280	210
					(44-66)	Fz	0.0002	0.0004	0.0008	0.0010	0.0013	0.0014	0.0015
					Feed (ipm)	1.3	1.7	2.2	2.1	2.2	2.0	1.6	
		HSM	≤ 0.05	≤ 2	85	RPM	2598	1299	866	649	520	433	325
					(68-102)	Fz	0.0003	0.0008	0.0015	0.0021	0.0026	0.0027	0.0029
					Feed (ipm)	4.0	5.2	6.5	6.8	6.8	5.8	4.7	
<b>TITANIUM ALLOYS</b> Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	Profile	≤ 0.25	≤ 1.5	235	RPM	7182	3591	2394	1795	1436	1197	898	
				(188-282)	Fz	0.0002	0.0006	0.0012	0.0016	0.0020	0.0021	0.0023	
				Feed (ipm)	7.2	10.8	14.4	14.4	14.4	12.6	10.3		
	HSM	≤ 0.05	≤ 2	390	RPM	11918	5959	3973	2980	2384	1986	1490	
				(312-468)	Fz	0.0005	0.0013	0.0024	0.0032	0.0040	0.0041	0.0045	
				Feed (ipm)	29.8	38.7	47.7	47.7	47.7	40.7	33.5		
<b>TITANIUM ALLOYS (DIFFICULT)</b> Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	Profile	≤ 0.25	≤ 1.5	85	RPM	2598	1299	866	649	520	433	325	
				(68-102)	Fz	0.0002	0.0006	0.0012	0.0016	0.0020	0.0021	0.0023	
				Feed (ipm)	2.6	3.9	5.2	5.2	5.2	4.5	3.7		
	HSM	≤ 0.05	≤ 2	140	RPM	4278	2139	1426	1070	856	713	535	
				(112-168)	Fz	0.0005	0.0013	0.0024	0.0032	0.0040	0.0042	0.0045	
				Feed (ipm)	10.7	13.9	17.1	17.1	17.1	15.0	12.0		

Bhn (Brinell)    HRc (Rockwell C)    HSM (High Speed Machining)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fz \times 5 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 reduce Ap to 1 x D<sub>1</sub> (maximum) when profile milling with long or extra long flute length tools  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))





**55M**  
METRIC SERIES



- Unequal indexing, high helix and an ideal rake and relief combination for unmatched finishing capability
- The choice when peak finish quality is the requirement
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

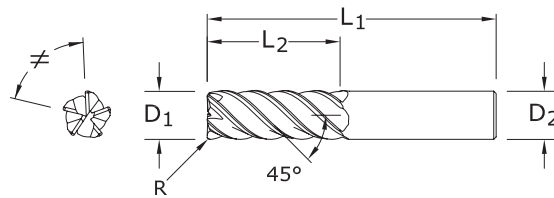
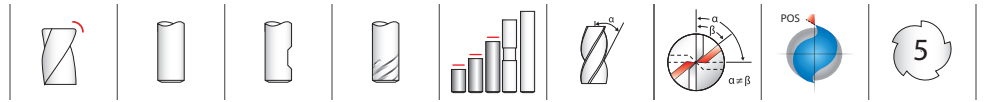
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	EDP NO.		STOCK
				Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT	
6,0	12,0	50,0	6,0	42606	—	●
6,0	19,0	63,0	6,0	42607	—	●
6,0	25,0	75,0	6,0	42608	—	●
8,0	12,0	50,0	8,0	42609	—	●
8,0	20,0	63,0	8,0	42610	—	●
8,0	25,0	75,0	8,0	42611	—	●
10,0	16,0	50,0	10,0	42612	—	●
10,0	22,0	75,0	10,0	42622	42613	●
10,0	38,0	100,0	10,0	42614	—	●
12,0	19,0	63,0	12,0	42615	—	●
12,0	25,0	75,0	12,0	42616	42623	●
12,0	50,0	100,0	12,0	42617	—	●
16,0	32,0	89,0	16,0	42618	42624	●
16,0	50,0	100,0	16,0	42626	—	■
16,0	75,0	150,0	16,0	42619	—	●
20,0	38,0	100,0	20,0	42620	42625	●
20,0	50,0	100,0	20,0	42627	—	■
20,0	75,0	150,0	20,0	42621	—	●

**TOLERANCES (mm)**

D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



**55MCR**  
METRIC SERIES

**TOLERANCES (mm)**

$D_1 = +0,000/-0,050$   
 $D_2 = h_6$

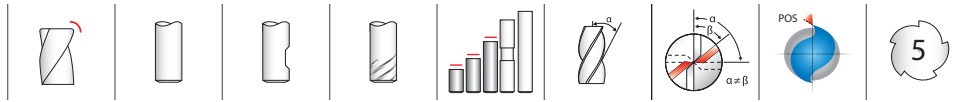
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

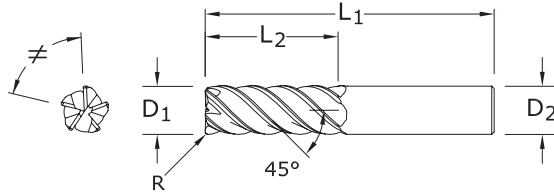
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	mm			CORNER RADIUS $R$	EDP NO. Ti-NAMITE-A (AlTiN)	STOCK
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$				
6,0	12,0	50,0	6,0	0,5	42660	■	
6,0	19,0	63,0	6,0	0,25	42661	■	
6,0	19,0	63,0	6,0	0,5	42662	■	
6,0	19,0	63,0	6,0	1,0	42663	■	
6,0	19,0	63,0	6,0	1,5	42664	■	
6,0	25,0	75,0	6,0	0,5	42665	■	
8,0	12,0	50,0	8,0	0,5	42666	■	
8,0	20,0	63,0	8,0	0,5	42667	■	
8,0	20,0	63,0	8,0	1,0	42668	■	
8,0	20,0	63,0	8,0	1,5	42669	■	
8,0	20,0	63,0	8,0	2,0	42670	■	
8,0	25,0	75,0	8,0	0,5	42671	■	
10,0	16,0	50,0	10,0	0,5	42672	■	
10,0	22,0	75,0	10,0	0,5	42673	■	
10,0	22,0	75,0	10,0	1,0	42674	■	
10,0	22,0	75,0	10,0	1,5	42675	■	
10,0	22,0	75,0	10,0	2,0	42676	■	
10,0	22,0	75,0	10,0	2,5	42677	■	
10,0	38,0	100,0	10,0	0,5	42678	■	
12,0	19,0	63,0	12,0	0,5	42679	■	
12,0	25,0	75,0	12,0	0,5	42680	■	
12,0	25,0	75,0	12,0	1,0	42681	■	
12,0	25,0	75,0	12,0	1,5	42682	■	
12,0	25,0	75,0	12,0	2,0	42683	■	
12,0	25,0	75,0	12,0	2,5	42684	■	
12,0	25,0	75,0	12,0	3,0	42685	■	
12,0	50,0	100,0	12,0	0,5	42686	■	
12,0	50,0	100,0	12,0	3,0	42630	■	
12,0	50,0	100,0	12,0	4,0	42631	■	
16,0	32,0	89,0	16,0	1,0	42687	■	
16,0	32,0	89,0	16,0	1,5	42688	■	
16,0	32,0	89,0	16,0	2,0	42689	■	

- Unequal indexing, high helix and an ideal rake and relief combination for unmatched finishing capability
- The choice when peak finish quality is the requirement
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

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**55MCR**  
METRIC SERIES



CONTINUED

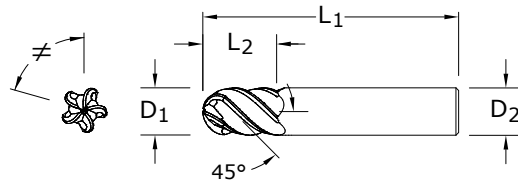
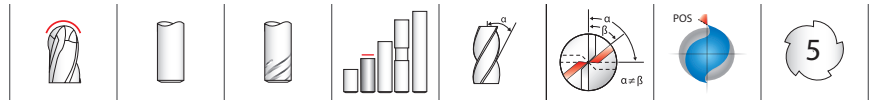
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	mm			CORNER RADIUS R	EDP NO. Ti-NAMITE-A (AITiN)	STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>				
16,0	32,0	89,0	16,0	2,5	42690	■	
16,0	32,0	89,0	16,0	3,0	42691	■	
16,0	32,0	89,0	16,0	4,0	42692	■	
16,0	50,0	100,0	16,0	2,0	42656	■	
16,0	50,0	100,0	16,0	2,5	42657	■	
16,0	50,0	100,0	16,0	3,0	42658	■	
16,0	50,0	100,0	16,0	4,0	42659	■	
16,0	50,0	100,0	16,0	5,0	42628	■	
16,0	75,0	150,0	16,0	1,0	42693	■	
16,0	75,0	150,0	16,0	3,0	42632	■	
16,0	75,0	150,0	16,0	4,0	42633	■	
20,0	38,0	100,0	20,0	1,0	42694	■	
20,0	38,0	100,0	20,0	1,5	42695	■	
20,0	38,0	100,0	20,0	2,0	42696	■	
20,0	38,0	100,0	20,0	2,5	42697	■	
20,0	38,0	100,0	20,0	3,0	42698	■	
20,0	38,0	100,0	20,0	4,0	42699	■	
20,0	38,0	100,0	20,0	5,0	42700	■	
20,0	38,0	100,0	20,0	6,0	42648	■	
20,0	50,0	100,0	20,0	2,0	42649	■	
20,0	50,0	100,0	20,0	2,5	42650	■	
20,0	50,0	100,0	20,0	3,0	42651	■	
20,0	50,0	100,0	20,0	4,0	42652	■	
20,0	50,0	100,0	20,0	5,0	42653	■	
20,0	50,0	100,0	20,0	6,0	42654	■	
20,0	75,0	150,0	20,0	1,0	42701	■	
20,0	75,0	150,0	20,0	2,0	42702	■	
20,0	75,0	150,0	20,0	3,0	42703	■	
20,0	75,0	150,0	20,0	4,0	42704	■	
20,0	75,0	150,0	20,0	5,0	42705	■	
20,0	75,0	150,0	20,0	6,0	42655	■	

TOLERANCES (mm)

D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



**55MB**  
METRIC SERIES

**TOLERANCES (mm)**

$D_1 = +0,000/-0,050$

$D_2 = h_6$

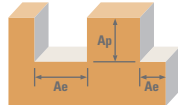
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

mm				EDP NO.	STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	Ti-NAMITE-A (AlTiN)	
6,0	13,0	57,0	6,0	42750	■
8,0	19,0	63,0	8,0	42751	■
10,0	22,0	72,0	10,0	42752	■
12,0	26,0	83,0	12,0	42753	■
16,0	32,0	92,0	16,0	42754	■
20,0	38,0	104,0	20,0	42755	■

- Unequal indexing, high helix and an ideal rake and relief combination for unmatched finishing capability
- The choice when peak finish quality is the requirement
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

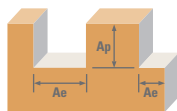
# METRIC V-Carb



Series  
55M, 55MCR,  
55MB  
Metric

Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)							
					6	8	10	12	16	20		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	Profile 	≤ 0.25	≤ 1.5	117	RPM	6220	4665	3732	3110	2333	1866
					(94-141)	Fz	0.022	0.036	0.061	0.070	0.072	0.085
					Feed (mm/min)	672	846	1145	1082	836	796	
		HSM 	≤ 0.05	≤ 2	192	RPM	10179	7634	6107	5089	3817	3054
					(154-230)	Fz	0.043	0.073	0.123	0.137	0.141	0.154
					Feed (mm/min)	2198	2769	3746	3481	2687	2345	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	Profile 	≤ 0.25	≤ 1.5	99	RPM	5251	3938	3151	2626	1969	1575
					(79-119)	Fz	0.017	0.028	0.045	0.053	0.054	0.064
					Feed (mm/min)	441	546	571	693	529	504	
		HSM 	≤ 0.05	≤ 2	162	RPM	8563	6422	5138	4282	3211	2569
					(129-194)	Fz	0.034	0.055	0.091	0.103	0.105	0.128
					Feed (mm/min)	1438	1781	2329	2209	1685	1644	
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	Profile 	≤ 0.25	≤ 1.5	53	RPM	2827	2121	1696	1414	1060	848
					(43-64)	Fz	0.012	0.021	0.035	0.038	0.044	0.048
					Feed (mm/min)	170	226	294	271	231	204	
		HSM 	≤ 0.05	≤ 2	88	RPM	4686	3514	2811	2343	1757	1406
					(71-106)	Fz	0.024	0.041	0.067	0.077	0.084	0.093
					Feed (mm/min)	562	712	937	900	742	656	
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	Profile 	≤ 0.25	≤ 1.5	143	RPM	7594	5695	4556	3797	2848	2278
					(115-172)	Fz	0.022	0.036	0.061	0.070	0.077	0.085
					Feed (mm/min)	820	1033	1397	1321	1093	972	
		HSM 	≤ 0.05	≤ 2	215	RPM	11391	8543	6834	5695	4271	3417
					(172-258)	Fz	0.043	0.073	0.123	0.137	0.151	0.171
					Feed (mm/min)	2460	3099	4192	3895	3226	2916	
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	Profile 	≤ 0.25	≤ 1.5	110	RPM	5816	4362	3490	2908	2181	1745
					(88-132)	Fz	0.017	0.028	0.045	0.053	0.059	0.064
					Feed (mm/min)	489	605	791	768	642	558	
		HSM 	≤ 0.05	≤ 2	165	RPM	8725	6544	5235	4362	3272	2617
					(132-198)	Fz	0.034	0.055	0.091	0.103	0.113	0.128
					Feed (mm/min)	1466	1815	2373	2251	1843	1675	

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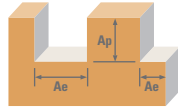








Series 55M, 55MCR, 55MB Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)							
					6	8	10	12	16	20		
<b>M</b>	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F ≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.25	≤ 1.5	113	RPM	5978	4484	3587	2989	2242	1793
					(90-135)	Fz	0.017	0.028	0.045	0.053	0.059	0.064
					Feed (mm/min)	502	622	813	789	660	574	
		HSM 	≤ 0.05	≤ 2	171	RPM	9048	6786	5429	4524	3393	2714
					(137-205)	Fz	0.034	0.055	0.091	0.103	0.113	0.128
					Feed (mm/min)	1520	1882	2461	2334	1911	1737	
<b>M</b>	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L ≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.25	≤ 1.5	78	RPM	4120	3090	2472	2060	1545	1236
					(62-93)	Fz	0.014	0.026	0.043	0.048	0.054	0.061
					Feed (mm/min)	297	396	527	494	415	379	
		HSM 	≤ 0.05	≤ 2	117	RPM	6220	4665	3732	3110	2333	1866
					(94-141)	Fz	0.031	0.051	0.085	0.096	0.105	0.120
					Feed (mm/min)	970	1194	1592	1493	1224	1120	
<b>M</b>	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450 ≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.25	≤ 1.5	72	RPM	3797	2848	2278	1898	1424	1139
					(57-86)	Fz	0.014	0.021	0.037	0.041	0.046	0.051
					Feed (mm/min)	273	13260	425	387	328	289	
		HSM 	≤ 0.05	≤ 2	108	RPM	5736	4302	3441	2868	2151	1721
					(87-130)	Fz	0.026	0.045	0.075	0.082	0.092	0.104
					Feed (mm/min)	757	14850	1285	1170	991	895	
<b>S</b>	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400 ≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.25	≤ 1.5	21	RPM	1131	848	679	565	424	339
					(17-26)	Fz	0.014	0.021	0.037	0.041	0.046	0.051
					Feed (mm/min)	81	16530	196792	115	98	86	
		HSM 	≤ 0.05	≤ 2	33	RPM	1729	1297	1037	864	648	519
					(26-39)	Fz	0.026	0.045	0.075	0.082	0.092	0.104
					Feed (mm/min)	228	290	387	353	299	270	
<b>S</b>	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene ≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.25	≤ 1.5	17	RPM	889	666	533	444	333	267
					(13-20)	Fz	0.010	0.017	0.027	0.031	0.036	0.040
					Feed (mm/min)	43	57	71	69	60	53	
		HSM 	≤ 0.05	≤ 2	26	RPM	1373	1030	824	687	515	412
					(21-31)	Fz	0.019	0.032	0.056	0.062	0.069	0.077
					Feed (mm/min)	132	165	231	214	178	159	

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# METRIC V-Carb

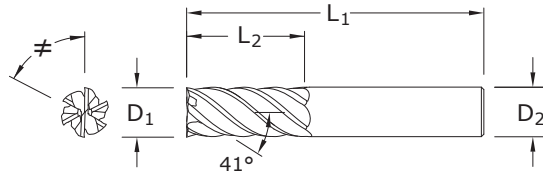
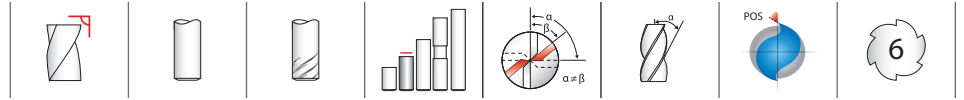
Series  
55M, 55MCR,  
55MB



Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)										
					6	8	10	12	16	20					
<b>S</b>  <b>TITANIUM ALLOYS</b> Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.25	≤ 1.5	72	RPM	3797	2848	2278	1898	1424	1139			
					(57-86)	Fz	0.014	0.026	0.043	0.048	0.054	0.061			
					Feed (mm/min)	273	365	486	456	383	349				
					HSM 	≤ 0.05	≤ 2	119	RPM	6301	4726	3781	3151	2363	1890
								(95-143)	Fz	0.031	0.051	0.085	0.096	0.105	0.120
								Feed (mm/min)	983	1210	1613	1512	1240	1134	
	≤ 440 Bhn or ≤ 47 HRc	Profile 	≤ 0.25	≤ 1.5	26	RPM	1373	1030	824	687	515	412			
					(21-31)	Fz	0.014	0.026	0.043	0.048	0.054	0.061			
					Feed (mm/min)	99	132	176	165	138	126				
					HSM 	≤ 0.05	≤ 2	43	RPM	2262	1696	1357	1131	848	679
								(34-51)	Fz	0.031	0.051	0.085	0.096	0.108	0.120
								Feed (mm/min)	353	434	579	543	456	407	
<b>TITANIUM ALLOYS (DIFFICULT)</b> Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRc	Profile 	≤ 0.25	≤ 1.5	26	RPM	1373	1030	824	687	515	412			
					(21-31)	Fz	0.014	0.026	0.043	0.048	0.054	0.061			
					Feed (mm/min)	99	132	176	165	138	126				
					HSM 	≤ 0.05	≤ 2	43	RPM	2262	1696	1357	1131	848	679
								(34-51)	Fz	0.031	0.051	0.085	0.096	0.108	0.120
								Feed (mm/min)	353	434	579	543	456	407	

Bhn (Brinell)    HRc (Rockwell C)    HSM (High Speed Machining)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fz \times 5 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 reduce Ap to 1 x D<sub>1</sub> (maximum) when profile milling with long or extra long flute length tools  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))





### TOLERANCES (inch)

D1 = +0.0000/-0.0020

D2 = h6

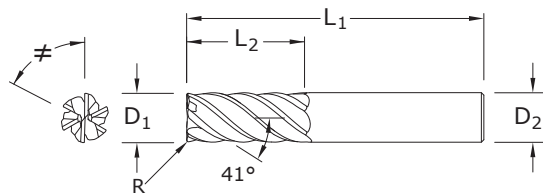
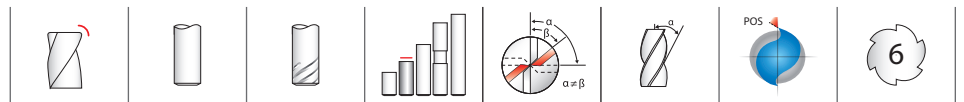
- STEELS
- STAINLESS STEELS
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	EDP NO.	STOCK
				Ti-NAMITE-X	
1/4	3/4	2-1/2	1/4	35100	●
3/8	1	2-1/2	3/8	35101	●
1/2	1-1/4	3	1/2	35102	●
5/8	1-5/8	3-1/2	5/8	35103	●
3/4	1-5/8	4	3/4	35104	●
1	2-5/8	6	1	35105	●

## 51 FRACTIONAL SERIES

- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Designed for aggressive ramping at high speeds where evacuation and load may be a contributing factor
- Eccentric relief provides superior strength and smoother surface finish
- Recommended for materials ≤ 45 HRC (≤ 420 Bhn)



### TOLERANCES (inch)

D1 = +0.0000/-0.0020

D2 = h6

R = +0.000/-0.0020

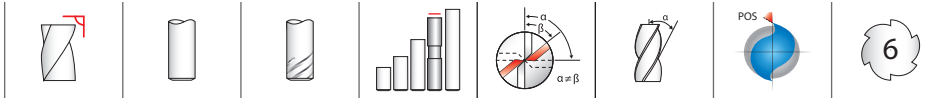
- STEELS
- STAINLESS STEELS
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

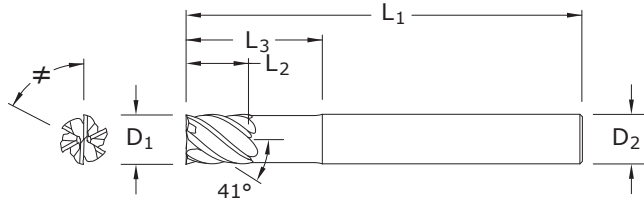
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R	EDP NO.	STOCK
					Ti-NAMITE-X	
1/4	3/4	2-1/2	1/4	.015	35112	●
3/8	1	2-1/2	3/8	.015	35113	●
3/8	1	2-1/2	3/8	.030	35114	●
1/2	1-1/4	3	1/2	.030	35115	●
1/2	1-1/4	3	1/2	.090	35116	●
1/2	1-1/4	3	1/2	.120	35117	●
5/8	1-5/8	3-1/2	5/8	.030	35118	●
5/8	1-5/8	3-1/2	5/8	.090	35119	●
5/8	1-5/8	3-1/2	5/8	.120	35120	●
3/4	1-5/8	4	3/4	.030	35121	●
3/4	1-5/8	4	3/4	.090	35122	●
3/4	1-5/8	4	3/4	.120	35123	●
1	2-5/8	6	1	.030	35124	●
1	2-5/8	6	1	.090	35125	●
1	2-5/8	6	1	.120	35126	●

## 51CR FRACTIONAL SERIES

- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Designed for aggressive ramping at high speeds where evacuation and load may be a contributing factor
- Eccentric relief provides superior strength and smoother surface finish
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRC
- Recommended for materials ≤ 45 HRC (≤ 420 Bhn)



**51L**  
FRACTIONAL SERIES



- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Designed for aggressive ramping at high speeds where evacuation and load may be a contributing factor
- Eccentric relief provides superior strength and smoother surface finish
- Necked design with blended diameter transitions provide clearance to reach
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

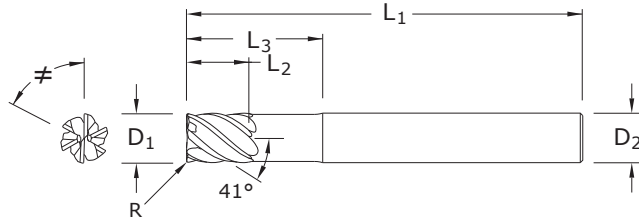
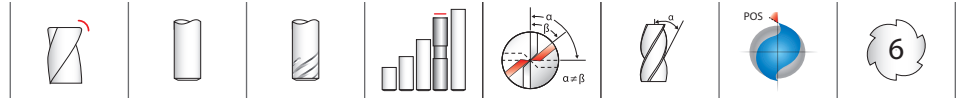
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			EDP NO.		STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>	Ti-NAMITE-X		
1/4	3/8	4	1/4	1-1/8	35106	●	
3/8	1/2	4	3/8	2-1/8	35107	●	
1/2	5/8	4	1/2	2-1/4	35108	●	
5/8	3/4	5	5/8	2-1/2	35109	●	
3/4	1	6	3/4	3-3/8	35110	●	
1	1-1/4	6	1	3-3/8	35111	●	

**TOLERANCES (inch)**

D1 = +0.0000/-0.0020  
D2 = h6

- STEELS
- STAINLESS STEELS
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



**51LC**  
FRACTIONAL SERIES

**TOLERANCES (inch)**  
**D1** = +0.0000/-0.0020  
**D2** = h6  
**R** = +0.000/-0.0020

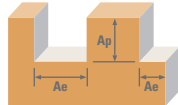
- STEELS
- STAINLESS STEELS
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>	CORNER RADIUS R	EDP NO.	STOCK
						Ti-NAMITE-X	
1/4	3/8	4	1/4	1-1/8	.015	35127	●
3/8	1/2	4	3/8	2-1/8	.015	35128	●
3/8	1/2	4	3/8	2-1/8	.030	35129	●
1/2	5/8	4	1/2	2-1/4	.030	35130	●
1/2	5/8	4	1/2	2-1/4	.090	35131	●
1/2	5/8	4	1/2	2-1/4	.120	35132	●
5/8	3/4	5	5/8	2-1/2	.030	35133	●
5/8	3/4	5	5/8	2-1/2	.090	35134	●
5/8	3/4	5	5/8	2-1/2	.120	35135	●
3/4	1	6	3/4	3-3/8	.030	35136	●
3/4	1	6	3/4	3-3/8	.090	35137	●
3/4	1	6	3/4	3-3/8	.120	35138	●
1	1-1/4	6	1	3-3/8	.030	35139	●
1	1-1/4	6	1	3-3/8	.090	35140	●
1	1-1/4	6	1	3-3/8	.120	35141	●

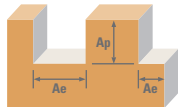
- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Designed for aggressive ramping at high speeds where evacuation and load may be a contributing factor
- Eccentric relief provides superior strength and smoother surface finish
- Necked design with blended diameter transitions provide clearance to reach
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

# FRACTIONAL T-Carb



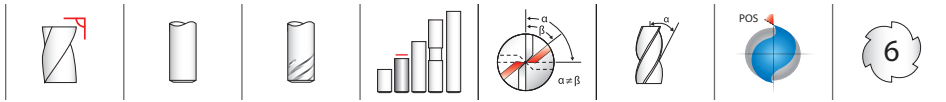
Series 51, 51CR Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)							
					1/4	3/8	1/2	5/8	3/4	1		
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	Profile 	≤ 0.1	≤ 1	720	RPM	11002	7334	5501	4401	3667	2750
					(576-864)	Fz	0.0020	0.0035	0.0050	0.0055	0.0061	0.0071
					Feed (ipm)	132	154	165	145	134	117	
		HSM 	≤ 0.05	≤ 2	915	RPM	13981	9321	6991	5592	4660	3495
					(732-1098)	Fz	0.0028	0.0053	0.0070	0.0077	0.0085	0.0100
					Feed (ipm)	235	296	294	258	238	210	
	<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	Profile 	≤ 0.1	≤ 1	490	RPM	7487	4991	3744	2995	2496	1872
					(392-588)	Fz	0.0015	0.0029	0.0038	0.0042	0.0046	0.0054
					Feed (ipm)	67	87	85	75	69	61	
		HSM 	≤ 0.05	≤ 2	620	RPM	9474	6316	4737	3789	3158	2368
					(496-744)	Fz	0.0021	0.0039	0.0052	0.0057	0.0062	0.0073
					Feed (ipm)	119	148	148	130	117	104	
<b>H</b>	<b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	Profile 	≤ 0.1	≤ 1	240	RPM	3667	2445	1834	1467	1222	917
					(192-288)	Fz	0.0012	0.0023	0.0030	0.0034	0.0037	0.0043
					Feed (ipm)	26	34	33	30	27	24	
		HSM 	≤ 0.05	≤ 2	305	RPM	4660	3107	2330	1864	1553	1165
					(244-366)	Fz	0.0017	0.0032	0.0042	0.0046	0.0050	0.0059
					Feed (ipm)	48	60	59	51	47	41	
<b>M</b>	<b>STAINLESS STEELS (FREE MACHINING)</b> 303, 416, 420F, 430F, 440F	Profile 	≤ 0.1	≤ 1	510	RPM	7793	5195	3896	3117	2598	1948
					(459-561)	Fz	0.0015	0.0028	0.0038	0.0041	0.0045	0.0053
					Feed (ipm)	70	87	89	77	70	62	
		HSM 	≤ 0.05	≤ 2	650	RPM	9932	6621	4966	3973	3311	2483
					(585-715)	Fz	0.0021	0.0038	0.0051	0.0056	0.0061	0.0072
					Feed (ipm)	125	151	152	133	121	107	
	<b>STAINLESS STEELS (DIFFICULT)</b> 304, 304L, 316, 316L	Profile 	≤ 0.1	≤ 1	350	RPM	5348	3565	2674	2139	1783	1337
					(315-385)	Fz	0.0012	0.0023	0.0030	0.0033	0.0036	0.0042
					Feed (ipm)	39	49	48	42	39	34	
		HSM 	≤ 0.05	≤ 2	450	RPM	6876	4584	3438	2750	2292	1719
					(405-495)	Fz	0.0017	0.0032	0.0042	0.0046	0.0050	0.0059
					Feed (ipm)	70	88	87	76	69	61	
<b>STAINLESS STEELS (PH)</b> 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	Profile 	≤ 0.1	≤ 1	325	RPM	4966	3311	2483	1986	1655	1242	
				(293-358)	Fz	0.0012	0.0023	0.0030	0.0033	0.0036	0.0042	
				Feed (ipm)	36	46	45	39	36	31		
	HSM 	≤ 0.05	≤ 2	410	RPM	6265	4177	3132	2506	2088	1566	
				(369-451)	Fz	0.0017	0.0032	0.0042	0.0046	0.0050	0.0059	
				Feed (ipm)	64	80	79	69	63	55		

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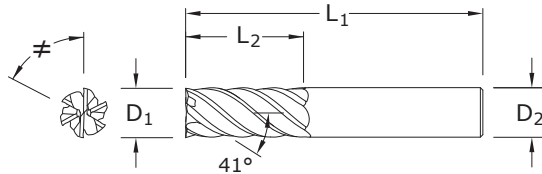


Series 51, 51CR Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)							
					1/4	3/8	1/2	5/8	3/4	1		
<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400</b>	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.1	≤ 1	105	RPM	1604	1070	802	642	535	401
					(84-126)	Fz	0.0014	0.0027	0.0036	0.0039	0.0043	0.0050
		HSM 	≤ 0.05	≤ 2	130	RPM	1986	1324	993	795	662	497
					(104-156)	Fz	0.0016	0.0036	0.0048	0.0053	0.0058	0.0067
		Profile 	≤ 0.1	≤ 1	80	RPM	1222	815	611	489	407	306
					(64-96)	Fz	0.0010	0.0018	0.0025	0.0027	0.0029	0.0034
HSM 	≤ 0.05	≤ 2	100	RPM	1528	1019	764	611	509	382		
			(80-120)	Fz	0.0013	0.0025	0.0034	0.0037	0.0041	0.0047		
<b>TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si</b>	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.1	≤ 1	280	RPM	4278	2852	2139	1711	1426	1070
					(224-336)	Fz	0.0010	0.0018	0.0025	0.0027	0.0029	0.0034
		HSM 	≤ 0.05	≤ 2	355	RPM	5424	3616	2712	2170	1808	1356
					(284-426)	Fz	0.0013	0.0025	0.0034	0.0037	0.0041	0.0047
		Profile 	≤ 0.1	≤ 1	155	RPM	2368	1579	1184	947	789	592
					(124-186)	Fz	0.0010	0.0018	0.0025	0.0027	0.0029	0.0034
HSM 	≤ 0.05	≤ 2	200	RPM	3056	2037	1528	1222	1019	764		
			(160-240)	Fz	0.0013	0.0025	0.0034	0.0037	0.0041	0.0047		
Profile 	≤ 0.1	≤ 1	155	RPM	2368	1579	1184	947	789	592		
			(124-186)	Fz	0.0010	0.0018	0.0025	0.0027	0.0029	0.0034		
HSM 	≤ 0.05	≤ 2	200	RPM	3056	2037	1528	1222	1019	764		
			(160-240)	Fz	0.0013	0.0025	0.0034	0.0037	0.0041	0.0047		

Bhn (Brinell)    HRc (Rockwell C)    HSM (High Speed Machining)  
 rpm = Vc x 3.82 / D<sub>1</sub>  
 ipm = Fz x 6 x rpm  
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstoool.com](http://www.kyocera-sgstoool.com))



**51M**  
METRIC SERIES



- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Designed for aggressive ramping at high speeds where evacuation and load may be a contributing factor
- Eccentric relief provides superior strength and smoother surface finish
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

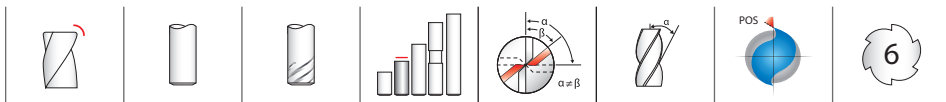
mm				EDP NO.	STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	Ti-NAMITE-X	
6,0	19,0	63,0	6,0	45100	●
8,0	20,0	63,0	8,0	45101	●
10,0	22,0	75,0	10,0	45102	●
12,0	26,0	83,0	12,0	45103	●
16,0	32,0	92,0	16,0	45104	●
20,0	38,0	104,0	20,0	45105	●

**TOLERANCES (mm)**

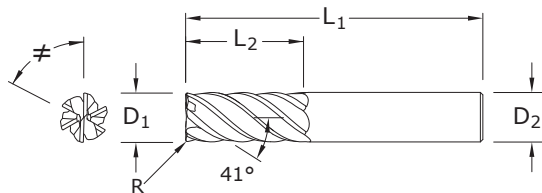
D1 = +0,000/-0,050  
D2 = h6

- STEELS
- STAINLESS STEELS
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



**51MCR**  
METRIC SERIES



- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Designed for aggressive ramping at high speeds where evacuation and load may be a contributing factor
- Eccentric relief provides superior strength and smoother surface finish
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

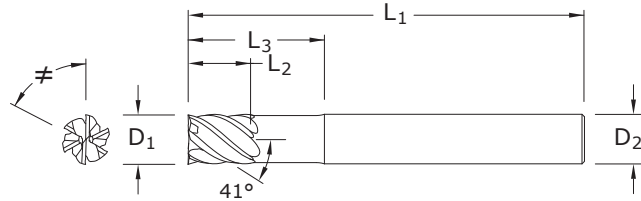
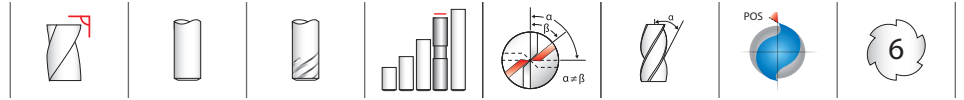
mm					EDP NO.	STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R	Ti-NAMITE-X	
6,0	19,0	63,0	6,0	0,5	45112	●
8,0	20,0	63,0	8,0	0,5	45113	●
8,0	20,0	63,0	8,0	1,0	45114	●
8,0	20,0	63,0	8,0	1,2	45150	■
10,0	22,0	75,0	10,0	1,0	45115	●
10,0	22,0	75,0	10,0	1,5	45116	●
10,0	22,0	75,0	10,0	2,0	45117	●
12,0	26,0	83,0	12,0	1,0	45118	●
12,0	26,0	83,0	12,0	1,5	45119	●
12,0	26,0	83,0	12,0	2,0	45120	●
16,0	32,0	92,0	16,0	1,0	45121	●
16,0	32,0	92,0	16,0	1,5	45122	●
16,0	32,0	92,0	16,0	2,0	45123	●
20,0	38,0	104,0	20,0	1,0	45124	●
20,0	38,0	104,0	20,0	1,5	45125	●
20,0	38,0	104,0	20,0	2,0	45126	●

**TOLERANCES (mm)**

D1 = +0,000/-0,050  
D2 = h6  
R = +0,000/-0,050

- STEELS
- STAINLESS STEELS
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



**51ML**  
METRIC SERIES

**TOLERANCES (mm)**

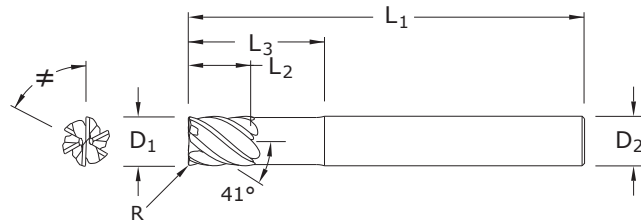
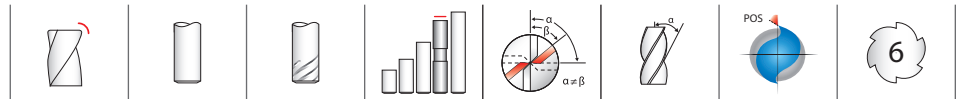
D1 = +0,000/-0,050  
D2 = h6

- STEELS
- STAINLESS STEELS
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>	EDP NO.	STOCK
					Ti-NAMITE-X	
6,0	8,0	75,0	6,0	32,0	45106	●
8,0	10,0	75,0	8,0	32,0	45107	●
10,0	12,0	100,0	10,0	40,0	45108	●
12,0	15,0	100,0	12,0	48,0	45109	●
16,0	20,0	115,0	16,0	65,0	45110	●
20,0	24,0	150,0	20,0	80,0	45111	●

- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Designed for aggressive ramping at high speeds where evacuation and load may be a contributing factor
- Eccentric relief provides superior strength and smoother surface finish
- Necked design with blended diameter transitions provide clearance to reach
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)



**51MLC**  
METRIC SERIES

**TOLERANCES (mm)**

D1 = +0,000/-0,050  
D2 = h6  
R = +0,000/-0,050

- STEELS
- STAINLESS STEELS
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

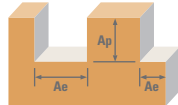
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery














CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>	CORNER RADIUS	EDP NO.	STOCK
					R	Ti-NAMITE-X	
6,0	8,0	75,0	6,0	32,0	0,5	45127	●
8,0	10,0	75,0	8,0	32,0	0,5	45128	●
8,0	10,0	75,0	8,0	32,0	1,0	45129	●
10,0	12,0	100,0	10,0	40,0	1,0	45130	●
10,0	12,0	100,0	10,0	40,0	1,5	45131	●
10,0	12,0	100,0	10,0	40,0	2,0	45132	●
12,0	15,0	100,0	12,0	48,0	1,0	45133	●
12,0	15,0	100,0	12,0	48,0	1,5	45134	●
12,0	15,0	100,0	12,0	48,0	2,0	45135	●
16,0	20,0	115,0	16,0	65,0	1,0	45136	●
16,0	20,0	115,0	16,0	65,0	1,5	45137	●
16,0	20,0	115,0	16,0	65,0	2,0	45138	●
20,0	24,0	150,0	20,0	80,0	1,0	45139	●
20,0	24,0	150,0	20,0	80,0	1,5	45140	●
20,0	24,0	150,0	20,0	80,0	2,0	45141	●

- Engineered for High Speed Milling using Trochoidal and Peel Milling techniques
- Designed for aggressive ramping at high speeds where evacuation and load may be a contributing factor
- Eccentric relief provides superior strength and smoother surface finish
- Necked design with blended diameter transitions provide clearance to reach
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 45 HRc (≤ 420 Bhn)

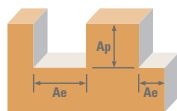


# METRIC T-Carb



Series 51M, 51MCR, 51ML, 51MLC Metric	Hardness	Profile 	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)							
						6	8	10	12	16	20		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.1	≤ 1	219	RPM	11633	8725	6980	5816	4362	3490	
					(176-263)	Fz	0.048	0.081	0.101	0.121	0.142	0.158	
					Feed (mm/min)	3350	4240	4230	4223	3717	3308		
		HSM 	≤ 0.05	≤ 2	279	RPM	14784	11088	8870	7392	5544	4435	
					(223-335)	Fz	0.066	0.113	0.141	0.169	0.197	0.220	
					Feed (mm/min)	5854	7517	7504	7495	6553	5854		
	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.1	≤ 1	149	RPM	7917	5938	4750	3958	2969	2375	
					(119-179)	Fz	0.036	0.061	0.077	0.092	0.107	0.119	
					Feed (mm/min)	1710	2173	2195	2185	1906	1696		
		HSM 	≤ 0.05	≤ 2	189	RPM	10017	7513	6010	5009	3756	3005	
					(151-227)	Fz	0.049	0.083	0.104	0.125	0.146	0.163	
					Feed (mm/min)	2945	3741	3750	3756	3291	2939		
<b>H</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.1	≤ 1	73	RPM	3878	2908	2327	1939	1454	1163	
					(59-88)	Fz	0.029	0.049	0.061	0.073	0.086	0.096	
					Feed (mm/min)	675	855	852	849	750	670		
		HSM 	≤ 0.05	≤ 2	93	RPM	4928	3696	2957	2464	1848	1478	
					(74-112)	Fz	0.040	0.069	0.086	0.103	0.120	0.134	
					Feed (mm/min)	1183	1530	1526	1523	1331	1189		
	<b>M</b>  <b>STAINLESS STEELS (FREE MACHINING)</b> 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.1	≤ 1	155	RPM	8240	6180	4944	4120	3090	2472
						(140-171)	Fz	0.035	0.060	0.075	0.090	0.105	0.117
						Feed (mm/min)	1730	2225	2225	2225	1947	1735	
			HSM 	≤ 0.05	≤ 2	198	RPM	10502	7877	6301	5251	3938	3151
						(178-218)	Fz	0.048	0.082	0.102	0.122	0.143	0.159
						Feed (mm/min)	3025	3875	3856	3844	3379	3006	
≤ 275 Bhn or ≤ 28 HRc		Profile 	≤ 0.1	≤ 1	107	RPM	5655	4241	3393	2827	2121	1696	
					(96-117)	Fz	0.029	0.049	0.061	0.073	0.086	0.096	
					Feed (mm/min)	984	1247	1242	1238	1094	977		
		HSM 	≤ 0.05	≤ 2	137	RPM	7271	5453	4362	3635	2726	2181	
					(123-151)	Fz	0.040	0.069	0.086	0.103	0.120	0.134	
					Feed (mm/min)	1745	2258	2251	2247	1963	1754		
≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.1	≤ 1	99	RPM	5251	3938	3151	2626	1969	1575		
				(89-109)	Fz	0.029	0.049	0.061	0.073	0.086	0.096		
				Feed (mm/min)	914	1158	1153	1150	1016	907			
	HSM 	≤ 0.05	≤ 2	125	RPM	6624	4968	3975	3312	2484	1987		
				(112-137)	Fz	0.040	0.069	0.086	0.103	0.120	0.134		
				Feed (mm/min)	1590	2057	2051	2047	1789	1598			

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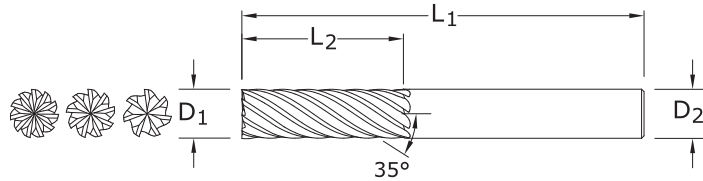


Series 51M, 51MCR, 51ML, 51MLC Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)							
					6	8	10	12	16	20		
<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400</b>	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.1	≤ 1	32	RPM	1696	1272	1018	848	636	509
					(26-38)	Fz	0.034	0.057	0.071	0.085	0.100	0.110
					Feed (mm/min)	346	435	434	433	382	336	
		HSM 	≤ 0.05	≤ 2	40	RPM	2100	1575	1260	1050	788	630
					(32-48)	Fz	0.046	0.077	0.097	0.120	0.140	0.150
					Feed (mm/min)	580	728	733	756	662	567	
<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene</b>	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.1	≤ 1	24	RPM	1293	969	776	646	485	388
					(20-29)	Fz	0.023	0.039	0.049	0.059	0.068	0.077
					Feed (mm/min)	178	227	228	229	198	179	
		HSM 	≤ 0.05	≤ 2	30	RPM	1616	1212	969	808	606	485
					(24-37)	Fz	0.032	0.054	0.068	0.081	0.095	0.110
					Feed (mm/min)	310	393	396	393	345	320	
<b>TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si</b>	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.1	≤ 1	85	RPM	4524	3393	2714	2262	1696	1357
					(68-102)	Fz	0.023	0.039	0.049	0.059	0.068	0.077
					Feed (mm/min)	624	794	798	801	692	627	
		HSM 	≤ 0.05	≤ 2	108	RPM	5736	4302	3441	2868	2151	1721
					(87-130)	Fz	0.032	0.054	0.068	0.081	0.095	0.110
					Feed (mm/min)	1101	1394	1404	1394	1226	1136	
<b>TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al</b>	≤ 440 Bhn or ≤ 47 HRc	Profile 	≤ 0.1	≤ 1	47	RPM	2504	1878	1503	1252	939	751
					(38-57)	Fz	0.023	0.039	0.049	0.059	0.068	0.077
					Feed (mm/min)	346	440	442	443	383	347	
		HSM 	≤ 0.05	≤ 2	61	RPM	3231	2424	1939	1616	1212	969
					(49-73)	Fz	0.032	0.054	0.068	0.081	0.095	0.110
					Feed (mm/min)	620	785	791	785	691	640	

Bhn (Brinell)    HRc (Rockwell C)    HSM (High Speed Machining)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fz \times 6 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



**66**  
FRACTIONAL SERIES



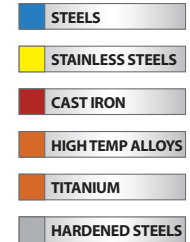
- Heavy core and rigid design allow for straight walls
- High flute count design results in smoother cutting performance and enhanced tool life in precise finishing applications
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	NO. OF FLUTES	EDP NO.	
					Ti-NAMITE-A (AITiN)	STOCK
3/16	5/8	2	3/16	7	36620	●
1/4	3/4	2-1/2	1/4	7	36621	●
3/8	1	3	3/8	7	36622	●
1/2	1-1/4	3	1/2	9	36623	●
5/8	1-5/8	3-1/2	5/8	9	36624	●
3/4	1-5/8	4	3/4	11	36625	●
1	2	6	1	11	36626	●

Neck Option Available

**TOLERANCES (inch)**

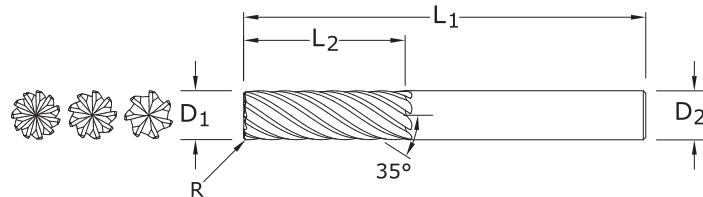
D<sub>1</sub> = +0.0000/-0.0020  
D<sub>2</sub> = h<sub>6</sub>



- U.S. Stock Standard
- NOT STOCKED— Call for Delivery



**66CR**  
FRACTIONAL SERIES



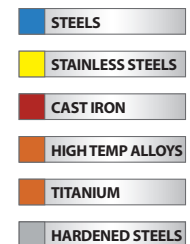
- Heavy core and rigid design allow for straight walls
- High flute count design results in smoother cutting performance and enhanced tool life in precise finishing applications
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R	NO. OF FLUTES	EDP NO.	
						Ti-NAMITE-A (AITiN)	STOCK
3/16	5/8	2	3/16	.010	7	36627	●
1/4	3/4	2-1/2	1/4	.015	7	36628	●
3/8	1	3	3/8	.015	7	36629	●
1/2	1-1/4	3	1/2	.030	9	36630	●
1/2	1-1/4	3	1/2	.090	9	36631	●
1/2	1-1/4	3	1/2	.120	9	36632	●
5/8	1-5/8	3-1/2	5/8	.030	9	36633	●
5/8	1-5/8	3-1/2	5/8	.090	9	36634	●
5/8	1-5/8	3-1/2	5/8	.120	9	36635	●
3/4	1-5/8	4	3/4	.030	11	36636	●
3/4	1-5/8	4	3/4	.090	11	36637	●
3/4	1-5/8	4	3/4	.120	11	36638	●
1	2	6	1	.030	11	36639	●
1	2	6	1	.090	11	36640	●
1	2	6	1	.120	11	36641	●

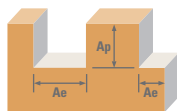
Neck Option Available













**TOLERANCES (inch)**

D<sub>1</sub> = +0.0000/-0.0020  
D<sub>2</sub> = h<sub>6</sub>  
R = +0.0000/-0.0020



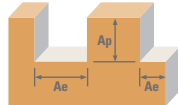
- U.S. Stock Standard
- NOT STOCKED— Call for Delivery



Series	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
					3/16	1/4	3/8	1/2	5/8	3/4	1		
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	Profile 	≤ 0.05	≤ 1	635	RPM	12937	9703	6469	4851	3881	3234	2426
					(508-762)	Fz	0.0008	0.0012	0.0022	0.0030	0.0037	0.0038	0.0042
					Feed (ipm)	72.4	81.5	99.6	131.0	129.2	135.2	112.1	
		Finish 	≤ 0.02	≤ 2	762	RPM	15524	11643	7762	5822	4657	3881	2911
					(610-914)	Fz	0.0006	0.0010	0.0018	0.0024	0.0030	0.0030	0.0034
					Feed (ipm)	69.5	78.2	95.6	125.7	124.1	129.8	107.6	
	<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	Profile 	≤ 0.05	≤ 1	360	RPM	7334	5501	3667	2750	2200	1834	1375
					(288-432)	Fz	0.0006	0.0009	0.0017	0.0023	0.0029	0.0030	0.0032
					Feed (ipm)	30.8	34.7	43.6	56.9	57.4	60.5	48.4	
		Finish 	≤ 0.02	≤ 2	432	RPM	8801	6601	4401	3300	2640	2200	1650
					(346-518)	Fz	0.0005	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
					Feed (ipm)	29.6	33.3	41.9	54.7	55.1	58.1	46.5	
<b>H</b>	Profile 	≤ 0.05	≤ 1	290	RPM	5908	4431	2954	2216	1772	1477	1108	
				(232-348)	Fz	0.0004	0.0006	0.0012	0.0016	0.0020	0.0021	0.0022	
				Feed (ipm)	16.5	18.6	24.8	31.9	31.9	34.1	26.8		
	Finish 	≤ 0.02	≤ 2	348	RPM	7090	5317	3545	2659	2127	1772	1329	
				(278-418)	Fz	0.0003	0.0005	0.0010	0.0013	0.0016	0.0017	0.0018	
				Feed (ipm)	15.9	17.9	23.8	30.6	30.6	32.8	25.7		
<b>K</b>	<b>CAST IRONS (LOW &amp; MEDIUM ALLOY)</b> Gray, Malleable, Ductile	Profile 	≤ 0.05	≤ 1	705	RPM	14363	10772	7182	5386	4309	3591	2693
					(564-846)	Fz	0.0008	0.0012	0.0022	0.0030	0.0037	0.0038	0.0042
					Feed (ipm)	80.4	90.5	110.6	145.4	143.5	150.1	124.4	
		Finish 	≤ 0.02	≤ 2	846	RPM	17236	12927	8618	6463	5171	4309	3232
					(677-1015)	Fz	0.0006	0.0010	0.0018	0.0024	0.0030	0.0030	0.0034
					Feed (ipm)	77.2	86.9	106.2	139.6	137.7	144.1	119.4	
	<b>CAST IRONS (HIGH ALLOY)</b> Gray, Malleable, Ductile	Profile 	≤ 0.05	≤ 1	540	RPM	11002	8251	5501	4126	3300	2750	2063
					(432-648)	Fz	0.0006	0.0009	0.0017	0.0023	0.0029	0.0030	0.0032
					Feed (ipm)	46.2	52.0	65.5	85.4	86.1	90.8	72.6	
		Finish 	≤ 0.02	≤ 2	648	RPM	13202	9901	6601	4951	3961	3300	2475
					(518-778)	Fz	0.0005	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
					Feed (ipm)	44.4	49.9	62.8	82.0	82.7	87.1	69.7	
<b>M</b>	Profile 	≤ 0.05	≤ 1	560	RPM	11409	8557	5705	4278	3423	2852	2139	
				(448-672)	Fz	0.0006	0.0009	0.0017	0.0023	0.0029	0.0030	0.0032	
				Feed (ipm)	47.9	53.9	67.9	88.6	89.3	94.1	75.3		
	Finish 	≤ 0.02	≤ 2	448	RPM	9127	6845	4564	3423	2738	2282	1711	
				(358-538)	Fz	0.0005	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026	
				Feed (ipm)	30.7	34.5	43.4	56.7	57.2	60.2	48.2		

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# FRACTIONAL Multi-Carb



Series 66, 66CR Fractional	Hardness	Profile Ae x D <sub>1</sub>	Finish Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)							
					3/16	1/4	3/8	1/2	5/8	3/4	1	
<b>M</b>	<b>STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L</b>	Profile ≤ 0.05	≤ 1	385	RPM	7844	5883	3922	2941	2353	1961	1471
				(308-462)	Fz	0.0005	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
				Feed (ipm)	27.5	28.8	38.4	47.7	48.7	51.8	42.1	
		Finish ≤ 0.02	≤ 2	462	RPM	9412	7059	4706	3530	2824	2353	1765
				(370-554)	Fz	0.0004	0.0006	0.0011	0.0014	0.0018	0.0019	0.0021
				Feed (ipm)	26.4	27.7	36.9	45.7	46.8	49.7	40.4	
	<b>STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450</b>	Profile ≤ 0.05	≤ 1	355	RPM	7233	5424	3616	2712	2170	1808	1356
				(284-426)	Fz	0.0005	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
				Feed (ipm)	25.3	26.6	35.4	43.9	44.9	47.7	38.8	
		Finish ≤ 0.02	≤ 2	426	RPM	8679	6509	4340	3255	2604	2170	1627
				(341-511)	Fz	0.0004	0.0006	0.0011	0.0014	0.0018	0.0019	0.0021
				Feed (ipm)	24.3	25.5	34.0	42.2	43.1	45.8	37.2	
<b>S</b>	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400</b>	Profile ≤ 0.05	≤ 1	105	RPM	2139	1604	1070	802	642	535	401
				(84-126)	Fz	0.0005	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
				Feed (ipm)	7.5	7.9	10.5	13.0	13.3	14.1	11.5	
		Finish ≤ 0.02	≤ 2	126	RPM	2567	1925	1284	963	770	642	481
				(101-151)	Fz	0.0004	0.0006	0.0011	0.0014	0.0018	0.0019	0.0021
				Feed (ipm)	7.2	7.5	10.1	12.5	12.8	13.6	11.0	
	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene</b>	Profile ≤ 0.05	≤ 1	85	RPM	1732	1299	866	649	520	433	325
				(68-102)	Fz	0.0003	0.0005	0.0009	0.0011	0.0014	0.0015	0.0016
				Feed (ipm)	3.6	4.5	5.5	6.4	6.5	7.1	5.7	
		Finish ≤ 0.02	≤ 2	102	RPM	2078	1559	1039	779	623	520	390
				(82-122)	Fz	0.0002	0.0004	0.0007	0.0009	0.0011	0.0012	0.0013
				Feed (ipm)	3.5	4.4	5.2	6.2	6.3	6.9	5.5	
<b>TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si</b>	Profile ≤ 0.05	≤ 1	390	RPM	7946	5959	3973	2980	2384	1986	1490	
			(312-468)	Fz	0.0005	0.0008	0.0015	0.0021	0.0026	0.0027	0.0029	
			Feed (ipm)	27.8	33.4	41.7	56.3	55.8	59.0	47.5		
	Finish ≤ 0.02	≤ 2	468	RPM	9535	7151	4767	3576	2860	2384	1788	
			(374-562)	Fz	0.0004	0.0006	0.0012	0.0017	0.0021	0.0022	0.0023	
			Feed (ipm)	26.7	32.0	40.0	54.1	53.5	56.6	45.6		
<b>TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al</b>	Profile ≤ 0.05	≤ 1	140	RPM	2852	2139	1426	1070	856	713	535	
			(112-168)	Fz	0.0005	0.0008	0.0015	0.0021	0.0026	0.0027	0.0029	
			Feed (ipm)	10.0	12.0	15.0	20.2	20.0	21.2	17.1		
	Finish ≤ 0.02	≤ 2	168	RPM	3423	2567	1711	1284	1027	856	642	
			(134-202)	Fz	0.0004	0.0006	0.0012	0.0017	0.0021	0.0022	0.0023	
			Feed (ipm)	9.6	11.5	14.4	19.4	19.2	20.3	16.4		

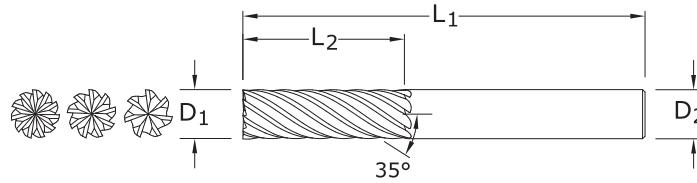
Bhn (Brinell)      HRc (Rockwell C)

rpm = Vc x 3.82 / D<sub>1</sub>

ipm = Fz x number of flutes x rpm

reduce speed and feed for materials harder than listed

refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



**TOLERANCES (mm)**

$D_1 = +0,000/-0,050$   
 $D_2 = h_6$

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

mm					EDP NO.	STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	NO. OF FLUTES	Ti-NAMITE-A (AlTiN)	
6,0	19,0	63,0	6,0	7	46620	●
8,0	20,0	63,0	8,0	7	46621	●
10,0	22,0	75,0	10,0	7	46622	●
12,0	26,0	83,0	12,0	9	46623	●
16,0	32,0	92,0	16,0	9	46624	●
20,0	38,0	104,0	20,0	11	46625	●
25,0	38,0	104,0	25,0	11	46626	●

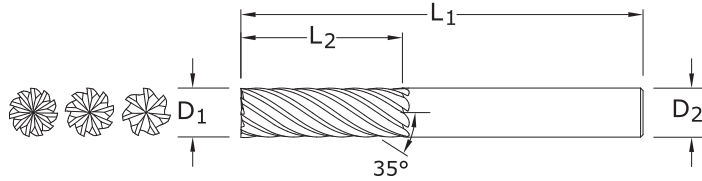
Neck Option Available

**66M**  
METRIC SERIES

- Heavy core and rigid design allow for straight walls
- High flute count design results in smoother cutting performance and enhanced tool life in precise finishing applications
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)



**66MCR**  
METRIC SERIES



- Heavy core and rigid design allow for straight walls
- High flute count design results in smoother cutting performance and enhanced tool life in precise finishing applications
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	mm			NO. OF FLUTES	EDP NO.	STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R		Ti-NAMITE-A (AITiN)	
6,0	19,0	63,0	6,0	0,5	7	46627	●
6,0	19,0	65,0	6,0	1,0	7	46628	■
8,0	20,0	63,0	8,0	0,5	7	46629	●
8,0	20,0	63,0	8,0	1,0	7	46630	■
8,0	20,0	63,0	8,0	1,5	7	46631	■
10,0	22,0	75,0	10,0	0,5	7	46632	●
10,0	22,0	75,0	10,0	1,0	7	46633	■
10,0	22,0	75,0	10,0	1,5	7	46634	■
10,0	22,0	75,0	10,0	2,0	7	46635	■
12,0	26,0	83,0	12,0	1,0	9	46636	●
12,0	26,0	83,0	12,0	1,5	9	46637	■
12,0	26,0	83,0	12,0	2,0	9	46638	●
12,0	26,0	83,0	12,0	2,5	9	46639	■
12,0	26,0	83,0	12,0	3,0	9	46640	●
16,0	32,0	92,0	16,0	1,0	9	46641	●
16,0	32,0	92,0	16,0	1,5	9	46642	■
16,0	32,0	92,0	16,0	2,0	9	46643	●
16,0	32,0	92,0	16,0	2,5	9	46644	■
16,0	32,0	92,0	16,0	3,0	9	46645	●
16,0	32,0	92,0	16,0	4,0	9	46646	■

Neck Option Available

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**TOLERANCES (mm)**

D<sub>1</sub> = +0,000/-0,050

D<sub>2</sub> = h<sub>6</sub>

R = +0,000/-0,050

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



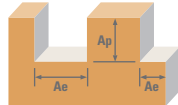
**66MCR**  
METRIC SERIES

CONTINUED

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	mm			NO. OF FLUTES	EDP NO.	STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R		Ti-NAMITE-A (AlTiN)	
20,0	38,0	104,0	20,0	1,0	11	46647	●
20,0	38,0	104,0	20,0	1,5	11	46648	■
20,0	38,0	104,0	20,0	2,0	11	46649	●
20,0	38,0	104,0	20,0	2,5	11	46650	■
20,0	38,0	104,0	20,0	3,0	11	46651	●
20,0	38,0	104,0	20,0	4,0	11	46652	■
20,0	38,0	104,0	20,0	5,0	11	46653	■
25,0	38,0	104,0	25,0	1,0	11	46654	●
25,0	38,0	104,0	25,0	1,5	11	46655	■
25,0	38,0	104,0	25,0	2,0	11	46656	●
25,0	38,0	104,0	25,0	2,5	11	46657	■
25,0	38,0	104,0	25,0	3,0	11	46658	●
25,0	38,0	104,0	25,0	4,0	11	46659	■
25,0	38,0	104,0	25,0	5,0	11	46660	■

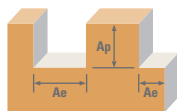
Neck Option Available

# Multi-Carb



Series 66M, 66MCR Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
					6	8	10	12	16	20	25		
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	Profile 	≤ 0.05	≤ 1	194	RPM	10260	7695	6156	5130	3847	3078	2462
					(155-232)	Fz	0.029	0.047	0.059	0.072	0.095	0.101	0.105
					Feed (mm/min)	2068	2528	2528	3324	3280	3431	2844	
		Finish 	≤ 0.02	≤ 2	232	RPM	12312	9234	7387	6156	4617	3693	2955
					(186-279)	Fz	0.023	0.038	0.047	0.058	0.076	0.081	0.084
					Feed (mm/min)	1985	2427	2427	3191	3149	3294	2730	
	<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	Profile 	≤ 0.05	≤ 1	110	RPM	5816	4362	3490	2908	2181	1745	1396
					(88-132)	Fz	0.022	0.036	0.045	0.055	0.074	0.080	0.080
					Feed (mm/min)	879	1108	1107	1445	1457	1536	1229	
		Finish 	≤ 0.02	≤ 2	132	RPM	6980	5235	4188	3490	2617	2094	1675
					(105-158)	Fz	0.017	0.029	0.036	0.044	0.059	0.064	0.064
					Feed (mm/min)	844	1063	1063	1387	1399	1474	1179	
<b>H</b>	Profile 	≤ 0.05	≤ 1	88	RPM	4686	3514	2811	2343	1757	1406	1125	
				(71-106)	Fz	0.014	0.026	0.032	0.038	0.051	0.056	0.055	
				Feed (mm/min)	472	630	630	810	810	866	680		
	Finish 	≤ 0.02	≤ 2	106	RPM	5623	4217	3374	2811	2108	1687	1349	
				(85-127)	Fz	0.012	0.020	0.026	0.031	0.041	0.045	0.044	
				Feed (mm/min)	453	605	605	777	777	831	653		
<b>K</b>	<b>CAST IRONS (LOW &amp; MEDIUM ALLOY)</b> Gray, Malleable, Ductile	Profile 	≤ 0.05	≤ 1	215	RPM	11391	8543	6834	5695	4271	3417	2734
					(172-258)	Fz	0.029	0.047	0.059	0.072	0.095	0.101	0.105
					Feed (mm/min)	2296	2807	2807	3690	3641	3809	3158	
		Finish 	≤ 0.02	≤ 2	258	RPM	13669	10252	8201	6834	5126	4101	3281
					(206-309)	Fz	0.023	0.038	0.047	0.058	0.076	0.081	0.084
					Feed (mm/min)	2204	2695	2694	3543	3496	3657	3031	
	<b>CAST IRONS (HIGH ALLOY)</b> Gray, Malleable, Ductile	Profile 	≤ 0.05	≤ 1	165	RPM	8725	6544	5235	4362	3272	2617	2094
					(132-198)	Fz	0.022	0.036	0.045	0.055	0.074	0.080	0.080
					Feed (mm/min)	1319	1661	1661	2167	2186	2303	1843	
		Finish 	≤ 0.02	≤ 2	198	RPM	10470	7852	6282	5235	3926	3141	2513
					(158-237)	Fz	0.017	0.029	0.036	0.044	0.059	0.064	0.064
					Feed (mm/min)	1266	1595	1595	2080	2099	2211	1769	
<b>M</b>	Profile 	≤ 0.05	≤ 1	171	RPM	9048	6786	5429	4524	3393	2714	2171	
				(137-205)	Fz	0.022	0.036	0.045	0.055	0.074	0.080	0.080	
				Feed (mm/min)	1368	1723	1723	2247	2267	2389	1911		
	Finish 	≤ 0.02	≤ 2	137	RPM	7238	5429	4343	3619	2714	2171	1737	
				(109-164)	Fz	0.017	0.029	0.036	0.044	0.059	0.064	0.064	
				Feed (mm/min)	875	1103	1103	1438	1451	1529	1223		

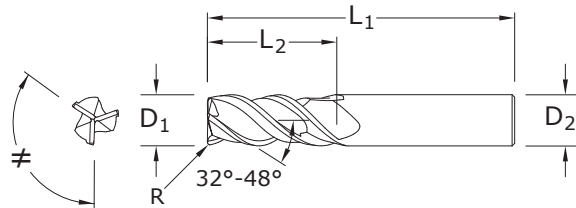
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Series 66M, 66MCR Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
					6	8	10	12	16	20	25		
M	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L ≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.05	≤ 1	117	RPM	6220	4665	3732	3110	2333	1866	1493
					(94-141)	Fz	0.017	0.030	0.037	0.043	0.059	0.064	0.065
					Feed (mm/min)	731	975	975	1209	1236	1314	1067	
		Finish 	≤ 0.02	≤ 2	141	RPM	7465	5598	4479	3732	2799	2239	1791
					(113-169)	Fz	0.013	0.024	0.030	0.035	0.047	0.051	0.052
					Feed (mm/min)	702	17	936	1161	1187	1261	1025	
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450 ≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.05	≤ 1	108	RPM	5736	4302	3441	2868	2151	1721	1377
					(87-130)	Fz	0.017	0.030	0.037	0.043	0.059	0.064	0.065
					Feed (mm/min)	674	899	899	1115	1140	1211	984	
		Finish 	≤ 0.02	≤ 2	130	RPM	6883	5162	4130	3441	2581	2065	1652
					(104-156)	Fz	0.013	0.024	0.030	0.035	0.047	0.051	0.052
					Feed (mm/min)	647	863	863	1070	1094	1163	945	
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400 ≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.05	≤ 1	32	RPM	1696	1272	1018	848	636	509	407
					(26-38)	Fz	0.017	0.030	0.037	0.043	0.059	0.064	0.065
					Feed (mm/min)	199	266	213	330	337	358	291	
		Finish 	≤ 0.02	≤ 2	38	RPM	2036	1527	1221	1018	763	611	489
					(31-46)	Fz	0.013	0.024	0.030	0.035	0.047	0.051	0.052
					Feed (mm/min)	192	255	255	317	324	344	279	
	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene ≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.05	≤ 1	26	RPM	1373	1030	824	687	515	412	330
					(21-31)	Fz	0.012	0.019	0.024	0.026	0.036	0.040	0.040
					Feed (mm/min)	115	138	138	163	166	181	145	
		Finish 	≤ 0.02	≤ 2	31	RPM	1648	1236	989	824	618	494	396
					(25-37)	Fz	0.010	0.015	0.019	0.021	0.029	0.032	0.032
					Feed (mm/min)	111	133	133	157	159	174	139	
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si ≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.05	≤ 1	119	RPM	6301	4726	3781	3151	2363	1890	1512	
				(95-143)	Fz	0.019	0.032	0.040	0.050	0.067	0.072	0.073	
				Feed (mm/min)	847	1059	1059	1429	1415	1497	1206		
	Finish 	≤ 0.02	≤ 2	143	RPM	7561	5671	4537	3781	2836	2268	1815	
				(114-171)	Fz	0.015	0.026	0.032	0.040	0.053	0.058	0.058	
				Feed (mm/min)	813	1016	1016	1372	1359	1437	1158		
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al ≤ 440 Bhn or ≤ 47 HRc	Profile 	≤ 0.05	≤ 1	43	RPM	2262	1696	1357	1131	848	679	543	
				(34-51)	Fz	0.019	0.032	0.040	0.050	0.067	0.072	0.073	
				Feed (mm/min)	304	380	380	513	508	537	433		
	Finish 	≤ 0.02	≤ 2	51	RPM	2714	2036	1629	1357	1018	814	651	
				(41-61)	Fz	0.015	0.026	0.032	0.040	0.053	0.058	0.058	
				Feed (mm/min)	292	365	365	492	488	516	416		

Bhn (Brinell)      HRc (Rockwell C)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fz \times \text{number of flutes} \times rpm$   
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# FRACTIONAL Series 33



## 33CR FRACTIONAL SERIES

- Specially engineered step core design provides stability for aggressive ramping and rigidity when flutes are completely engaged
- Open design at axial end accommodates material flow and load reduction during machining operations
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			CORNER RADIUS $R$	EDP NO.	STOCK
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	TI-NAMITE-A (AlTiN)			
1/8	3/8	2-1/2	1/4	.015	33345	●	
3/16	9/16	2-1/2	1/4	.015	33346	●	
1/4	3/4	2-1/2	1/4	.020	33347	●	
5/16	13/16	2-1/2	5/16	.020	33348	●	
3/8	1	2-1/2	3/8	.020	33349	●	
7/16	1-1/8	2-3/4	7/16	.020	33350	●	
1/2	1-1/4	3-1/4	1/2	.030	33351	●	
5/8	1-1/2	3-1/2	5/8	.040	33352	●	
3/4	1-3/4	4	3/4	.040	33353	●	
1	2-1/4	5	1	.040	33354	●	

### TOLERANCES (inch)

#### 1/8–1/4 DIAMETER

$D_1 = +0.0000/-0.0012$

$D_2 = h6$

$R = +0.0000/-0.0020$

#### >1/4–3/8 DIAMETER

$D_1 = +0.0000/-0.0016$

$D_2 = h6$

$R = +0.0000/-0.0020$

#### >3/8–1 DIAMETER

$D_1 = +0.0000/-0.0020$

$D_2 = h6$

$R = +0.0000/-0.0020$

STEELS

STAINLESS STEELS

CAST IRON

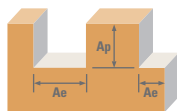
HIGH TEMP ALLOYS

TITANIUM

HARDENED STEELS

● U.S. Stock Standard

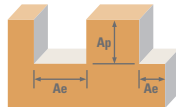
■ NOT STOCKED—  
Call for Delivery



Series 33CR Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
					1/8	1/4	3/8	1/2	5/8	3/4	1		
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	Profile 	≤ 0.5	≤ 1.5	550	RPM	16808	8404	5603	4202	3362	2801	2101
					(440-660)	Fz	0.0005	0.0012	0.0023	0.0031	0.0039	0.0040	0.0043
					Feed (ipm)	25.2	30.3	38.7	39.1	39.3	33.6	27.1	
		Slot 	1	≤ 1	440	RPM	13446	6723	4482	3362	2689	2241	1681
					(352-528)	Fz	0.0005	0.0012	0.0023	0.0031	0.0039	0.0040	0.0043
					Feed (ipm)	20.2	24.2	30.9	31.3	31.5	26.9	21.7	
	<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	Profile 	≤ 0.5	≤ 1.5	315	RPM	9626	4813	3209	2407	1925	1604	1203
					(252-378)	Fz	0.0004	0.0009	0.0017	0.0023	0.0029	0.0030	0.0032
					Feed (ipm)	11.6	13.0	16.4	16.6	16.7	14.4	11.6	
		Slot 	1	≤ 1	250	RPM	7640	3820	2547	1910	1528	1273	955
					(200-300)	Fz	0.0004	0.0009	0.0017	0.0023	0.0029	0.0030	0.0032
					Feed (ipm)	9.2	10.3	13.0	13.2	13.3	11.5	9.2	
<b>H</b>	<b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	Profile 	≤ 0.5	≤ 1.5	185	RPM	5654	2827	1885	1413	1131	942	707
					(148-222)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0025
					Feed (ipm)	5.1	5.9	7.9	7.6	7.8	6.8	5.3	
		Slot 	1	≤ 1	145	RPM	4431	2216	1477	1108	886	739	554
					(116-174)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0025
					Feed (ipm)	4.0	4.7	6.2	6.0	6.1	5.3	4.2	
<b>K</b>	<b>CAST IRONS (LOW &amp; MEDIUM ALLOY)</b> Gray, Malleable, Ductile	Profile 	≤ 0.5	≤ 1.5	445	RPM	13599	6800	4533	3400	2720	2267	1700
					(356-534)	Fz	0.0004	0.0011	0.0021	0.0028	0.0035	0.0036	0.0039
					Feed (ipm)	14.3	22.4	28.6	28.6	28.6	24.5	19.9	
		Slot 	1	≤ 1	355	RPM	10849	5424	3616	2712	2170	1808	1356
					(284-426)	Fz	0.0004	0.0011	0.0021	0.0028	0.0035	0.0036	0.0039
					Feed (ipm)	11.4	17.9	22.8	22.8	22.8	19.5	15.9	
	<b>CAST IRONS (HIGH ALLOY)</b> Gray, Malleable, Ductile	Profile 	≤ 0.5	≤ 1.5	340	RPM	10390	5195	3463	2598	2078	1732	1299
					(272-408)	Fz	0.0003	0.0008	0.0016	0.0021	0.0026	0.0027	0.0029
					Feed (ipm)	9.4	12.5	16.6	16.4	16.2	14.0	11.3	
		Slot 	1	≤ 1	270	RPM	8251	4126	2750	2063	1650	1375	1031
					(216-324)	Fz	0.0003	0.0008	0.0016	0.0021	0.0026	0.0027	0.0029
					Feed (ipm)	7.4	9.9	13.2	13.0	12.9	11.1	9.0	
<b>M</b>	<b>STAINLESS STEELS (FREE MACHINING)</b> 303, 416, 420F, 430F, 440F	Profile 	≤ 0.5	≤ 1.5	490	RPM	14974	7487	4991	3744	2995	2496	1872
					(392-588)	Fz	0.0004	0.0010	0.0019	0.0025	0.0031	0.0032	0.0035
					Feed (ipm)	17.1	22.5	28.5	28.1	27.9	24.0	19.7	
		Slot 	1	≤ 1	390	RPM	11918	5959	3973	2980	2384	1986	1490
					(312-468)	Fz	0.0004	0.0010	0.0019	0.0025	0.0031	0.0032	0.0035
					Feed (ipm)	13.6	17.9	22.6	22.3	22.2	19.1	15.6	

continued on next page

# FRACTIONAL Series 33



Series 33CR Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)									
					1/8	1/4	3/8	1/2	5/8	3/4	1			
M	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	340	RPM	10390	5195	3463	2598	2078	1732	1299
						(272-408)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028
						Feed (ipm)	9.4	12.5	15.6	15.6	15.6	13.5	10.9	
			Slot 	1	≤ 1	270	RPM	8251	4126	2750	2063	1650	1375	1031
						(216-324)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028
						Feed (ipm)	7.4	9.9	12.4	12.4	12.4	10.7	8.7	
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Profile 	≤ 0.5	≤ 1.5	310	RPM	9474	4737	3158	2368	1895	1579	1184
						(248-372)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028
						Feed (ipm)	8.5	11.4	14.2	14.2	14.2	12.3	9.9	
			Slot 	1	≤ 1	250	RPM	7640	3820	2547	1910	1528	1273	955
						(200-300)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028
						Feed (ipm)	6.9	9.2	11.5	11.5	11.5	9.9	8.0	
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.5	≤ 1.5	80	RPM	2445	1222	815	611	489	407	306
						(64-96)	Fz	0.0003	0.0007	0.0013	0.0017	0.0021	0.0022	0.0024
						Feed (ipm)	1.9	2.6	3.2	3.1	3.1	2.7	2.2	
			Slot 	1	≤ 1	65	RPM	1986	993	662	497	397	331	248
						(52-78)	Fz	0.0003	0.0007	0.0013	0.0017	0.0021	0.0022	0.0024
						Feed (ipm)	1.5	2.1	2.6	2.5	2.5	2.2	1.8	
	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Profile 	≤ 0.5	≤ 1.5	62	RPM	1895	947	632	474	379	316	237
						(50-74)	Fz	0.0002	0.0005	0.0009	0.0012	0.0015	0.0016	0.0017
						Feed (ipm)	1.1	1.4	1.7	1.7	1.7	1.5	1.2	
			Slot 	1	≤ 1	49	RPM	1497	749	499	374	299	250	187
						(39-59)	Fz	0.0002	0.0005	0.0009	0.0012	0.0015	0.0016	0.0017
						Feed (ipm)	0.9	1.1	1.3	1.3	1.3	1.2	1.0	
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.5	≤ 1.5	215	RPM	6570	3285	2190	1643	1314	1095	821	
					(172-258)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028	
					Feed (ipm)	5.9	7.9	9.9	9.9	9.9	8.5	6.9		
		Slot 	1	≤ 1	170	RPM	5195	2598	1732	1299	1039	866	649	
					(136-204)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028	
					Feed (ipm)	4.7	6.2	7.8	7.8	7.8	6.8	5.5		
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRc	Profile 	≤ 0.5	≤ 1.5	75	RPM	2292	1146	764	573	458	382	287	
					(60-90)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028	
					Feed (ipm)	2.1	2.8	3.4	3.4	3.4	3.0	2.4		
		Slot 	1	≤ 1	60	RPM	1834	917	611	458	367	306	229	
					(48-72)	Fz	0.0003	0.0008	0.0015	0.0020	0.0025	0.0026	0.0028	
					Feed (ipm)	1.7	2.2	2.8	2.8	2.8	2.4	1.9		

Bhn (Brinell) HRc (Rockwell C)

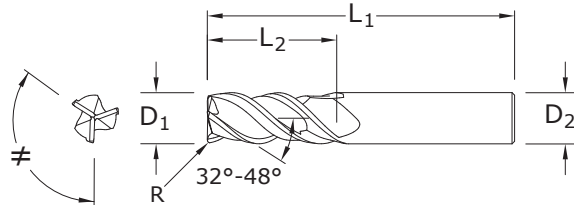
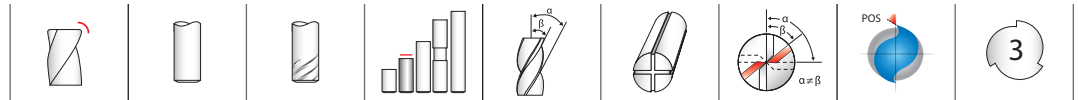
rpm = Vc x 3.82 / D<sub>1</sub>

ipm = Fz x 3 x rpm

reduce speed and feed for materials harder than listed

reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)

refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



**33MCR**  
METRIC SERIES

**TOLERANCES (mm)**

**3-6 DIAMETER**

$D_1 = +0,000/-0,030$

$D_2 = h_6$

$R = +0,000/-0,050$

**>6-10 DIAMETER**

$D_1 = +0,000/-0,040$

$D_2 = h_6$

$R = +0,000/-0,050$

**>10-20 DIAMETER**

$D_1 = +0,000/-0,050$

$D_2 = h_6$

$R = +0,000/-0,050$

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

HARDENED STEELS

● U.S. Stock Standard

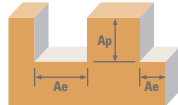
■ NOT STOCKED—  
Call for Delivery

mm					EDP NO.	STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	CORNER RADIUS $R$	TI-NAMITE-A (AlTiN)	
3,0	9,0	57,0	6,0	0,3	43445	●
3,0	9,0	57,0	6,0	0,5	43470	●
4,0	12,0	57,0	6,0	0,3	43446	●
4,0	12,0	57,0	6,0	0,5	43471	●
5,0	15,0	57,0	6,0	0,3	43447	●
5,0	15,0	57,0	6,0	0,5	43472	●
6,0	18,0	57,0	6,0	0,5	43448	●
6,0	18,0	57,0	6,0	1,0	43473	●
6,0	18,0	57,0	6,0	1,5	43474	●
6,0	18,0	57,0	6,0	2,0	43475	●
8,0	20,0	63,0	8,0	0,5	43449	●
8,0	20,0	63,0	8,0	1,0	43476	●
8,0	20,0	63,0	8,0	1,5	43477	●
8,0	20,0	63,0	8,0	2,0	43478	●
10,0	27,0	72,0	10,0	0,5	43450	●
10,0	27,0	72,0	10,0	1,0	43479	●
10,0	27,0	72,0	10,0	1,5	43480	●
10,0	27,0	72,0	10,0	2,0	43481	●
10,0	27,0	72,0	10,0	2,5	43482	●
12,0	30,0	83,0	12,0	0,5	43451	●
12,0	30,0	83,0	12,0	1,0	43483	●
12,0	30,0	83,0	12,0	1,5	43484	●
12,0	30,0	83,0	12,0	2,0	43485	●
12,0	30,0	83,0	12,0	2,5	43486	●
12,0	30,0	83,0	12,0	3,0	43487	●
12,0	30,0	83,0	12,0	4,0	43488	●
16,0	38,0	92,0	16,0	1,0	43452	●
16,0	38,0	92,0	16,0	1,5	43489	●
16,0	38,0	92,0	16,0	2,0	43490	●
16,0	38,0	92,0	16,0	2,5	43491	●
16,0	38,0	92,0	16,0	3,0	43492	●
16,0	38,0	92,0	16,0	4,0	43493	●
20,0	46,0	104,0	20,0	1,0	43453	●
20,0	46,0	104,0	20,0	2,0	43494	●
20,0	46,0	104,0	20,0	2,5	43495	●
20,0	46,0	104,0	20,0	3,0	43496	●
20,0	46,0	104,0	20,0	4,0	43497	●

- Specially engineered step core design provides stability for aggressive ramping and rigidity when flutes are completely engaged
- Open design at axial end accommodates material flow and load reduction during machining operations
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 45$  HRC ( $\leq 420$  Bhn)

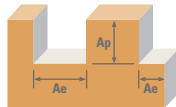


# Series 33



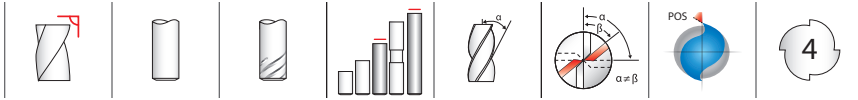
Series 33/MCR	Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
						3	6	8	10	12	16	20		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	168	RPM	17773	8886	6665	5332	4443	3332	2666
						(134-201)	Fz	0.012	0.029	0.049	0.061	0.074	0.100	0.107
						Feed (mm/min)	640	768	981	981	992	998	853	
						134	RPM	14218	7109	5332	4265	3555	2666	2133
						(107-161)	Fz	0.012	0.029	0.049	0.061	0.074	0.100	0.107
						Feed (mm/min)	512	614	785	785	793	798	682	
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ 1.5	96	RPM	10179	5089	3817	3054	2545	1909	1527
						(77-115)	Fz	0.010	0.022	0.036	0.045	0.055	0.074	0.080
						Feed (mm/min)	293	330	415	415	421	425	366	
						76	RPM	8078	4039	3029	2424	2020	1515	1212
						(61-91)	Fz	0.010	0.022	0.036	0.045	0.055	0.074	0.080
						Feed (mm/min)	233	262	330	330	334	337	291	
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Profile 	≤ 0.5	≤ 1.5	56	RPM	5978	2989	2242	1793	1495	1121	897
						(45-68)	Fz	0.007	0.017	0.030	0.037	0.043	0.059	0.064
						Feed (mm/min)	129	151	201	201	194	198	172	
						44	RPM	4686	2343	1757	1406	1171	879	703
						(35-53)	Fz	0.007	0.017	0.030	0.037	0.043	0.059	0.064
						Feed (mm/min)	101	118	157	157	152	155	135	
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.5	≤ 1.5	136	RPM	14380	7190	5392	4314	3595	2696	2157
						(109-163)	Fz	0.008	0.026	0.045	0.056	0.067	0.090	0.096
						Feed (mm/min)	362	569	725	725	725	725	621	
						108	RPM	11471	5736	4302	3441	2868	2151	1721
						(87-130)	Fz	0.008	0.026	0.045	0.056	0.067	0.090	0.096
						Feed (mm/min)	289	454	578	578	578	578	496	
	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Profile 	≤ 0.5	≤ 1.5	104	RPM	10987	5493	4120	3296	2747	2060	1648
						(83-124)	Fz	0.007	0.019	0.034	0.043	0.050	0.067	0.072
						Feed (mm/min)	237	316	422	422	415	411	356	
						82	RPM	8725	4362	3272	2617	2181	1636	1309
						(66-99)	Fz	0.007	0.019	0.034	0.043	0.050	0.067	0.072
						Feed (mm/min)	188	251	335	335	330	327	283	
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	149	RPM	15834	7917	5938	4750	3958	2969	2375
						(119-179)	Fz	0.009	0.024	0.041	0.051	0.060	0.079	0.085
						Feed (mm/min)	433	570	722	722	712	707	608	
						119	RPM	12602	6301	4726	3781	3151	2363	1890
						(95-143)	Fz	0.009	0.024	0.041	0.051	0.060	0.079	0.085
						Feed (mm/min)	345	454	575	575	567	563	484	

continued on next page



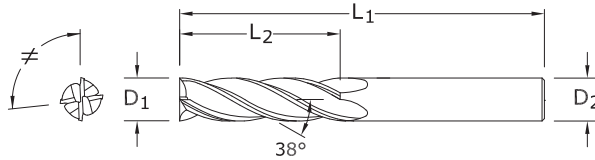
Series 33MCR Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
					3	6	8	10	12	16	20		
M	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	Profile 	≤ 0.5	≤ 1.5	104	RPM	10987	5493	4120	3296	2747	2060	1648
					(83-124)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069
					Feed (mm/min)	237	316	396	396	395	396	343	
		Slot 	1	≤ 1	82	RPM	8725	4362	3272	2617	2181	1636	1309
					(66-99)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069
					Feed (mm/min)	188	251	314	314	314	314	272	
	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	Profile 	≤ 0.5	≤ 1.5	94	RPM	10017	5009	3756	3005	2504	1878	1503
					(76-113)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069
					Feed (mm/min)	216	288	361	361	361	361	313	
		Slot 	1	≤ 1	76	RPM	8078	4039	3029	2424	2020	1515	1212
					(61-91)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069
					Feed (mm/min)	174	233	291	291	291	291	252	
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	Profile 	≤ 0.5	≤ 1.5	24	RPM	2585	1293	969	776	646	485	388
					(20-29)	Fz	0.006	0.017	0.028	0.035	0.041	0.054	0.059
					Feed (mm/min)	48	65	81	65	79	78	68	
		Slot 	1	≤ 1	20	RPM	2100	1050	788	630	525	394	315
					(16-24)	Fz	0.006	0.017	0.028	0.035	0.041	0.054	0.059
					Feed (mm/min)	39	53	66	66	64	64	55	
	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	Profile 	≤ 0.5	≤ 1.5	19	RPM	2003	1002	751	601	501	376	301
					(15-23)	Fz	0.005	0.012	0.019	0.024	0.029	0.038	0.043
					Feed (mm/min)	29	36	43	43	43	43	38	
		Slot 	1	≤ 1	15	RPM	1583	792	594	475	396	297	238
					(12-18)	Fz	0.005	0.012	0.019	0.024	0.029	0.038	0.043
					Feed (mm/min)	23	28	34	34	34	34	30	
TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	Profile 	≤ 0.5	≤ 1.5	66	RPM	6947	3474	2605	2084	1737	1303	1042	
				(52-79)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069	
				Feed (mm/min)	150	200	250	250	250	250	217		
	Slot 	1	≤ 1	52	RPM	5493	2747	2060	1648	1373	1030	824	
				(41-62)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069	
				Feed (mm/min)	119	158	198	198	198	198	171		
TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	Profile 	≤ 0.5	≤ 1.5	23	RPM	2424	1212	909	727	606	454	364	
				(18-27)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069	
				Feed (mm/min)	52	70	87	87	87	87	76		
	Slot 	1	≤ 1	18	RPM	1939	969	727	582	485	364	291	
				(15-22)	Fz	0.007	0.019	0.032	0.040	0.048	0.064	0.069	
				Feed (mm/min)	42	56	70	70	70	70	60		

Bhn (Brinell)      HRc (Rockwell C)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fz \times 3 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



**7**  
FRACTIONAL SERIES

- Variable pitch allows for improved chatter suppression along with improved surface finish and enhanced tool life
- Raised land and increased core diameter designed to enhance tool life and decrease tool deflection
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)



CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch		SHANK DIAMETER $D_2$	EDP NO. Ti-NAMITE-X	STOCK
		OVERALL LENGTH $L_1$				
1/8	3/4	2-1/4		1/8	70470	●
1/8	1	3		1/8	70471	●
3/16	3/4	2-1/2		3/16	70472	●
3/16	1-1/8	3		3/16	70473	●
1/4	1-1/8	3		1/4	70474	●
1/4	1-1/2	4		1/4	70475	●
5/16	1-1/8	3		5/16	70476	●
5/16	1-5/8	4		5/16	70477	●
3/8	1-1/8	3		3/8	70478	●
3/8	1-3/4	4		3/8	70479	●
7/16	2	4-1/2		7/16	70480	●
7/16	3	6		7/16	70481	●
1/2	2	4-1/2		1/2	70482	●
1/2	3	6		1/2	70483	●
5/8	2-1/4	5		5/8	70484	●
5/8	3	6		5/8	70485	●
3/4	2-1/4	5		3/4	70486	●
3/4	3	6		3/4	70487	●
1	2-1/4	5		1	70488	●
1	3	6		1	70489	●

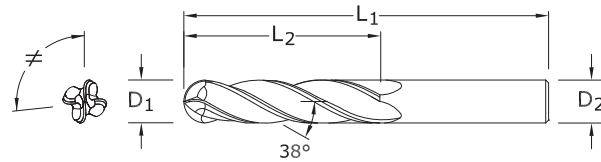
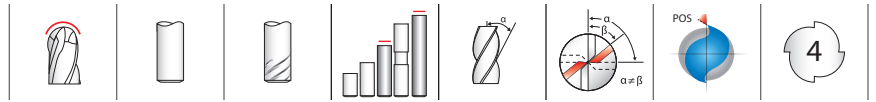
**TOLERANCES (inch)**

$D_1 = +0.0000/-0.0020$

$D_2 = h_6$

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



**7B**  
FRACTIONAL SERIES

**TOLERANCES (inch)**

$D_1 = +0.0000/-0.0020$

$D_2 = h_6$

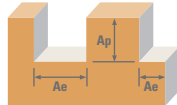
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.	STOCK
				Ti-NAMITE-X	
1/8	3/4	2-1/4	1/8	70441	●
1/8	1	3	1/8	70442	●
3/16	3/4	2-1/2	3/16	70444	●
3/16	1-1/8	3	3/16	70445	●
1/4	1-1/8	3	1/4	70447	●
1/4	1-1/2	4	1/4	70448	●
5/16	1-1/8	3	5/16	70450	●
5/16	1-5/8	4	5/16	70451	●
3/8	1-1/8	3	3/8	70453	●
3/8	1-3/4	4	3/8	70454	●
7/16	2	4-1/2	7/16	70456	●
7/16	3	6	7/16	70457	●
1/2	2	4-1/2	1/2	70459	●
1/2	3	6	1/2	70460	●
5/8	2-1/4	5	5/8	70462	●
5/8	3	6	5/8	70463	●
3/4	2-1/4	5	3/4	70465	●
3/4	3	6	3/4	70466	●
1	2-1/4	5	1	70468	●
1	3	6	1	70469	●

- Variable pitch allows for improved chatter suppression along with improved surface finish and enhanced tool life
- Raised land and increased core diameter designed to enhance tool life and decrease tool deflection
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

# FRACTIONAL Series 7



Series 7, 7B Fractional	Hardness	Finish	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
						1/8	1/4	3/8	1/2	5/8	3/4	1		
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Finish	≤ 0.02	≤ 2	480	RPM	14669	7334	4890	3667	2934	2445	1834
						(384-576)	Fz	0.0004	0.0010	0.0019	0.0025	0.0032	0.0033	0.0035
						Feed (ipm)	23.5	29.3	37.2	36.7	37.6	32.3	25.7	
<b>P</b>	<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Finish	≤ 0.02	≤ 2	275	RPM	8404	4202	2801	2101	1681	1401	1051
						(220-330)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
						Feed (ipm)	10.1	11.8	15.7	15.1	15.5	13.4	10.9	
<b>H</b>	<b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Finish	≤ 0.02	≤ 2	230	RPM	7029	3514	2343	1757	1406	1171	879
						(184-276)	Fz	0.0002	0.0006	0.0012	0.0016	0.0020	0.0021	0.0022
						Feed (ipm)	5.6	8.4	11.2	11.2	11.2	9.8	7.7	
<b>K</b>	<b>CAST IRONS (LOW &amp; MEDIUM ALLOY)</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Finish	≤ 0.02	≤ 2	605	RPM	18489	9244	6163	4622	3698	3081	2311
						(484-726)	Fz	0.0006	0.0015	0.0028	0.0037	0.0046	0.0047	0.0051
						Feed (ipm)	44.4	55.5	69.0	68.4	68.0	57.9	47.1	
<b>K</b>	<b>CAST IRONS (HIGH ALLOY)</b> Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Finish	≤ 0.02	≤ 2	465	RPM	14210	7105	4737	3553	2842	2368	1776
						(372-558)	Fz	0.0004	0.0011	0.0021	0.0028	0.0034	0.0036	0.0039
						Feed (ipm)	22.7	31.3	39.8	39.8	38.7	34.1	27.7	
<b>M</b>	<b>STAINLESS STEELS (FREE MACHINING)</b> 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Finish	≤ 0.02	≤ 2	420	RPM	12835	6418	4278	3209	2567	2139	1604
						(336-504)	Fz	0.0004	0.0010	0.0019	0.0025	0.0032	0.0033	0.0035
						Feed (ipm)	20.5	25.7	32.5	32.1	32.9	28.2	22.5	
<b>M</b>	<b>STAINLESS STEELS (DIFFICULT)</b> 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Finish	≤ 0.02	≤ 2	290	RPM	8862	4431	2954	2216	1772	1477	1108
						(232-348)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
						Feed (ipm)	10.6	12.4	16.5	16.0	16.3	14.2	11.5	
<b>M</b>	<b>STAINLESS STEELS (PH)</b> 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Finish	≤ 0.02	≤ 2	265	RPM	8098	4049	2699	2025	1620	1350	1012
						(212-318)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
						Feed (ipm)	9.7	11.3	15.1	14.6	14.9	13.0	10.5	
<b>S</b>	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE)</b> Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Finish	≤ 0.02	≤ 2	80	RPM	2445	1222	815	611	489	407	306
						(64-96)	Fz	0.0003	0.0007	0.0014	0.0018	0.0023	0.0024	0.0026
						Feed (ipm)	2.9	3.4	4.6	4.4	4.5	3.9	3.2	
<b>S</b>	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE)</b> Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Finish	≤ 0.02	≤ 2	65	RPM	1986	993	662	497	397	331	248
						(52-78)	Fz	0.0002	0.0006	0.0010	0.0014	0.0017	0.0018	0.0019
						Feed (ipm)	1.6	2.4	2.6	2.8	2.7	2.4	1.9	
<b>S</b>	<b>TITANIUM ALLOYS</b> Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Finish	≤ 0.02	≤ 2	300	RPM	9168	4584	3056	2292	1834	1528	1146
						(240-360)	Fz	0.0004	0.0011	0.0021	0.0028	0.0034	0.0036	0.0039
						Feed (ipm)	14.7	20.2	25.7	25.7	24.9	22.0	17.9	
<b>S</b>	<b>TITANIUM ALLOYS (DIFFICULT)</b> Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRc	Finish	≤ 0.02	≤ 2	105	RPM	3209	1604	1070	802	642	535	401
						(84-126)	Fz	0.0004	0.0011	0.0021	0.0028	0.0034	0.0036	0.0039
						Feed (ipm)	5.1	7.1	9.0	9.0	8.7	7.7	6.3	

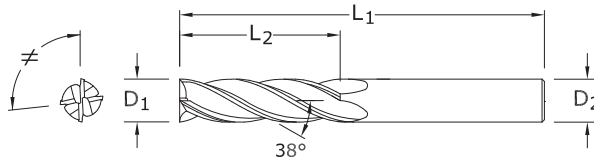
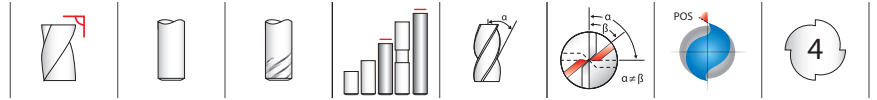
Bhn (Brinell) HRc (Rockwell C)

rpm = Vc x 3.82 / D<sub>1</sub>

ipm = Fz x 4 x rpm

reduce speed and feed for materials harder than listed

refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



**TOLERANCES (mm)**

$D_1 = +0,000/+0,050$

$D_2 = h_6$

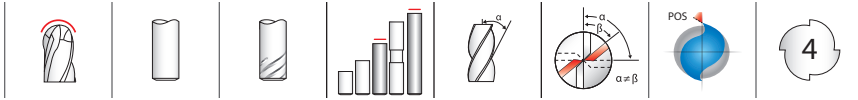
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

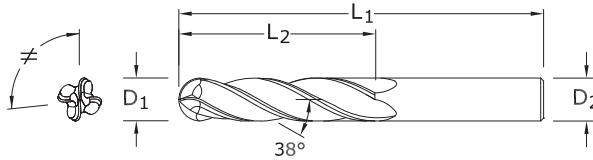
**7M**  
METRIC SERIES

mm				EDP NO.	STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	Ti-NAMITE-X	
3,0	25,0	75,0	3,0	70551	●
4,0	25,0	75,0	4,0	70552	●
5,0	25,0	75,0	5,0	70553	●
6,0	25,0	75,0	6,0	70554	●
8,0	25,0	75,0	8,0	70555	●
10,0	38,0	100,0	10,0	70556	●
12,0	50,0	100,0	12,0	70557	●
12,0	75,0	150,0	12,0	70558	●
14,0	75,0	150,0	14,0	70559	●
16,0	75,0	150,0	16,0	70560	●
18,0	75,0	150,0	18,0	70561	●
20,0	75,0	150,0	20,0	70562	●
25,0	75,0	150,0	25,0	70563	●

- Variable pitch allows for improved chatter suppression along with improved surface finish and enhanced tool life
- Raised land and increased core diameter designed to enhance tool life and decrease tool deflection
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)



**7MB**  
METRIC SERIES



- Variable pitch allows for improved chatter suppression along with improved surface finish and enhanced tool life
- Raised land and increased core diameter designed to enhance tool life and decrease tool deflection
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 45$  HRc ( $\leq 420$  Bhn)

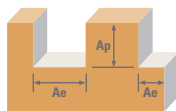
mm				EDP NO.	STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	Ti-NAMITE-X	
3,0	25,0	75,0	3,0	70527	●
4,0	25,0	75,0	4,0	70529	●
5,0	25,0	75,0	5,0	70531	●
6,0	25,0	75,0	6,0	70533	●
8,0	25,0	75,0	8,0	70535	●
10,0	38,0	100,0	10,0	70537	●
12,0	50,0	100,0	12,0	70539	●
12,0	75,0	150,0	12,0	70540	●
14,0	75,0	150,0	14,0	70542	●
16,0	75,0	150,0	16,0	70544	●
18,0	75,0	150,0	18,0	70546	●
20,0	75,0	150,0	20,0	70548	●
25,0	75,0	150,0	25,0	70550	●

**TOLERANCES (mm)**

$D_1 = +0,000/+0,050$   
 $D_2 = h_6$

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

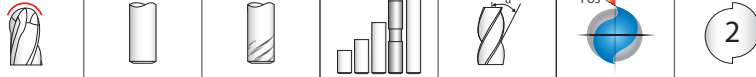
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



Series 7M, 7MB Metric	Hardness	Finish	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)									
						3	6	8	10	12	16	20	25		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 275 Bhn or ≤ 28 HRc	Finish	≤ 0.02	≤ 2	146	RPM	15511	7755	5816	4653	3878	2908	2327	1861
						(117-176)	Fz	0.0166	0.043	0.075	0.093	0.110	0.125	0.147	0.160
						Feed (mm/min)	1030	1334	1745	1731	1706	1454	1368	1191	
P	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 375 Bhn or ≤ 40 HRc	Finish	≤ 0.02	≤ 2	84	RPM	8886	4443	3332	2666	2222	1666	1333	1066
						(67-101)	Fz	0.0122	0.034	0.051	0.069	0.082	0.091	0.109	0.120
						Feed (mm/min)	434	604	680	736	729	606	581	512	
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Finish	≤ 0.02	≤ 2	70	RPM	7432	3716	2787	2230	1858	1394	1115	892
						(56-84)	Fz	0.0070	0.019	0.040	0.043	0.048	0.057	0.064	0.070
						Feed (mm/min)	208	282	446	384	357	318	285	250	
K	CAST IRONS (LOW & MEDIUM ALLOY) Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Finish	≤ 0.02	≤ 2	184	RPM	19550	9775	7331	5865	4887	3666	2932	2346
						(148-221)	Fz	0.0132	0.036	0.052	0.075	0.089	0.099	0.117	0.130
						Feed (mm/min)	1032	1408	1525	1759	1740	1452	1372	1220	
K	CAST IRONS (HIGH ALLOY) Gray, Malleable, Ductile	≤ 260 Bhn or ≤ 26 HRc	Finish	≤ 0.02	≤ 2	142	RPM	15026	7513	5635	4508	3756	2817	2254	1803
						(113-170)	Fz	0.0132	0.036	0.052	0.075	0.089	0.099	0.117	0.130
						Feed (mm/min)	793	1082	1172	1352	1337	1116	1055	938	
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Finish	≤ 0.02	≤ 2	128	RPM	13572	6786	5089	4072	3393	2545	2036	1629
						(102-154)	Fz	0.0086	0.024	0.040	0.048	0.058	0.065	0.077	0.087
						Feed (mm/min)	467	651	814	782	787	662	627	567	
M	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L	≤ 275 Bhn or ≤ 28 HRc	Finish	≤ 0.02	≤ 2	88	RPM	9371	4686	3514	2811	2343	1757	1406	1125
						(71-106)	Fz	0.0082	0.022	0.037	0.045	0.048	0.060	0.072	0.078
						Feed (mm/min)	307	412	520	506	450	422	405	351	
M	STAINLESS STEELS (PH) 13-8 PH, 15-5 PH, 17-4 PH, Custom 450	≤ 325 Bhn or ≤ 35 HRc	Finish	≤ 0.02	≤ 2	81	RPM	8563	4282	3211	2569	2141	1606	1284	1028
						(65-97)	Fz	0.0070	0.019	0.029	0.040	0.048	0.055	0.064	0.070
						Feed (mm/min)	240	325	372	411	411	353	329	288	
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400	≤ 300 Bhn or ≤ 32 HRc	Finish	≤ 0.02	≤ 2	24	RPM	2585	1293	969	776	646	485	388	310
						(20-29)	Fz	0.0072	0.019	0.029	0.037	0.046	0.053	0.061	0.085
						Feed (mm/min)	74	98	112	90	119	103	95	105	
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 718, X-750, Incoloy, Waspaloy, Hastelloy, Rene	≤ 400 Bhn or ≤ 43 HRc	Finish	≤ 0.02	≤ 2	20	RPM	2100	1050	788	630	525	394	315	252
						(16-24)	Fz	0.0075	0.016	0.021	0.030	0.038	0.044	0.051	0.070
						Feed (mm/min)	63	67	66	76	80	69	64	71	
S	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si	≤ 350 Bhn or ≤ 38 HRc	Finish	≤ 0.02	≤ 2	91	RPM	9694	4847	3635	2908	2424	1818	1454	1163
						(73-110)	Fz	0.0091	0.024	0.004	0.005	0.060	0.070	0.080	0.088
						Feed (mm/min)	353	465	51	59	582	509	465	409	
S	TITANIUM ALLOYS (DIFFICULT) Ti10Al2Fe3Al, Ti5Al5V5Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti15V3 Cr3Sn3Al	≤ 440 Bhn or ≤ 47 HRc	Finish	≤ 0.02	≤ 2	32	RPM	3393	1696	1272	1018	848	636	509	407
						(26-38)	Fz	0.0082	0.019	0.029	0.037	0.046	0.053	0.061	0.085
						Feed (mm/min)	111	129	148	151	156	135	124	138	

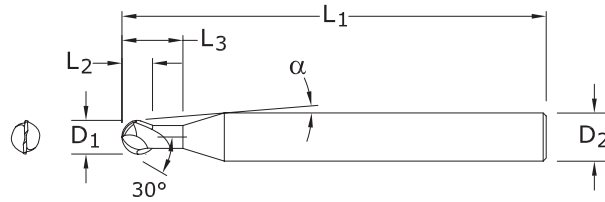
Bhn (Brinell)    HRc (Rockwell C)  
 rpm = (Vc x 1000) / (D<sub>1</sub> x 3.14)  
 mm/min = Fz x 4 x rpm  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information (www.kyocera-sgstoool.com)





**56B**  
FRACTIONAL SERIES

- Short flute length and rigid design to reduce deflection
- S-Gash Ball geometry minimizes load and heat produced during the cutting process, ultimately enhancing tool life
- Ideal for machining complex contoured shapes in hardened steels
- Recommended for materials 35 to 60 HRc (327 to 654 Bhn)



CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			REACH L <sub>3</sub>	EDP NO. Ti-NAMITE-X	STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	α			
1/32	1/32	3	1/4	8°20'	1/16	93272	●
1/16	1/16	3	1/4	7°40'	1/8	93273	●
3/32	3/32	3	1/4	6°50'	3/16	93274	●
1/8	1/8	3	1/4	6°	1/4	93275	●
3/16	3/16	3	1/4	3°35'	3/8	93276	●
1/4	1/4	3-1/2	1/4	—	1/2	93277	●
5/16	5/16	4	5/16	—	5/8	93278	●
3/8	3/8	4	3/8	—	3/4	93279	●
1/2	1/2	4-1/2	1/2	—	1	93280	●
5/8	5/8	5-1/2	5/8	—	1-1/4	93281	●
3/4	3/4	6-1/2	3/4	—	1-1/2	93282	●

Neck Option Available

**TOLERANCES (inch)**

**1/32–3/32 DIAMETER**

D<sub>1</sub> = +0.0000/–0.0010  
D<sub>2</sub> = h<sub>6</sub>

**>3/32–1/4 DIAMETER**

D<sub>1</sub> = +0.0000/–0.0012  
D<sub>2</sub> = h<sub>6</sub>

**>1/4–3/8 DIAMETER**

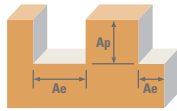
D<sub>1</sub> = +0.0000/–0.0016  
D<sub>2</sub> = h<sub>6</sub>







**>3/8–3/4 DIAMETER**

D<sub>1</sub> = +0.0000/–0.0020  
D<sub>2</sub> = h<sub>6</sub>

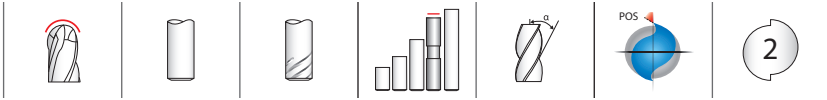
**HARDENED STEELS**

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

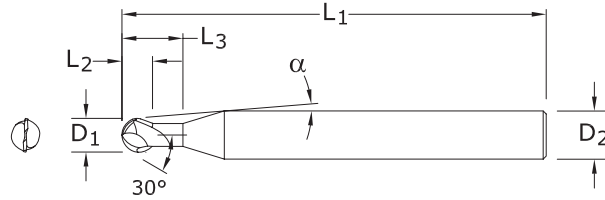


Series 56B	Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
						1/32	1/16	1/8	3/16	1/4	3/8	1/2	3/4	
H	TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	Rough 	≤ 0.4	≤ 0.1	625	RPM	76400	38200	19100	12733	9550	6367	4775	3183
					(500-750)	Fz	0.0006	0.0015	0.0030	0.0040	0.0050	0.0080	0.0100	0.0120
					Feed (ipm)	92	115	115	102	96	102	96	76	
		HSM 	≤ 0.4	≤ 0.03	950	RPM	116128	58064	29032	19355	14516	9677	7258	4839
					(760-1140)	Fz	0.0007	0.0017	0.0033	0.0044	0.0060	0.0088	0.0110	0.0130
					Feed (ipm)	163	197	192	170	174	170	160	126	
	TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	Rough 	≤ 0.4	≤ 0.05	750	RPM	91680	45840	22920	15280	11460	7640	5730	3820
					(600-900)	Fz	0.0005	0.0011	0.0023	0.0030	0.0038	0.0060	0.0075	0.0085
					Feed (ipm)	92	101	105	92	87	92	86	65	
		HSM 	≤ 0.4	≤ 0.02	1150	RPM	140576	70288	35144	23429	17572	11715	8786	5857
					(920-1380)	Fz	0.0006	0.0012	0.0025	0.0033	0.0042	0.0066	0.0082	0.0100
					Feed (ipm)	169	169	176	155	148	155	144	117	
TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	Rough 	≤ 0.4	≤ 0.04	500	RPM	61120	30560	15280	10187	7640	5093	3820	2547	
				(400-600)	Fz	0.0004	0.0008	0.0017	0.0023	0.0029	0.0045	0.0057	0.0063	
				Feed (ipm)	49	49	52	47	44	46	44	32		
	HSM 	≤ 0.4	≤ 0.01	1000	RPM	122240	61120	30560	20373	15280	10187	7640	5093	
				(800-1200)	Fz	0.0005	0.0009	0.0019	0.0025	0.0032	0.0050	0.0063	0.0071	
				Feed (ipm)	122	110	116	102	98	102	96	72		

Bhn (Brinell)    HRc (Rockwell C)    HSM (High Speed Machining)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fz \times 2 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



## 56MB METRIC SERIES



- Short flute length and rigid design to reduce deflection
- S-Gash Ball geometry minimizes load and heat produced during the cutting process, ultimately enhancing tool life
- Ideal for machining complex contoured shapes in hardened steels
- Recommended for materials 35 to 60 HRc (327 to 654 Bhn)

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	mm				REACH L <sub>3</sub>	EDP NO. Ti-NAMITE-X	STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	α				
1,0	1,0	76,0	6,0	8°10'	2,0	91349	●	
1,5	1,5	76,0	6,0	7°45'	3,0	91350	●	
2,0	2,0	76,0	6,0	7°10'	4,0	91351	●	
2,5	2,5	76,0	6,0	6°35'	5,0	91352	●	
3,0	3,0	76,0	6,0	6°	6,0	91353	●	
4,0	4,0	76,0	6,0	4°30'	8,0	91354	●	
5,0	5,0	89,0	6,0	2°30'	10,0	91355	●	
6,0	6,0	89,0	6,0	—	12,0	91356	●	
8,0	8,0	102,0	8,0	—	16,0	91357	●	
10,0	10,0	102,0	10,0	—	20,0	91358	●	
12,0	12,0	114,0	12,0	—	24,0	91359	●	
16,0	16,0	140,0	16,0	—	32,0	91360	●	
20,0	20,0	165,0	20,0	—	40,0	91361	●	

Neck Option Available

### TOLERANCES (mm)

#### 1–2,5 DIAMETER

D<sub>1</sub> = +0,000/–0,025

D<sub>2</sub> = h<sub>6</sub>

#### >2,5–6 DIAMETER

D<sub>1</sub> = +0,000/–0,030

D<sub>2</sub> = h<sub>6</sub>

#### >6–10 DIAMETER

D<sub>1</sub> = +0,000/–0,040

D<sub>2</sub> = h<sub>6</sub>

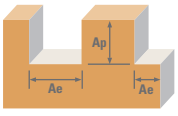
#### >10–20 DIAMETER







D<sub>1</sub> = +0,000/–0,050

D<sub>2</sub> = h<sub>6</sub>

### HARDENED STEELS

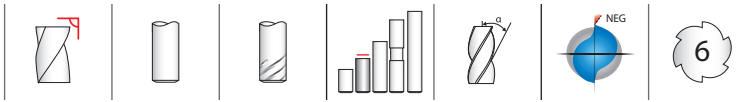
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



Series 56MB Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)									
					1	1.5	3	5	6	10	12	20		
<b>H</b>  TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 375 Bhn or ≤ 40 HRc	Rough 	≤ 0.4	≤ 0.1	191	RPM	60748	40498	20249	12150	10125	6075	5062	3037
					(153-229)	Fz	0.015	0.038	0.076	0.102	0.127	0.203	0.254	0.305
					Feed (mm/min)	1822	3078	3078	2479	2572	2466	2572	1853	
		HSM 	≤ 0.4	≤ 0.03	290	RPM	92235	61490	46117	18447	15372	9223	7686	4612
					(232-348)	Fz	0.018	0.043	0.084	0.112	0.117	0.224	0.279	0.330
					Feed (mm/min)	3320	5288	7748	4132	3597	4132	4289	3044	
	≤ 475 Bhn or ≤ 50 HRc	Rough 	≤ 0.4	≤ 0.05	229	RPM	72833	48556	24278	14567	12139	7283	6069	3642
					(183-275)	Fz	0.013	0.028	0.058	0.076	0.097	0.152	0.191	0.216
					Feed (mm/min)	1894	2719	2816	2214	2355	2214	2319	1573	
		HSM 	≤ 0.4	≤ 0.02	351	RPM	111636	74424	37212	22327	18606	11164	9303	5582
					(281-421)	Fz	0.015	0.030	0.064	0.084	0.107	0.168	0.208	0.254
					Feed (mm/min)	3349	4465	4763	3751	3982	3751	3870	2836	
TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 655 Bhn or ≤ 60 HRc	Rough 	≤ 0.4	≤ 0.04	152	RPM	48344	32229	16115	9669	8057	4834	4029	2417
					(122-182)	Fz	0.010	0.020	0.043	0.058	0.074	0.114	0.145	0.160
					Feed (mm/min)	967	1289	1386	1122	1192	1102	1168	773	
	HSM 	≤ 0.4	≤ 0.01	305	RPM	97005	64670	32335	19401	16168	9701	8084	4850	
				(244-366)	Fz	0.013	0.023	0.048	0.064	0.081	0.127	0.160	0.180	
				Feed (mm/min)	2522	2975	3104	2483	2619	2464	2587	1746		

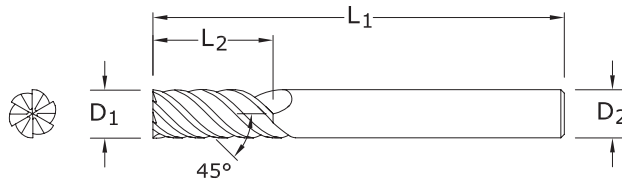
Bhn (Brinell)    HRc (Rockwell C)    HSM (High Speed Machining)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fz \times 2 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# FRACTIONAL Power-Carb



## 57 FRACTIONAL SERIES

- Ideal in Trochoidal milling applications in hardened steels and dry machining
- Short flute length and large core design to reduce deflection
- Unsurpassed edge strength with extreme negative rake and eccentric relief
- Recommended for materials 45 to 65 HRc (421 to 739 Bhn)



inch				EDP NO.	STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	Ti-NAMITE-X	
1/4	17/32	3-1/2	1/4	36140	●
5/16	11/16	4	5/16	36141	●
3/8	13/16	4	3/8	36142	●
1/2	1-3/32	4-1/2	1/2	36143	●

Neck Option Available

### TOLERANCES (inch)

#### 1/4 DIAMETER

D<sub>1</sub> = +0.0000/-0.0012

D<sub>2</sub> = h<sub>6</sub>

#### 5/16 DIAMETER

D<sub>1</sub> = +0.0000/-0.0016

D<sub>2</sub> = h<sub>6</sub>

#### 3/8 DIAMETER

D<sub>1</sub> = +0.0000/-0.0016

D<sub>2</sub> = h<sub>6</sub>

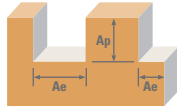
#### 1/2 DIAMETER

D<sub>1</sub> = +0.0000/-0.0020

D<sub>2</sub> = h<sub>6</sub>

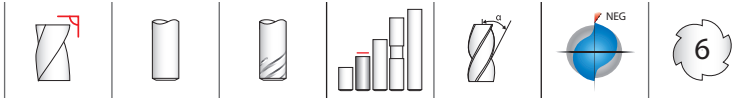
### HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

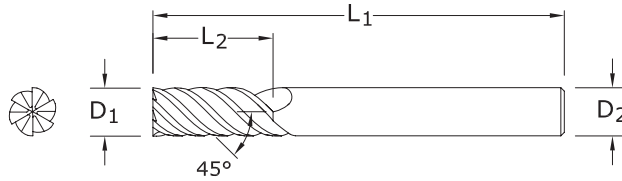


Series 57 Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)					
					1/4	5/16	3/8	1/2		
TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 420 Bhn or ≤ 45 HRc	Slot 	1	≤ 0.3	215	RPM	3285	2628	2190	1643
					(172-258)	Fz	0.0013	0.0019	0.0025	0.0031
						Feed (ipm)	26	30	33	31
	Profile 	≤ 0.1	≤ 1.5	265	RPM	4049	3239	2699	2025	
				(212-318)	Fz	0.0018	0.0026	0.0035	0.0044	
					Feed (ipm)	44	51	57	53	
	HSM 	≤ 0.04	≤ 1.5	560	RPM	8557	6845	5705	4278	
				(448-672)	Fz	0.0022	0.0033	0.0044	0.0055	
					Feed (ipm)	113	136	151	141	
TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 560 Bhn or ≤ 55 HRc	Slot 	1	≤ 0.3	120	RPM	1834	1467	1222	917
					(96-144)	Fz	0.0010	0.0015	0.0020	0.0025
						Feed (ipm)	11	13	15	14
	Profile 	≤ 0.1	≤ 1.5	150	RPM	2292	1834	1528	1146	
				(120-180)	Fz	0.0014	0.0021	0.0028	0.0035	
					Feed (ipm)	19	23	26	24	
	HSM 	≤ 0.04	≤ 1.5	490	RPM	7487	5990	4991	3744	
				(392-588)	Fz	0.0018	0.0026	0.0035	0.0044	
					Feed (ipm)	81	93	105	99	
TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 740 Bhn or ≤ 65 HRc	Slot 	1	≤ 0.3	65	RPM	993	795	662	497
					(52-78)	Fz	0.0008	0.0011	0.0015	0.0019
						Feed (ipm)	5	5	6	6
	Profile 	≤ 0.1	≤ 1.5	80	RPM	1222	978	815	611	
				(64-96)	Fz	0.0011	0.0016	0.0021	0.0026	
					Feed (ipm)	8	9	10	10	
	HSM 	≤ 0.04	≤ 1.5	250	RPM	3820	3056	2547	1910	
				(200-300)	Fz	0.0013	0.0019	0.0025	0.0031	
					Feed (ipm)	30	35	38	36	

Bhn (Brinell)    HRc (Rockwell C)    HSM (High Speed Machining)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fz \times 6 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



## 57M METRIC SERIES



- Ideal in Trochoidal milling applications in hardened steels and dry machining
- Short flute length and large core design to reduce deflection
- Unsurpassed edge strength with extreme negative rake and eccentric relief
- Recommended for materials 45 to 65 HRc (421 to 739 Bhn)

mm				EDP NO.	STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	Ti-NAMITE-X	
6,0	13,0	89,0	6,0	46140	●
8,0	18,0	102,0	8,0	46141	●
10,0	22,0	102,0	10,0	46142	●
12,0	26,0	114,0	12,0	46143	●
16,0	32,0	140,0	16,0	46145	■
20,0	38,0	165,0	20,0	46147	■

Neck Option Available

### TOLERANCES (mm)

#### 6 DIAMETER

D<sub>1</sub> = +0,000/-0,030  
D<sub>2</sub> = h<sub>6</sub>

#### 8 DIAMETER

D<sub>1</sub> = +0,000/-0,040  
D<sub>2</sub> = h<sub>6</sub>

#### 10 DIAMETER

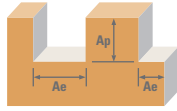
D<sub>1</sub> = +0,000/-0,040  
D<sub>2</sub> = h<sub>6</sub>










#### 12-20 DIAMETER

D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>

**HARDENED STEELS**

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

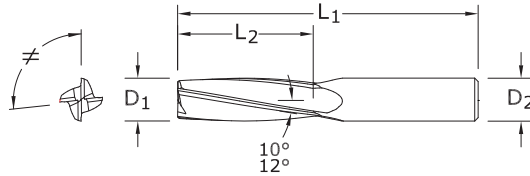


Series 57M Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)							
					6	8	10	12	16	20		
TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 420 Bhn or ≤ 45 HRc	Slot 	1	≤ 0.3	66	RPM	3499	2624	2099	1749	1312	1050
					(53-79)	Fz	0.032	0.048	0.064	0.079	0.094	0.109
					Feed (mm/min)	672	756	806	829	740	686	
	Profile 	≤ 0.1	≤ 1.5	81	RPM	4294	3220	2576	2147	1610	1288	
				(65-97)	Fz	0.046	0.066	0.089	0.112	0.132	0.152	
				Feed (mm/min)	1185	1275	1376	1443	1275	1175		
	HSM 	≤ 0.04	≤ 1.5	171	RPM	9064	6798	5439	4532	3399	2719	
				(137-205)	Fz	0.056	0.084	0.112	0.140	0.170	0.200	
				Feed (mm/min)	3046	3426	3655	3807	3467	3263		
TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 560 Bhn or ≤ 55 HRc	Slot 	1	≤ 0.3	37	RPM	1961	1471	1177	981	735	588
					(30-44)	Fz	0.025	0.038	0.051	0.064	0.077	0.090
					Feed (mm/min)	294	335	360	377	340	318	
	Profile 	≤ 0.1	≤ 1.5	46	RPM	2438	1829	1463	1219	914	732	
				(37-55)	Fz	0.036	0.053	0.071	0.089	0.107	0.125	
				Feed (mm/min)	527	582	623	651	587	549		
	HSM 	≤ 0.04	≤ 1.5	149	RPM	7898	5924	4739	3949	2962	2369	
				(119-179)	Fz	0.046	0.066	0.089	0.112	0.135	0.158	
				Feed (mm/min)	2180	2346	2531	2654	2399	2246		
TOOL STEELS MOLD AND DIE STEEL 300M, 4340, 52100, HP-9-4-20, M50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 740 Bhn or ≤ 65 HRc	Slot 	1	≤ 0.3	20	RPM	1060	795	636	530	398	318
					(16-24)	Fz	0.020	0.028	0.038	0.048	0.058	0.068
					Feed (mm/min)	127	134	145	153	138	130	
	Profile 	≤ 0.1	≤ 1.5	24	RPM	1272	954	763	636	477	382	
				(19-29)	Fz	0.028	0.041	0.053	0.066	0.078	0.090	
				Feed (mm/min)	214	235	243	252	223	206		
	HSM 	≤ 0.04	≤ 1.5	76	RPM	4029	3021	2417	2014	1511	1209	
				(61-91)	Fz	0.033	0.048	0.064	0.079	0.094	0.109	
				Feed (mm/min)	798	870	928	955	852	790		

Bhn (Brinell)    HRc (Rockwell C)    HSM (High Speed Machining)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fz \times 6 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



# Series 27



## 27 FRACTIONAL SERIES

- Slow helix design adds strength to the edge allowing ease for milling highly abrasive materials
- Two levels of chatter suppression: variable helix and indexing
- Excels at roughing (slotting, profiling) and finishing in a variety of plastics and composites

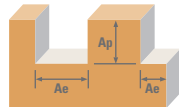
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	EDP NO.		STOCK
				UNCOATED	Di-NAMITE (Diamond)	
1/4	1	2-1/2	1/4	72978	72979	●
3/8	1-1/8	2-1/2	3/8	72980	72981	●
1/2	1-1/2	3-1/2	1/2	72982	72983	●
3/4	1-3/8	4	3/4	72984	72985	●

### TOLERANCES (inch)

D<sub>1</sub> = +0.0000/-0.0030  
D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

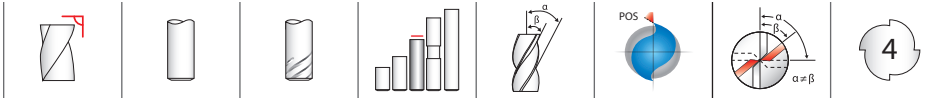


Series 27 Fractional	Ae x D1	Ap x D1	Vc (sfm)	Diameter (D1) (inch)					
				1/4	3/8	1/2	3/4		
CFRP, AFRP (CARBON FIBER, ARAMID FIBER)	Slot	1	≤ 1	400	RPM	6112	4075	3056	2037
				(320-480)	Fz	0.0016	0.0030	0.0040	0.0048
				Feed (ipm)	39	49	49	39	
	Profile	≤ 0.5	≤ 1.5	500	RPM	7640	5093	3820	2547
				(400-600)	Fz	0.0016	0.0030	0.0040	0.0048
				Feed (ipm)	49	61	61	49	
	HSM	≤ 0.5	≤ 2	825	RPM	12606	8404	6303	4202
				(660-990)	Fz	0.0037	0.0069	0.0092	0.0110
				Feed (ipm)	187	232	232	185	
GFRP (FIBERGLASS)	Slot	1	≤ 1	320	RPM	4890	3260	2445	1630
				(256-384)	Fz	0.0016	0.0030	0.0040	0.0048
				Feed (ipm)	31	39	39	31	
	Profile	≤ 0.5	≤ 1.5	400	RPM	6112	4075	3056	2037
				(320-480)	Fz	0.0016	0.0030	0.0040	0.0048
				Feed (ipm)	39	49	49	39	
	HSM	≤ 0.5	≤ 2	660	RPM	10085	6723	5042	3362
				(528-792)	Fz	0.0037	0.0069	0.0092	0.0110
				Feed (ipm)	149	186	186	148	
N CARBON, GRAPHITE	Slot	1	≤ 1	480	RPM	7334	4890	3667	2445
				(384-576)	Fz	0.0020	0.0038	0.0050	0.0060
				Feed (ipm)	59	74	73	59	
	Profile	≤ 0.5	≤ 1.5	600	RPM	9168	6112	4584	3056
				(480-720)	Fz	0.0020	0.0038	0.0050	0.0060
				Feed (ipm)	73	93	92	73	
	HSM	≤ 0.5	≤ 2	990	RPM	15127	10085	7564	5042
				(792-1188)	Fz	0.0046	0.0086	0.0115	0.0138
				Feed (ipm)	278	347	348	278	
PLASTICS	Slot	1	≤ 1	800	RPM	12224	8149	6112	4075
				(640-690)	Fz	0.0020	0.0038	0.0050	0.0060
				Feed (ipm)	98	124	122	98	
	Profile	≤ 0.5	≤ 1.5	1000	RPM	15280	10187	7640	5093
				(800-1200)	Fz	0.0020	0.0038	0.0050	0.0060
				Feed (ipm)	122	155	153	122	
	HSM	≤ 0.5	≤ 2	1650	RPM	25212	16808	12606	8404
				(1320-1980)	Fz	0.0046	0.0086	0.0115	0.0138
				Feed (ipm)	464	578	580	464	
MACHINABLE CERAMICS MACHINABLE GLASS	Slot	1	≤ 1	40	RPM	611	407	306	204
				(32-48)	Fz	0.0008	0.0015	0.0020	0.0024
				Feed (ipm)	2.0	2.4	2.4	2.0	
	Profile	≤ 0.5	≤ 1.5	50	RPM	764	509	382	255
				(40-60)	Fz	0.0008	0.0015	0.0020	0.0024
				Feed (ipm)	2.4	3.1	3.1	2.4	
	HSM	≤ 0.5	≤ 2	85	RPM	1299	866	649	433
				(68-102)	Fz	0.0018	0.0034	0.0046	0.0055
				Feed (ipm)	9.4	11.8	11.9	9.5	

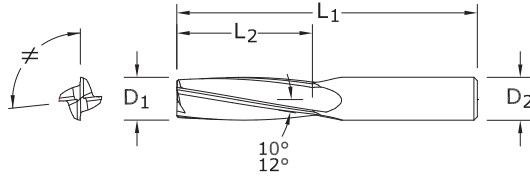
HSM (High Speed Machining)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fz \times 4 \times rpm$   
 adjust parameters based on resin type and fiber structure  
 reduce speed when overheating causes melting or damage to resin  
 reduce feed if delamination or fraying occur  
 finish cuts typically required reduced feed and cutting depths

rates shown are for use without coolant; rates may be increased with coolant  
 dust collection is vital when machining dry  
 diamond coating will increase tool life in graphite and composite materials  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# Series 27



## 27M METRIC SERIES



- Slow helix design adds strength to the edge allowing ease for milling highly abrasive materials
- Two levels of chatter suppression: variable helix and indexing
- Excels at roughing (slotting, profiling) and finishing in a variety of plastics and composites

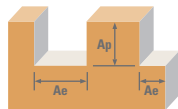
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	EDP NO.		STOCK
				UNCOATED	Di-NAMITE (Diamond)	
6,0	25,0	63,0	6,0	83056	83057	●
8,0	25,0	63,0	8,0	83058	83059	●
10,0	28,0	63,0	10,0	83060	83061	●
12,0	38,0	89,0	12,0	83062	83063	●
16,0	48,0	115,0	16,0	83064	83065	●

### TOLERANCES (mm)

D<sub>1</sub> = +0,000/-0,080  
D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



Series 27M Metric	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)						
				6	8	10	12	16		
CFRP, AFRP (CARBON FIBER, ARAMID FIBER)	Slot 	1	≤ 1	120	RPM	6361	4771	3817	3181	2385
				(96-164)	Fz	0.040	0.065	0.075	0.100	0.120
				Feed (mm/min)	1018	1240	1145	1272	1145	
	Profile 	≤ 0.5	≤ 1.5	150	RPM	7951	5963	4771	3976	2982
				(120-180)	Fz	0.040	0.065	0.075	0.100	0.120
				Feed (mm/min)	1272	1550	1431	1590	1431	
	HSM 	≤ 0.5	≤ 2	250	RPM	13252	9939	7951	6626	4970
				(200-300)	Fz	0.095	0.145	0.175	0.235	0.280
				Feed (mm/min)	5036	5765	5566	6228	5566	
GFRP (FIBERGLASS)	Slot 	1	≤ 1	100	RPM	5301	3976	3181	2650	1988
				(80-120)	Fz	0.040	0.065	0.075	0.100	0.120
				Feed (mm/min)	848	1034	954	1060	954	
	Profile 	≤ 0.5	≤ 1.5	120	RPM	6361	4771	3817	3181	2385
				(96-164)	Fz	0.040	0.065	0.075	0.100	0.120
				Feed (mm/min)	1018	1240	1145	1272	1145	
	HSM 	≤ 0.5	≤ 2	200	RPM	10602	7951	6361	5301	3976
				(160-240)	Fz	0.095	0.145	0.175	0.235	0.280
				Feed (mm/min)	4029	4612	4453	4983	4453	
N CARBON, GRAPHITE	Slot 	1	≤ 1	145	RPM	7686	5765	4612	3843	2882
				(116-174)	Fz	0.050	0.080	0.095	0.125	0.150
				Feed (mm/min)	1537	1845	1752	1922	1729	
	Profile 	≤ 0.5	≤ 1.5	185	RPM	9807	7355	5884	4903	3677
				(148-222)	Fz	0.050	0.080	0.095	0.125	0.150
				Feed (mm/min)	1961	2354	2236	2452	2206	
	HSM 	≤ 0.5	≤ 2	300	RPM	15903	11927	9542	7951	5963
				(240-360)	Fz	0.115	0.185	0.220	0.290	0.350
				Feed (mm/min)	7315	8826	8397	9223	8349	
PLASTICS	Slot 	1	≤ 1	245	RPM	12987	9740	7792	6494	4870
				(196-294)	Fz	0.050	0.080	0.095	0.125	0.150
				Feed (mm/min)	2597	3117	2961	3247	2922	
	Profile 	≤ 0.5	≤ 1.5	305	RPM	16168	12126	9701	8084	6063
				(244-366)	Fz	0.050	0.080	0.095	0.125	0.150
				Feed (mm/min)	3234	3880	3686	4042	3638	
	HSM 	≤ 0.5	≤ 2	505	RPM	26769	20077	16062	13385	10038
				(404-606)	Fz	0.115	0.185	0.220	0.290	0.350
				Feed (mm/min)	12314	14857	14134	15526	14054	
MACHINABLE CERAMICS MACHINABLE GLASS	Slot 	1	≤ 1	10	RPM	530	398	318	265	199
				(8-12)	Fz	0.020	0.035	0.045	0.050	0.060
				Feed (mm/min)	42	56	57	53	48	
	Profile 	≤ 0.5	≤ 1.5	15	RPM	795	596	477	398	298
				(12-18)	Fz	0.020	0.035	0.045	0.050	0.060
				Feed (mm/min)	64	83	86	80	72	
	HSM 	≤ 0.5	≤ 2	25	RPM	1325	994	795	663	497
				(20-30)	Fz	0.045	0.075	0.085	0.115	0.140
				Feed (mm/min)	239	298	270	305	278	

HSM (High Speed Machining)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fz \times 4 \times rpm$   
 adjust parameters based on resin type and fiber structure  
 reduce speed when overheating causes melting or damage to resin  
 reduce feed if delamination or fraying occur  
 finish cuts typically required reduced feed and cutting depths

rates shown are for use without coolant; rates may be increased with coolant  
 dust collection is vital when machining dry  
 diamond coating will increase tool life in graphite and composite materials  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

## High Performance Aluminum End Mills



# Milling

HIGH PERFORMANCE ALUMINUM END MILLS	SERIES	DESCRIPTION	PAGE	
S-Carb APR & APF	43APR	3 Flute Advanced Productivity Rougher Fractional	116	
	43MAPR	3 Flute Advanced Productivity Rougher Metric	120	
	43APF	4 Flute Advanced Productivity Finisher Fractional	118	
	43MAPF	4 Flute Advanced Productivity Finisher Metric	122	
S-Carb (3 Flute)	43	3 Flute Non-Ferrous Square End Fractional	124	
	43M	3 Flute Non-Ferrous Square End Metric (Unpolished Flutes)	137	
	43M	3 Flute Non-Ferrous Square End Metric (Polished Flutes)	143	
	43CR	3 Flute Non-Ferrous Corner Radius Fractional	125	
	43MCR	3 Flute Non-Ferrous Corner Radius Metric (Unpolished Flutes)	137	
	43MCR	3 Flute Non-Ferrous Corner Radius Metric (Polished Flutes)	138	
	43MCR	3 Flute Non-Ferrous Corner Radius 4xD Metric (Polished Flutes)	139	
	43LC	3 Flute Non-Ferrous Long Reach Corner Radius Fractional	129	
	43MLC	3 Flute Non-Ferrous Long Reach Corner Radius Metric (Unpolished Flutes)	141	
	43MLC	3 Flute Non-Ferrous Long Reach Corner Radius Metric (Polished Flutes)	142	
	43L	3 Flute Non-Ferrous Square End Long Reach Fractional	128	
	43ML	3 Flute Non-Ferrous Square End Long Reach Metric	140	
	43EC	3 Flute Non-Ferrous Square End Extra Long Reach Fractional	131	
	43B	3 Flute Non-Ferrous Ball End Fractional	132	
	43MB	3 Flute Non-Ferrous Ball End Metric (Polished Flutes)	144	
	43LB	3 Flute Non-Ferrous Ball End Long Reach Fractional	133	
	43EB	3 Flute Non-Ferrous Ball End Extra Long Reach Fractional	133	
	S-Carb Rougher (3 Flute)	43CB	3 Flute Rougher Non-Ferrous Chip Breaker Fractional	134
		43MCB	3 Flute Rougher Non-Ferrous Chip Breaker Metric	145
43LCB		3 Flute Rougher Non-Ferrous Chip Breaker Long Reach Fractional	135	
S-Carb (2 Flute)	47	2 Flute Non-Ferrous Square End Fractional	147	
	47M	2 Flute Non-Ferrous Square End Metric	150	
	47B	2 Flute Non-Ferrous Ball End Fractional	148	
	47MB	2 Flute Non-Ferrous Ball End Metric	152	
	47L	2 Flute Non-Ferrous Square End Long Reach Fractional	147	
	47ML	2 Flute Non-Ferrous Square End Long Reach Metric	151	
	47LB	2 Flute Non-Ferrous Ball End Long Reach Fractional	148	
Ski-Carb	47MLB	2 Flute Non-Ferrous Ball End Long Reach Metric	152	
	44	2 Flute Non-Ferrous Materials Corner Radius Fractional	154	
	44M	2 Flute Non-Ferrous Materials Corner Radius Metric	156	
	45	2 Flute Non-Ferrous Materials Long Reach Corner Radius Fractional	158	

*Speed & Feed Recommendations listed after each series*

# Fresado

FRESAS DE ALTO RENDIMIENTO PARA ALUMINIO			
	SERIE	DESCRIPCIÓN	PÁGINA
S-Carb APR y APF	43APR	3 filos, productividad avanzada, desbastador, fraccional	116
	43MAPR	3 filos, productividad avanzada, desbastador, métrico	120
	43APF	4 filos, productividad avanzada, acabador, fraccional	118
	43MAPF	4 filos, productividad avanzada, acabador, métrico	122
S-Carb (3 filos)	43	3 filos, no férrico, punta cuadrada, fraccional	124
	43M	3 filos, no férrico, punta cuadrada, métrico (filos no pulidos)	137
	43M	3 filos, no férrico, punta cuadrada, métrico (filos pulidos)	143
	43CR	3 filos, no férrico, radio angulado, fraccional	125
	43MCR	3 filos, no férrico, radio angulado, métrico (filos no pulidos)	137
	43MCR	3 filos, no férrico, radio angulado, métrico (filos pulidos)	138
	43MCR	3 filos, no férrico, radio angulado 4xD, métrico (filos pulidos)	139
	43LC	3 filos, no férricos, largo alcance, radio angulado, fraccional	129
	43MLC	3 filos, no férrico, largo alcance, radio angulado, métrico (filos no pulidos)	141
	43MLC	3 filos, no férrico, largo alcance, radio angulado, métrico (filos pulidos)	142
	43L	3 filos, no férrico, punta cuadrada, largo alcance, fraccional	128
	43ML	3 filos, no férrico, punta cuadrada, largo alcance, métrico	140
	43EC	3 filos, no férrico, punta cuadrada, alcance extralargo, fraccional	131
	43B	3 filos, no férrico, punta esférica, fraccional	132
	43MB	3 filos, no férrico, punta esférica, métrico (filos pulidos)	144
	43LB	3 filos, no férrico, punta esférica, largo alcance, fraccional	133
43EB	3 filos, no férrico, punta esférica, alcance extralargo, fraccional	133	
Desbastador S-Carb (3 filos)	43CB	3 filos, desbastador, no férrico, rompevirutas, fraccional	134
	43MCB	3 filos, desbastador, no férrico, rompevirutas, métrico	145
	43LCB	3 filos, desbastador, no férrico, rompevirutas, largo alcance, fraccional	135
S-Carb (2 filos)	47	2 filos, no férrico, punta cuadrada, fraccional	147
	47M	2 filos, no férrico, punta cuadrada, métrico	150
	47B	2 filos, no férrico, punta esférica, fraccional	148
	47MB	2 filos, no férrico, punta esférica, métrico	152
	47L	2 filos, no férrico, punta cuadrada, largo alcance, fraccional	147
	47ML	2 filos, no férrico, punta cuadrada, largo alcance, métrico	151
	47LB	2 filos, no férrico, punta esférica, largo alcance, fraccional	148
47MLB	2 filos, no férrico, punta esférica, largo alcance, métrico	152	
Ski-Carb	44	2 filos, materiales no férricos, radio angulado, fraccional	154
	44M	2 filos, materiales no férricos, radio angulado, métrico	156
	45	2 filos, materiales no férricos, largo alcance, radio angulado, fraccional	158

*Recomendaciones de velocidades y avances mostradas tras cada serie*

# Fraiseage

FRAISE HAUTE PERFORMANCE POUR ALUMINIUM	SÉRIES	DESCRIPTION	PAGE
S-Carb APR/APF	43APR	3 dents productivité avancée d'ébauche (fractionnel)	116
	43MAPR	3 dents productivité avancée d'ébauche (métrique)	120
	43APF	4 dents productivité avancée de finition (fractionnel)	118
	43MAPF	4 dents productivité avancée de finition (métrique)	122
S-Carb (3 dents)	43	3 dents non-ferreux à bout plat (fractionnel)	124
	43M	3 dents non-ferreux à bout plat (métrique) (goujures non polies)	137
	43M	3 dents non-ferreux à bout plat (métrique) (goujures polies)	143
	43CR	3 dents non-ferreux rayon en coin (fractionnel)	125
	43MCR	3 dents matériaux non-ferreux rayon en coin (métrique) (goujures non polies)	137
	43MCR	3 dents matériaux non-ferreux rayon en coin (métrique) (goujures polies)	138
	43MCR	3 dents matériaux non-ferreux rayon en coin 4xD (métrique) (goujures polies)	138
	43LC	3 dents non-ferreux longue portée rayon en coin (fractionnel)	129
	43MLC	3 dents non-ferreux longue portée rayon en coin (métrique) (goujures non polies)	141
	43MLC	3 dents non-ferreux longue portée rayon en coin (métrique) (goujures polies)	142
	43L	3 dents non-ferreux à bout plat longue portée (fractionnel)	128
	43ML	3 dents non-ferreux à bout plat longue portée (métrique)	140
	43EC	3 dents non-ferreux à bout plat portée extra-longue (fractionnel)	131
	43B	3 dents non-ferreux à bout hémisphérique (fractionnel)	132
	43MB	3 dents non-ferreux à bout hémisphérique (métrique) (goujures polies)	144
	43LB	3 dents non-ferreux à bout hémisphérique longue portée (fractionnel)	133
	43EB	3 dents non-ferreux à bout hémisphérique portée extra-longue (fractionnel)	133
S-Carb d'ébauche (3 dents)	43CB	3 dents d'ébauche non-ferreux brise-copeaux (fractionnel)	134
	43MCB	3 dents d'ébauche non-ferreux brise-copeaux (métrique)	145
	43LCB	3 dents d'ébauche non-ferreux brise-copeaux longue portée (fractionnel)	135
S-Carb (2 dents)	47	2 dents non-ferreux à bout plat (fractionnel)	147
	47M	2 dents non-ferreux à bout plat (métrique)	150
	47B	2 dents non-ferreux à bout hémisphérique (fractionnel)	148
	47MB	2 dents non-ferreux à bout hémisphérique (métrique)	152
	47L	2 dents non-ferreux à bout plat longue portée (fractionnel)	147
	47ML	2 dents non-ferreux à bout plat longue portée (métrique)	151
	47LB	2 dents non-ferreux à bout hémisphérique longue portée (fractionnel)	148
	47MLB	2 dents non-ferreux à bout hémisphérique longue portée (métrique)	152
Ski-Carb	44	2 dents matériaux non-ferreux rayon en coin (fractionnel)	154
	44M	2 dents matériaux non-ferreux rayon en coin (métrique)	156
	45	2 dents matériaux non-ferreux longue portée rayon en coin (fractionnel)	158

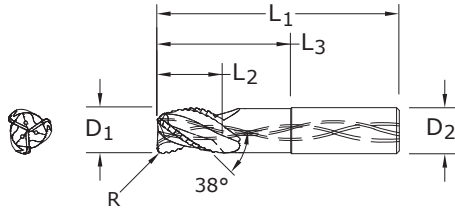
*Recommandations de vitesse et avance indiquées après chaque série*



# FRACTIONAL S-Carb APR



## 43APR FRACTIONAL SERIES



- Ultra high-productivity rougher for Aluminum alloys, specifically for aircraft components
- Designed for machine tools with capability of 600 in<sup>3</sup> per minute material removal rates
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Polished flutes maximize chip evacuation and provides enhanced finish
- Recommended for materials ≤ 150 Bhn (≤ 7 HRc)

inch						EDP NO.	STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>	CORNER RADIUS R	Ti-NAMITE-B (TiB <sub>2</sub> )	
3/4	1-3/8	4-1/4	3/4	2-3/8	.030	34000	●
3/4	1-3/8	4-1/4	3/4	2-3/8	.060	34001	●
3/4	1-3/8	4-1/4	3/4	2-3/8	.090	34002	●
3/4	1-3/8	4-1/4	3/4	2-3/8	.120	34003	●
3/4	1-1/4	4-7/8	3/4	3	.030	34004	●
3/4	1-1/4	4-7/8	3/4	3	.060	34005	●
3/4	1-1/4	4-7/8	3/4	3	.090	34006	●
3/4	1-1/4	4-7/8	3/4	3	.120	34007	●
1	1-3/4	4-1/2	1	2-1/2	.030	34008	●
1	1-3/4	4-1/2	1	2-1/2	.060	34009	●
1	1-3/4	4-1/2	1	2-1/2	.090	34010	●
1	1-3/4	4-1/2	1	2-1/2	.120	34011	●
1	1-1/2	5-1/4	1	3-1/4	.030	34012	●
1	1-1/2	5-1/4	1	3-1/4	.060	34013	●
1	1-1/2	5-1/4	1	3-1/4	.090	34014	●
1	1-1/2	5-1/4	1	3-1/4	.120	34015	●

Available on request: • JetStream Technology • Side exit coolant holes

### TOLERANCES (inch)

#### 3/4–1 DIAMETER

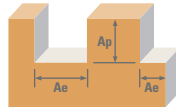
D<sub>1</sub> = +0.00040/–0.0020





D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0018

NON-FERROUS

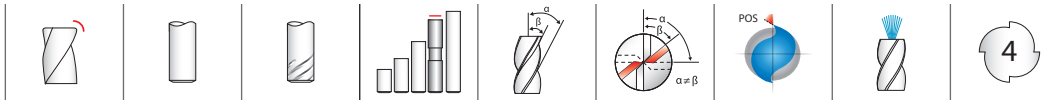
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



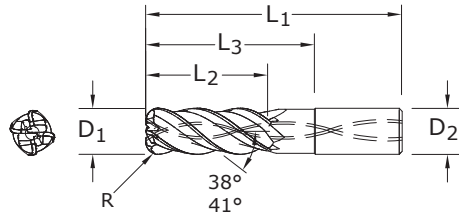
Series 43APR Fractional	Hardness		Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)		
						3/4	1	
<b>N</b>	≤ 150 Bhn or ≤ 7 HRc	Slot 	1	≤ 1	4920	RPM	25059	18794
					(3936-5904)	Fz	0.0060	0.0070
						Feed (in/min)	451	395
		Profile 	≤ 0.5	≤ 1.5	6560	RPM	33412	25059
					(5248-7872)	Fz	0.0060	0.0070
						Feed (in/min)	601	526
<b>ALUMINUM ALLOYS (LITHIUM)* 2090, 2091, 2099, 2195, 2199, 2297, 8090</b>	≤ 150 Bhn or ≤ 7 HRc	Slot 	1	≤ 1	3940	RPM	20068	15051
					(3152-4728)	Fz	0.0045	0.0053
						Feed (in/min)	271	239
		Profile 	≤ 0.5	≤ 1.5	4920	RPM	25059	18794
					(3936-5904)	Fz	0.0045	0.0053
						Feed (in/min)	338	299

Bhn (Brinell)    HRc (Rockwell C)  
 surface speed is dependent on machine spindle and fixturing  
 balancing is recommended at ultra high surface speeds  
 tool life may be reduced when machining Lithium Alloys  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fz \times 3 \times rpm$   
 maximum recommended depths shown  
 reduce speed and feed for materials harder than listed  
 ramp angle = 15° (feed rate = 50%)  
 plunge depth = 1 x D<sub>1</sub> (feed rate = 30%)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# FRACTIONAL S-Carb APF



## 43APF FRACTIONAL SERIES



- Ultra high-productivity finisher for Aluminum alloys, specifically for aircraft components
- Two levels of chatter suppression: variable helix and indexing
- Designed for single axial pass semi-finishing and finishing
- Polished flutes maximize chip evacuation and provides enhanced finish
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	inch			EDP NO.	STOCK
			SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>	CORNER RADIUS R	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/2	1-1/4	3-1/4	1/2	1-5/8	.030	34016	●
1/2	1-1/4	3-1/4	1/2	1-5/8	.060	34017	●
1/2	1-1/4	3-1/4	1/2	1-5/8	.090	34018	●
1/2	1-1/4	3-1/4	1/2	1-5/8	.120	34019	●
1/2	2	4	1/2	2-3/8	.030	34020	●
1/2	2	4	1/2	2-3/8	.060	34021	●
1/2	2	4	1/2	2-3/8	.090	34022	●
1/2	2	4	1/2	2-3/8	.120	34023	●
3/4	1-7/8	4-1/4	3/4	2-3/8	.030	34024	●
3/4	1-7/8	4-1/4	3/4	2-3/8	.060	34025	●
3/4	1-7/8	4-1/4	3/4	2-3/8	.090	34026	●
3/4	1-7/8	4-1/4	3/4	2-3/8	.120	34027	●
3/4	3	5-3/8	3/4	3-1/2	.030	34028	●
3/4	3	5-3/8	3/4	3-1/2	.060	34029	●
3/4	3	5-3/8	3/4	3-1/2	.090	34030	●
3/4	3	5-3/8	3/4	3-1/2	.120	34031	●

Available on request: • JetStream Technology

### TOLERANCES (inch)

#### 1/2-3/4 DIAMETER

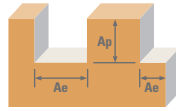
D<sub>1</sub> = +0.00040/-0.0020





D<sub>2</sub> = h<sub>6</sub>

R = +/-0.0018

NON-FERROUS

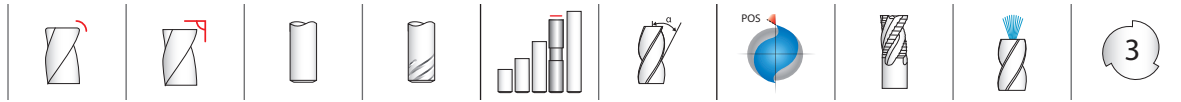
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



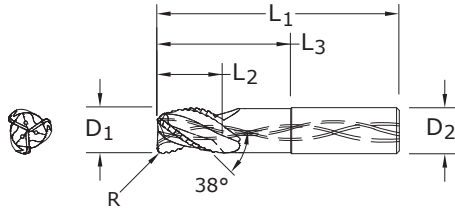
Series 43APF Fractional	Hardness	Profile	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)			
						1/2	3/4		
<b>N</b>	ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6063, 7075	≤ 150 Bhn or ≤ 7 HRc	Profile 	≤ 0.1	≤ 2.5	2625	RPM	20055	13370
						(2100-3150)	Fz	0.0030	0.0050
							Feed (in/min)	241	267
	ALUMINUM ALLOYS (LITHIUM)* 2090, 2091, 2099, 2195, 2199, 2297, 8090	≤ 150 Bhn or ≤ 7 HRc	Profile 	≤ 0.1	≤ 4	2625	RPM	20055	13370
						(2100-3150)	Fz	0.0020	0.0040
							Feed (in/min)	160	214
ALUMINUM ALLOYS (LITHIUM)* 2090, 2091, 2099, 2195, 2199, 2297, 8090	≤ 150 Bhn or ≤ 7 HRc	Profile 	≤ 0.1	≤ 2.5	1970	RPM	15051	10034	
					(1576-2364)	Fz	0.0030	0.0050	
						Feed (in/min)	181	201	
ALUMINUM ALLOYS (LITHIUM)* 2090, 2091, 2099, 2195, 2199, 2297, 8090	≤ 150 Bhn or ≤ 7 HRc	Profile 	≤ 0.1	≤ 4	1970	RPM	15051	10034	
					(1576-2364)	Fz	0.0020	0.0040	
						Feed (in/min)	120	161	

Bhn (Brinell)    HRc (Rockwell C)  
 surface speed is dependent on machine spindle and fixturing  
 balancing is recommended at ultra high surface speeds  
 tool life may be reduced when machining Lithium Alloys  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fz \times 4 \times rpm$   
 maximum recommended depths shown  
 reduce speed and feed for materials harder than listed  
 finish cuts typically require reduced feed and cutting depths of 0.02 X D<sub>1</sub> maximum  
 ramp angle = 6° (feed rate = 50%)  
 plunging not recommended  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# S-Carb APR



## 43MAPR METRIC SERIES



- Ultra high-productivity rougher for Aluminum alloys, specifically for aircraft components
- Designed for machine tools with capability of 600 in<sup>3</sup> per minute material removal rates
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Polished flutes maximize chip evacuation and provides enhanced finish
- Recommended for materials ≤ 150 Bhn (≤ 7 HRc)

mm						EDP NO.	STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>	CORNER RADIUS R	Ti-NAMITE-B (TiB <sub>2</sub> )	
12,0	18,0	83,0	12,0	38,0	—	44650	●
12,0	18,0	83,0	12,0	38,0	2,0	44685	●
12,0	18,0	83,0	12,0	38,0	3,0	44686	●
12,0	18,0	83,0	12,0	38,0	4,0	44687	●
16,0	24,0	92,0	16,0	51,0	—	44652	●
16,0	24,0	92,0	16,0	51,0	2,0	44688	●
16,0	24,0	92,0	16,0	51,0	3,0	44689	●
16,0	24,0	92,0	16,0	51,0	4,0	44690	●
20,0	30,0	86,0	20,0	45,0	—	44646	●
20,0	30,0	86,0	20,0	45,0	3,0	44647	●
20,0	30,0	86,0	20,0	45,0	4,0	44648	●
20,0	30,0	86,0	20,0	45,0	5,0	44649	●
20,0	35,0	104,0	20,0	64,0	—	44653	●
20,0	35,0	104,0	20,0	64,0	3,0	44691	●
20,0	35,0	104,0	20,0	64,0	4,0	44692	●
20,0	35,0	104,0	20,0	64,0	5,0	44693	●
25,0	35,0	108,0	25,0	55,0	3,0	44809	●
25,0	35,0	108,0	25,0	55,0	4,0	44810	●
25,0	35,0	108,0	25,0	55,0	5,0	44811	●
25,0	35,0	140,0	25,0	80,0	—	44654	●
25,0	35,0	140,0	25,0	80,0	3,0	44694	●
25,0	35,0	140,0	25,0	80,0	4,0	44695	●
25,0	35,0	140,0	25,0	80,0	5,0	44696	●
25,0	35,0	140,0	25,0	90,0	3,0	44645	●

Available on request: • JetStream Technology • Side exit coolant holes

### TOLERANCES (mm)

#### 12–25 DIAMETER

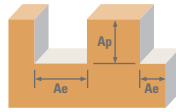
D<sub>1</sub> = +0,010/–0,050





D<sub>2</sub> = h<sub>6</sub>

R = +0,000/–0,030

NON-FERROUS

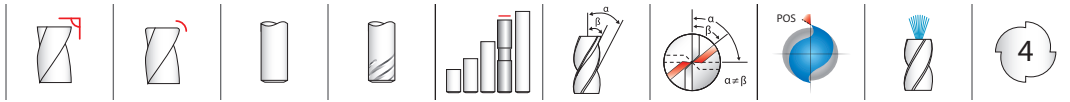
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



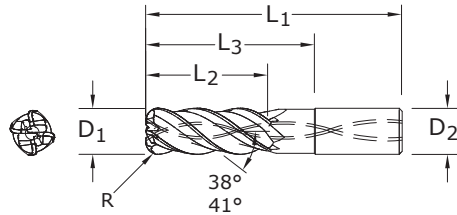
Series 43MAPR Metric	Hardness		Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)					
						12	16	20	25		
<b>N</b>	ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6063, 7075	Slot 	1	≤ 1	1500	RPM	39788	29841	23873	19098	
					(1200-1800)	Fz	0.080	0.110	0.150	0.180	
							Feed (mm/min)	9549	9848	10743	10313
		Profile 	≤ 150 Bhn or ≤ 7 HRc	≤ 0.5	≤ 1.5	2000	RPM	53050	39788	31830	25464
	(1600-2400)					Fz	0.080	0.110	0.150	0.180	
						Feed (mm/min)	12732	13130	14324	13751	
	ALUMINUM ALLOYS (LITHIUM)* 2090, 2091, 2099, 2195, 2199, 2297, 8090		Slot 	1	≤ 1	1200	RPM	31830	23873	19098	15278
		(960-1440)				Fz	0.060	0.083	0.110	0.140	
					Feed (mm/min)	11459	5944	6302	6417		
Profile 		≤ 150 Bhn or ≤ 7 HRc	≤ 0.5	≤ 1.5	1500	RPM	39788	29841	23873	19098	
	(1200-1800)				Fz	0.060	0.083	0.110	0.140		
					Feed (mm/min)	7162	7430	7878	8021		

Bhn (Brinell)    HRc (Rockwell C)  
 surface speed is dependent on machine spindle and fixturing  
 balancing is recommended at ultra high surface speeds  
 tool life may be reduced when machining Lithium Alloys  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $ipm = Fz \times 3 \times rpm$   
 maximum recommended depths shown  
 reduce speed and feed for materials harder than listed  
 ramp angle = 15° (feed rate = 50%)  
 plunge depth = 1 x D<sub>1</sub> (feed rate = 30%)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# METRIC S-Carb APF



## 43MAPF METRIC SERIES



- Ultra high-productivity finisher for Aluminum alloys, specifically for aircraft components
- Two levels of chatter suppression: variable helix and indexing
- Designed for single axial pass semi-finishing and finishing
- Polished flutes maximize chip evacuation and provides enhanced finish
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

mm						EDP NO.	STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>	CORNER RADIUS R	Ti-NAMITE-B (TiB <sub>2</sub> )	
6,0	24,0	58,0	6,0	30,0	—	44627	●
8,0	32,0	64,0	8,0	40,0	—	44628	●
10,0	40,0	80,0	10,0	50,0	—	44629	●
12,0	30,0	83,0	12,0	40,0	—	44630	●
12,0	30,0	83,0	12,0	40,0	2,0	44745	●
12,0	30,0	83,0	12,0	40,0	3,0	44746	●
12,0	30,0	83,0	12,0	40,0	4,0	44747	●
12,0	30,0	83,0	12,0	50,0	0,5	44641	●
12,0	30,0	83,0	12,0	50,0	5,0	44642	●
12,0	48,0	100,0	12,0	62,0	—	44631	●
12,0	48,0	100,0	12,0	62,0	2,0	44748	●
12,0	48,0	100,0	12,0	62,0	3,0	44749	●
12,0	48,0	100,0	12,0	62,0	4,0	44750	●
16,0	42,0	93,0	16,0	51,0	5,0	44643	●
16,0	40,0	92,0	16,0	51,0	—	44634	●
16,0	40,0	92,0	16,0	51,0	2,0	44751	●
16,0	40,0	92,0	16,0	51,0	3,0	44752	●
16,0	40,0	92,0	16,0	51,0	4,0	44753	●
16,0	64,0	125,0	16,0	82,0	—	44635	●
16,0	64,0	125,0	16,0	82,0	2,0	44754	●
16,0	64,0	125,0	16,0	82,0	3,0	44755	●
16,0	64,0	125,0	16,0	82,0	4,0	44756	●
20,0	50,0	108,0	20,0	63,0	—	44636	●
20,0	50,0	108,0	20,0	63,0	3,0	44757	●
20,0	50,0	108,0	20,0	63,0	4,0	44758	●
20,0	50,0	108,0	20,0	63,0	5,0	44759	●
20,0	80,0	150,0	20,0	102,0	—	44637	●
20,0	80,0	150,0	20,0	102,0	3,0	44760	●
20,0	80,0	150,0	20,0	102,0	4,0	44761	●
20,0	80,0	150,0	20,0	102,0	5,0	44762	●
25,0	63,0	130,0	25,0	79,0	—	44638	●
25,0	63,0	130,0	25,0	79,0	3,0	44763	●
25,0	63,0	130,0	25,0	79,0	4,0	44764	●
25,0	63,0	130,0	25,0	79,0	5,0	44765	●
25,0	100,0	175,0	25,0	120,0	—	44639	●
25,0	100,0	175,0	25,0	120,0	3,0	44766	●
25,0	100,0	175,0	25,0	120,0	4,0	44767	●
25,0	100,0	175,0	25,0	120,0	5,0	44768	●

Available on request: • JetStream Technology

### TOLERANCES (mm)

#### 6–25 DIAMETER

D<sub>1</sub> = +0,010/–0,050

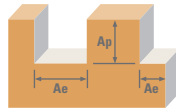
D<sub>2</sub> = h<sub>6</sub>

R = +0,000/–0,030

NON-FERROUS

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

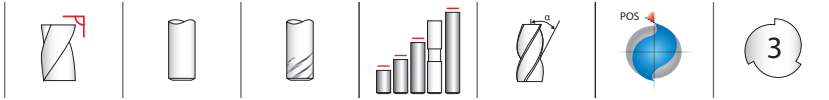


Series 43MAPF Metric	Hardness	Profile	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
						6	8	10	12	16	20	25		
<b>N</b>	ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6063, 7075	Profile 	≤ 0.1	≤ 2.5	800	RPM	42440	31830	25464	21220	15915	12732	10186	
					(640-960)	Fz	0.050	0.055	0.060	0.070	0.100	0.140	0.170	
					Feed (mm/min)	8488	7003	6111	5942	6366	7130	6926		
	ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6063, 7075	Profile 	≤ 0.1	≤ 4	800	RPM	42440	31830	25464	21220	15915	12732	10186	
					(640-960)	Fz	0.040	0.045	0.050	0.050	0.070	0.100	0.120	
					Feed (mm/min)	6790	5729	5093	4244	4456	5093	4889		
ALUMINUM ALLOYS (LITHIUM)* 2090, 2091, 2099, 2195, 2199, 2297, 8090	≤ 150 Bhn or ≤ 7 HRc	Profile 	≤ 0.1	≤ 2.5	600	RPM	31830	23873	19098	15915	11936	9549	7639	
					(480-720)	Fz	0.050	0.055	0.060	0.070	0.100	0.140	0.170	
					Feed (mm/min)	6366	5252	4584	4456	4774	5347	5195		
	ALUMINUM ALLOYS (LITHIUM)* 2090, 2091, 2099, 2195, 2199, 2297, 8090	≤ 150 Bhn or ≤ 7 HRc	Profile 	≤ 0.1	≤ 4	600	RPM	31830	23873	19098	15915	11936	9549	7639
						(480-720)	Fz	0.040	0.045	0.050	0.050	0.070	0.100	0.120
						Feed (mm/min)	5093	4297	3820	3183	3342	3820	3667	

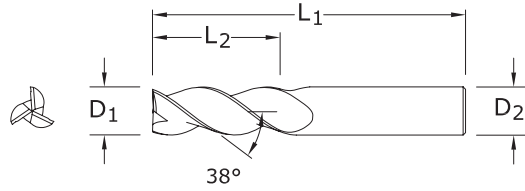
Bhn (Brinell)    HRc (Rockwell C)  
 surface speed is dependent on machine spindle and fixturing  
 balancing is recommended at ultra high surface speeds  
 \*tool life may be reduced when machining Lithium Alloys  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fz \times 4 \times rpm$   
 maximum recommended depths shown  
 reduce speed and feed for materials harder than listed  
 finish cuts typically require reduced feed and cutting depths of 0.02 X D<sub>1</sub> maximum  
 ramp angle = 6° (feed rate = 50%)  
 plunging not recommended  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



# FRACTIONAL S-Carb



## 43 FRACTIONAL SERIES



- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	EDP NO.		STOCK
				UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/8	3/8	1-1/2	1/8	34701	34728	●
3/16	5/16	2-1/2	3/16	34822	34857	●
3/16	9/16	2	3/16	34702	34729	●
3/16	3/4	2-1/2	3/16	34823	34858	●
1/4	3/8	2	1/4	34703	34730	●
1/4	1/2	2-1/2	1/4	34824	34859	●
1/4	3/4	2-1/2	1/4	34704	34731	●
1/4	1	3	1/4	34825	34860	●
1/4	1-1/4	3-1/2	1/4	34705	34732	●
1/4	1-3/4	4	1/4	34826	34861	●
5/16	7/16	2	5/16	34706	34733	●
5/16	5/8	2-1/2	5/16	34707	34734	●
5/16	1-1/4	4	5/16	34708	34735	●
3/8	1/2	2	3/8	34709	34736	●
3/8	1	2-1/2	3/8	34710	34737	●
3/8	1-1/4	3-1/2	3/8	34827	34862	●
3/8	1-1/2	3-1/2	3/8	34711	34738	●
3/8	2	4	3/8	34828	34863	●
1/2	5/8	2-1/2	1/2	34712	34739	●
1/2	1	3	1/2	34830	34865	●
1/2	1-1/4	3-1/4	1/2	34713	34740	●
1/2	1-5/8	4	1/2	34831	34866	●
1/2	2-1/2	5	1/2	34832	34867	●
1/2	2	4	1/2	34714	34741	●
1/2	3-1/8	6	1/2	34715	34742	●
5/8	3/4	3	5/8	34716	34743	●
5/8	1-5/8	3-3/4	5/8	34717	34744	●
5/8	2-1/8	4	5/8	34833	34868	●
5/8	2-1/2	5	5/8	34718	34745	●
5/8	3-1/4	6	5/8	34834	34869	●
5/8	3-3/4	6	5/8	34719	34746	●
3/4	1	3	3/4	34720	34747	●
3/4	1-5/8	4	3/4	34721	34748	●
3/4	2-1/4	5	3/4	34722	34749	●
3/4	3-1/4	6	3/4	34723	34750	●
1	1-1/4	4	1	34724	34751	●
1	2	4-1/2	1	34725	34752	●
1	2-5/8	6	1	34726	34753	●
1	3-1/4	6	1	34727	34754	●
1	4-1/8	7	1	34835	34870	●

### TOLERANCES (inch)

**1/8–3/16 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00032

D<sub>2</sub> = h<sub>6</sub>

**1/4–3/8 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00035

D<sub>2</sub> = h<sub>6</sub>

**1/2–5/8 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00043

D<sub>2</sub> = h<sub>6</sub>

**3/4–1 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00051

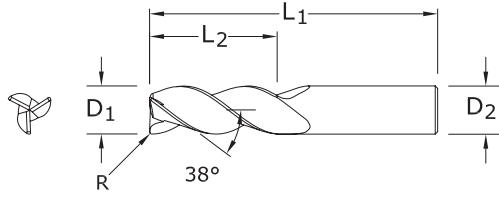
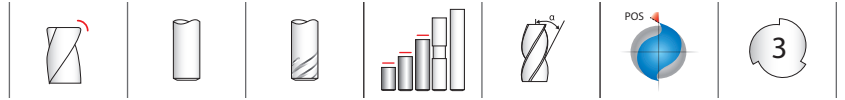
D<sub>2</sub> = h<sub>6</sub>

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



**43CR**  
FRACTIONAL SERIES

**TOLERANCES (inch)**

**1/8–3/16 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00032

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

**1/4–3/8 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00035

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

**1/2–5/8 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00043

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

**3/4–1 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00051

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

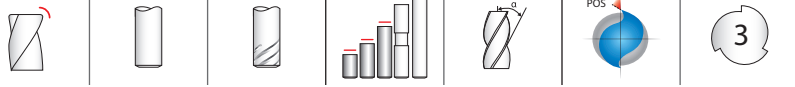
■ NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			EDP NO.		STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R	UNCOATED	TI-NAMITE-B (TiB <sub>2</sub> )	
1/8	3/8	1-1/2	1/8	.010	34771	34793	●
3/16	9/16	2	3/16	.010	34772	34794	●
1/4	3/8	2-1/2	1/4	.010	35575	35665	●
1/4	3/8	2-1/2	1/4	.015	35576	35666	●
1/4	3/8	2-1/2	1/4	.030	35577	35667	●
1/4	3/8	2-1/2	1/4	.060	35578	35668	●
1/4	3/4	2-1/2	1/4	.010	34773	34795	●
1/4	3/4	2-1/2	1/4	.015	35579	35669	●
1/4	3/4	2-1/2	1/4	.030	34774	34796	●
1/4	3/4	2-1/2	1/4	.060	35580	35670	●
1/4	1	3	1/4	.010	35581	35671	●
1/4	1	3	1/4	.015	35582	35672	●
1/4	1	3	1/4	.030	35583	35673	●
1/4	1	3	1/4	.060	35584	35674	●
5/16	5/8	2-1/2	5/16	.030	34775	34797	●
3/8	1/2	3	3/8	.010	35585	35675	●
3/8	1/2	3	3/8	.015	35586	35676	●
3/8	1/2	3	3/8	.030	35587	35677	●
3/8	1/2	3	3/8	.060	35588	35678	●
3/8	1/2	3	3/8	.090	35589	35679	●
3/8	1	2-1/2	3/8	.010	34776	34798	●
3/8	1	2-1/2	3/8	.030	34777	34799	●
3/8	1	2-1/2	3/8	.060	32761	32825	●
3/8	1	3	3/8	.015	35590	35680	●
3/8	1	3	3/8	.090	35591	35681	●
3/8	1-1/2	4	3/8	.010	35592	35682	●
3/8	1-1/2	4	3/8	.015	35593	35683	●
3/8	1-1/2	4	3/8	.030	35594	35684	●
3/8	1-1/2	4	3/8	.060	35595	35685	●
3/8	1-1/2	4	3/8	.090	35596	35686	●
1/2	5/8	3	1/2	.010	35597	35687	●
1/2	5/8	3	1/2	.015	35598	35688	●
1/2	5/8	3	1/2	.030	35599	35689	●
1/2	5/8	3	1/2	.060	35600	35690	●
1/2	5/8	3	1/2	.090	35601	35691	●
1/2	5/8	3	1/2	.120	35602	35692	●

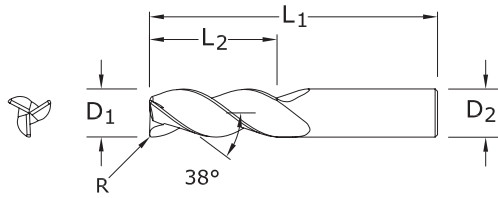
- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 150 Bhn (≤ 7 HRC)

continued on next page

# FRACTIONAL S-Carb



## 43CR FRACTIONAL SERIES



CONTINUED

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			EDP NO.		STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/2	1	3	1/2	.010	35603	35693	●
1/2	1	3	1/2	.015	35604	35694	●
1/2	1	3	1/2	.030	35605	35695	●
1/2	1	3	1/2	.060	35606	35696	●
1/2	1	3	1/2	.090	35607	35697	●
1/2	1	3	1/2	.120	35608	35698	●
1/2	1-1/4	3	1/2	.015	35609	35699	●
1/2	1-1/4	3-1/4	1/2	.010	34778	34800	●
1/2	1-1/4	3-1/4	1/2	.030	34779	34801	●
1/2	1-1/4	3-1/4	1/2	.060	34780	34802	●
1/2	1-1/4	3-1/4	1/2	.090	34781	34803	●
1/2	1-1/4	3-1/4	1/2	.120	32766	32830	●
1/2	1-5/8	4	1/2	.010	35610	35700	●
1/2	1-5/8	4	1/2	.015	35611	35701	●
1/2	1-5/8	4	1/2	.030	35612	35702	●
1/2	1-5/8	4	1/2	.060	35613	35703	●
1/2	1-5/8	4	1/2	.090	35614	35704	●
1/2	1-5/8	4	1/2	.120	35615	35705	●
1/2	2	4	1/2	.010	35616	35706	●
1/2	2	4	1/2	.015	35617	35707	●
1/2	2	4	1/2	.030	35618	35708	●
1/2	2	4	1/2	.060	35619	35709	●
1/2	2	4	1/2	.090	35620	35710	●
1/2	2	4	1/2	.120	35621	35711	●
5/8	3/4	3-1/2	5/8	.030	35622	35712	●
5/8	3/4	3-1/2	5/8	.060	35623	35713	●
5/8	3/4	3-1/2	5/8	.090	35624	35714	●
5/8	3/4	3-1/2	5/8	.120	35625	35715	●
5/8	1-5/8	3-1/2	5/8	.120	35626	35716	●
5/8	1-5/8	3-3/4	5/8	.030	34782	34804	●
5/8	1-5/8	3-3/4	5/8	.060	34783	34805	●
5/8	1-5/8	3-3/4	5/8	.090	34784	34806	●
3/4	1	4	3/4	.030	35627	35717	●
3/4	1	4	3/4	.060	35628	35718	●
3/4	1	4	3/4	.090	35629	35719	●
3/4	1	4	3/4	.120	35630	35720	●

### TOLERANCES (inch)

#### 1/8–3/16 DIAMETER

D<sub>1</sub> = +0.0000/–0.00032

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

#### 1/4–3/8 DIAMETER

D<sub>1</sub> = +0.0000/–0.00035

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

#### 1/2–5/8 DIAMETER

D<sub>1</sub> = +0.0000/–0.00043

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

#### 3/4–1 DIAMETER

D<sub>1</sub> = +0.0000/–0.00051

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

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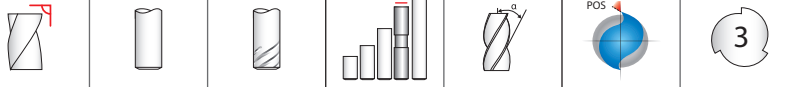


**43CR**  
FRACTIONAL SERIES

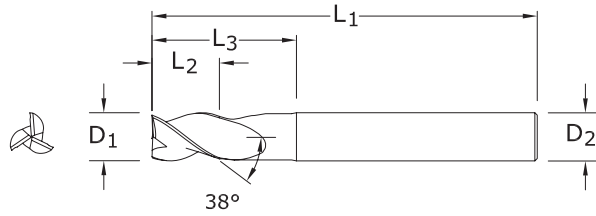
CONTINUED

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			EDP NO.		STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
3/4	1	4	3/4	.190	35631	35721	●
3/4	1	4	3/4	.250	35632	35722	●
3/4	1-5/8	4	3/4	.030	34785	34807	●
3/4	1-5/8	4	3/4	.060	34786	34808	●
3/4	1-5/8	4	3/4	.090	34787	34809	●
3/4	1-5/8	4	3/4	.120	34815	34817	●
3/4	1-5/8	4	3/4	.190	35633	35723	●
3/4	1-5/8	4	3/4	.250	35634	35724	●
3/4	2-1/4	5	3/4	.030	35635	35725	●
3/4	2-1/4	5	3/4	.060	35636	35726	●
3/4	2-1/4	5	3/4	.090	35637	35727	●
3/4	2-1/4	5	3/4	.120	35638	35728	●
3/4	2-1/4	5	3/4	.190	35639	35729	●
3/4	2-1/4	5	3/4	.250	35640	35730	●
1	1-1/4	5	1	.030	35641	35731	●
1	1-1/4	5	1	.060	35642	35732	●
1	1-1/4	5	1	.090	35643	35733	●
1	1-1/4	5	1	.120	35644	35734	●
1	1-1/4	5	1	.190	35645	35735	●
1	1-1/4	5	1	.250	35646	35736	●
1	2	5	1	.190	35647	35737	●
1	2	5	1	.250	35648	35738	●
1	2	4-1/2	1	.030	34789	34811	●
1	2	4-1/2	1	.060	34790	34812	●
1	2	4-1/2	1	.090	34791	34813	●
1	2	4-1/2	1	.120	34816	34818	●
1	3-1/4	6	1	.030	35649	35739	●
1	3-1/4	6	1	.060	35650	35740	●
1	3-1/4	6	1	.090	35651	35741	●
1	3-1/4	6	1	.120	35652	35742	●
1	3-1/4	6	1	.190	35653	35743	●
1	3-1/4	6	1	.250	35654	35744	●

# FRACTIONAL S-Carb



## 43L FRACTIONAL SERIES



- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Necked design with blended diameter transitions provide clearance to reach
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRc)

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			EDP NO.		STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/8	5/32	3	1/8	1/2	32700	32725	●
1/8	5/32	3	1/8	3/4	32691	34888	●
3/16	7/32	3	3/16	1/2	32701	32726	●
3/16	7/32	3	3/16	3/4	32692	34889	●
1/4	3/8	4	1/4	3/4	32702	32727	●
1/4	3/8	4	1/4	1-1/2	32703	32728	●
1/4	3/8	4	1/4	2-1/8	32704	32729	●
5/16	7/16	4	5/16	1-1/8	32705	32730	●
5/16	7/16	4	5/16	2-1/8	32706	32731	●
3/8	1/2	4	3/8	1-1/8	32707	32732	●
3/8	1/2	4	3/8	2-1/8	32708	32733	●
1/2	5/8	4	1/2	1-3/8	32709	32734	●
1/2	5/8	6	1/2	2-1/8	32710	32735	●
1/2	5/8	6	1/2	3-3/8	32711	32736	●
1/2	5/8	6	1/2	4-1/4	32697	34894	●
5/8	3/4	4	5/8	1-3/4	32712	32737	●
5/8	3/4	4	5/8	2-3/8	32713	32738	●
5/8	3/4	6	5/8	3-3/8	32714	32739	●
5/8	3/4	6	5/8	4-3/8	32698	34895	●
3/4	1	4	3/4	1-3/4	32715	32740	●
3/4	1	6	3/4	2-3/8	32716	32741	●
3/4	1	6	3/4	3-3/8	32717	32742	●
3/4	1	6	3/4	4-3/8	32699	34896	●
1	1-1/4	6	1	2-3/8	32718	32743	●
1	1-1/4	6	1	3-3/8	32719	32744	●
1	1-1/4	7	1	4-3/8	32720	32745	●

### TOLERANCES (inch)

#### 1/8–3/16 DIAMETER

D<sub>1</sub> = +0.0000/–0.00032

D<sub>2</sub> = h<sub>6</sub>

#### 1/4–3/8 DIAMETER

D<sub>1</sub> = +0.0000/–0.00035

D<sub>2</sub> = h<sub>6</sub>

#### 1/2–5/8 DIAMETER

D<sub>1</sub> = +0.0000/–0.00043

D<sub>2</sub> = h<sub>6</sub>

#### 3/4–1 DIAMETER

D<sub>1</sub> = +0.0000/–0.00051

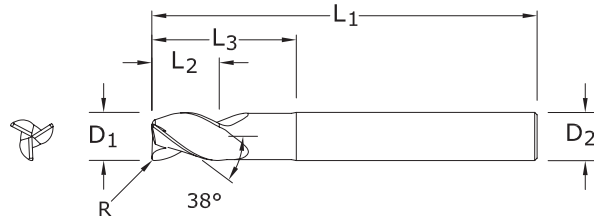
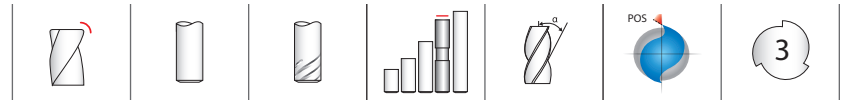
D<sub>2</sub> = h<sub>6</sub>

● NON-FERROUS

■ PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



**43LC**  
FRACTIONAL SERIES

**TOLERANCES (inch)**

**1/8–3/16 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00032

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

**1/4–3/8 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00035

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

**1/2–5/8 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00043

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

**3/4–1 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00051

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

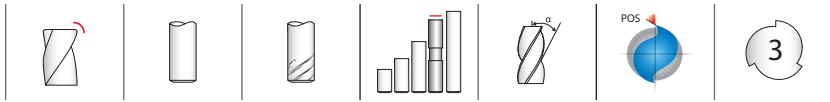
■ NOT STOCKED—  
Call for Delivery

inch						EDP NO.		STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>	CORNER RADIUS R	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/8	5/32	3	1/8	1/2	.010	32751	32815	●
3/16	7/32	3	3/16	1/2	.010	32752	32816	●
1/4	3/8	2-1/2	1/4	3/4	.015	35787	36235	●
1/4	3/8	2-1/2	1/4	3/4	.060	35788	36236	●
1/4	3/8	4	1/4	3/4	.010	32753	32817	●
1/4	3/8	4	1/4	3/4	.030	32754	32818	●
1/4	3/8	4	1/4	1-1/2	.010	32755	32819	●
1/4	3/8	4	1/4	1-1/2	.030	32756	32820	●
1/4	3/8	4	1/4	2-1/8	.010	32757	32821	●
1/4	3/8	4	1/4	2-1/8	.030	32758	32822	●
5/16	7/16	4	5/16	1-1/8	.030	32759	32823	●
5/16	7/16	4	5/16	2-1/8	.030	32760	32824	●
3/8	1/2	3	3/8	1-1/8	.015	35791	36239	●
3/8	1/2	3	3/8	1-1/8	.090	35792	36240	●
3/8	1/2	4	3/8	1-1/8	.030	32762	32826	●
3/8	1/2	4	3/8	1-1/8	.060	32763	32827	●
3/8	1/2	4	3/8	2-1/8	.030	32764	32828	●
3/8	1/2	4	3/8	2-1/8	.060	32765	32829	●
1/2	5/8	3	1/2	1-3/8	.015	35795	36243	●
1/2	5/8	4	1/2	1-3/8	.030	32767	32831	●
1/2	5/8	4	1/2	1-3/8	.060	32768	32832	●
1/2	5/8	4	1/2	1-3/8	.090	32769	32833	●
1/2	5/8	4	1/2	1-3/8	.120	32770	32834	●
1/2	5/8	4	1/2	2-1/4	.015	35796	36244	●
1/2	5/8	6	1/2	2-1/8	.030	32771	32835	●
1/2	5/8	6	1/2	2-1/8	.060	32772	32836	●
1/2	5/8	6	1/2	2-1/8	.090	32773	32837	●
1/2	5/8	6	1/2	2-1/8	.120	32774	32838	●
1/2	5/8	6	1/2	3-3/8	.030	32775	32839	●
1/2	5/8	6	1/2	3-3/8	.060	32776	32840	●
1/2	5/8	6	1/2	3-3/8	.090	32777	32841	●
1/2	5/8	6	1/2	3-3/8	.120	32778	32842	●
5/8	3/4	4	5/8	1-3/4	.030	32779	32843	●
5/8	3/4	4	5/8	1-3/4	.060	32780	32844	●
5/8	3/4	4	5/8	1-3/4	.090	32781	32845	●
5/8	3/4	4	5/8	1-3/4	.120	32782	32846	●
5/8	3/4	4	5/8	2-3/8	.030	32783	32847	●
5/8	3/4	4	5/8	2-3/8	.060	32784	32848	●

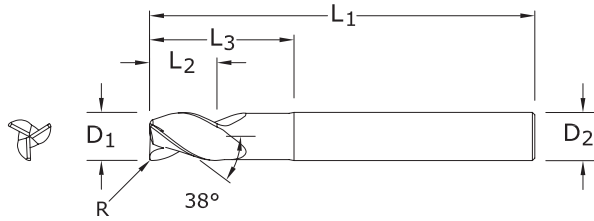
- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Necked design with blended diameter transitions provide clearance to reach
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 150 Bhn (≤ 7 HRC)

continued on next page

# FRACTIONAL S-Carb



## 43LC FRACTIONAL SERIES



CONTINUED

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch				EDP NO.		STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>	CORNER RADIUS R	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
5/8	3/4	4	5/8	2-3/8	.090	32785	32849	●
5/8	3/4	4	5/8	2-3/8	.120	32786	32850	●
5/8	3/4	6	5/8	3-3/8	.030	32787	32851	●
5/8	3/4	6	5/8	3-3/8	.060	32788	32852	●
5/8	3/4	6	5/8	3-3/8	.090	32789	32853	●
5/8	3/4	6	5/8	3-3/8	.120	32790	32854	●
3/4	1	4	3/4	1-3/4	.030	32791	32855	●
3/4	1	4	3/4	1-3/4	.060	32792	32856	●
3/4	1	4	3/4	1-3/4	.090	32793	32857	●
3/4	1	4	3/4	1-3/4	.120	32794	32858	●
3/4	1	4	3/4	2	.190	35803	36251	●
3/4	1	4	3/4	2	.250	35804	36252	●
3/4	1	6	3/4	2-3/8	.030	32795	32859	●
3/4	1	6	3/4	2-3/8	.060	32796	32860	●
3/4	1	6	3/4	2-3/8	.090	32797	32861	●
3/4	1	6	3/4	2-3/8	.120	32798	32862	●
3/4	1	6	3/4	3-3/8	.030	32799	32863	●
3/4	1	6	3/4	3-3/8	.060	32800	32864	●
3/4	1	6	3/4	3-3/8	.090	32801	32865	●
3/4	1	6	3/4	3-3/8	.120	32802	32866	●
1	1-1/4	5	1	2-5/8	.190	35809	36257	●
1	1-1/4	5	1	2-5/8	.250	35810	36258	●
1	1-1/4	6	1	2-3/8	.030	32803	32867	●
1	1-1/4	6	1	2-3/8	.060	32804	32868	●
1	1-1/4	6	1	2-3/8	.090	32805	32869	●
1	1-1/4	6	1	2-3/8	.120	32806	32870	●
1	1-1/4	6	1	3-3/8	.030	32807	32871	●
1	1-1/4	6	1	3-3/8	.060	32808	32872	●
1	1-1/4	6	1	3-3/8	.090	32809	32873	●
1	1-1/4	6	1	3-3/8	.120	32810	32874	●
1	1-1/4	6	1	3-3/8	.190	35811	36259	●
1	1-1/4	6	1	3-3/8	.250	35812	36260	●

### TOLERANCES (inch)

#### 1/8–3/16 DIAMETER

D<sub>1</sub> = +0.0000/–0.00032

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

#### 1/4–3/8 DIAMETER

D<sub>1</sub> = +0.0000/–0.00035

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

#### 1/2–5/8 DIAMETER

D<sub>1</sub> = +0.0000/–0.00043

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

#### 3/4–1 DIAMETER

D<sub>1</sub> = +0.0000/–0.00051

D<sub>2</sub> = h<sub>6</sub>

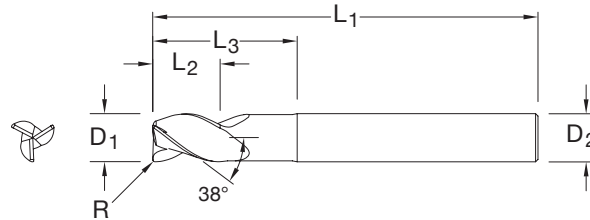
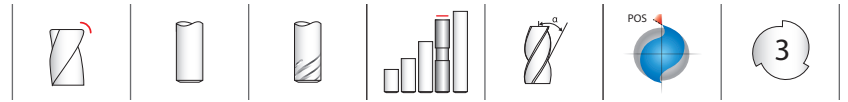
R = +0.0000/–0.0020

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



**43EC**  
FRACTIONAL SERIES

**TOLERANCES (inch)**

**1/4–3/8 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00035

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

**1/2–5/8 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00043

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

**3/4–1 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00051

D<sub>2</sub> = h<sub>6</sub>

R = +0.0000/–0.0020

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

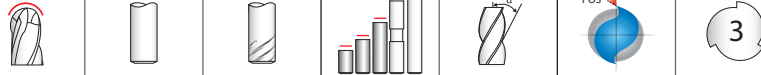
■ NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>	CORNER RADIUS R	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/4	3/8	3	1/4	1-1/8	.015	35789	36237	●
1/4	3/8	3	1/4	1-1/8	.060	35790	36238	●
3/8	1/2	4	3/8	2-1/8	.015	35793	36241	●
3/8	1/2	4	3/8	2-1/8	.090	35794	36242	●
1/2	5/8	5	1/2	3-3/8	.015	35797	36245	●
1/2	5/8	6	1/2	4-1/4	.015	35798	36246	●
1/2	5/8	6	1/2	4-1/4	.030	35799	36247	●
1/2	5/8	6	1/2	4-1/4	.060	35800	36248	●
1/2	5/8	6	1/2	4-1/4	.090	35801	36249	●
1/2	5/8	6	1/2	4-1/4	.120	35802	36250	●
3/4	1	6	3/4	3-3/8	.190	35805	36253	●
3/4	1	6	3/4	3-3/8	.250	35806	36254	●
1	1-1/4	7	1	4-3/8	.030	35813	36261	●
1	1-1/4	7	1	4-3/8	.060	35814	36262	●
1	1-1/4	7	1	4-3/8	.090	35815	36263	●
1	1-1/4	7	1	4-3/8	.120	35816	36264	●
1	1-1/4	7	1	4-3/8	.190	35817	36265	●
1	1-1/4	7	1	4-3/8	.250	35818	36266	●

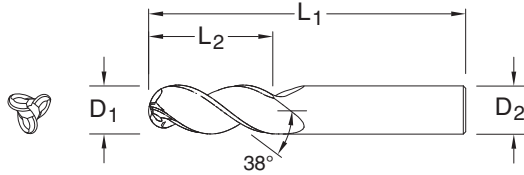
- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Necked design with blended diameter transitions provide clearance to reach
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 150 Bhn (≤ 7 HRc)



# FRACTIONAL S-Carb



## 43B FRACTIONAL SERIES



- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.		STOCK
				UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/4	3/8	2	1/4	34916	34972	●
1/4	3/4	2-1/2	1/4	34917	34973	●
1/4	1	3	1/4	34918	34974	●
3/8	1/2	2	3/8	34919	34975	●
3/8	1	2-1/2	3/8	34920	34976	●
3/8	1-1/2	3-1/2	3/8	34921	34977	●
1/2	5/8	2-1/2	1/2	34922	34978	●
1/2	1	3	1/2	34923	34979	●
1/2	1-1/4	3	1/2	34924	34980	●
1/2	1-5/8	4	1/2	34925	34981	●
1/2	2	4	1/2	34926	34982	●
5/8	3/4	3	5/8	34927	34983	●
5/8	1-5/8	4	5/8	34928	34984	●
3/4	1	3	3/4	34929	34985	●
3/4	1-5/8	4	3/4	34930	34986	●
3/4	2-1/4	5	3/4	34931	34987	●
1	1-1/4	4	1	34932	34988	●
1	2	5	1	34933	34989	●
1	3-1/4	6	1	34934	34990	●

### TOLERANCES (inch)

#### 1/4–3/8 DIAMETER

$D_1 = +0.0000/-0.00035$

$D_2 = h_6$

#### 1/2–5/8 DIAMETER

$D_1 = +0.0000/-0.00043$

$D_2 = h_6$

#### 3/4–1 DIAMETER

$D_1 = +0.0000/-0.00051$

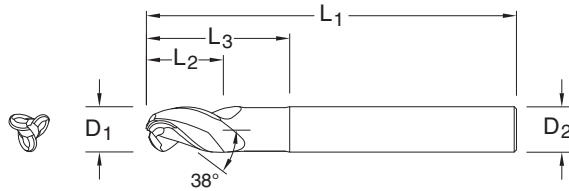
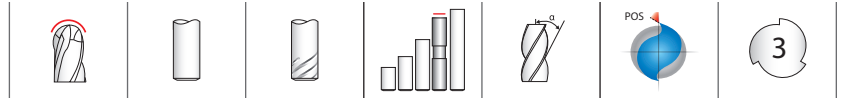
$D_2 = h_6$

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



**43LB**  
FRACTIONAL SERIES

**TOLERANCES (inch)**

**1/4–3/8 DIAMETER**

$D_1 = +0.0000/-0.00035$

$D_2 = h_6$

**1/2–5/8 DIAMETER**

$D_1 = +0.0000/-0.00043$

$D_2 = h_6$

**3/4–1 DIAMETER**

$D_1 = +0.0000/-0.00051$

$D_2 = h_6$

NON-FERROUS

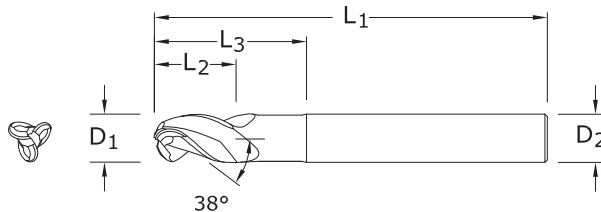
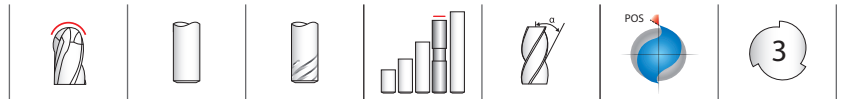
PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	EDP NO.		STOCK
					UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/4	3/8	2-1/2	1/4	3/4	34941	35005	●
3/8	1/2	3	3/8	1-1/8	34943	35007	●
1/2	5/8	3	1/2	1-3/8	34945	35009	●
1/2	5/8	4	1/2	2-1/4	34946	35010	●
5/8	3/4	4	5/8	1-5/8	34949	35013	●
3/4	1	4	3/4	2	34951	35015	●
1	1-1/4	5	1	2-5/8	34954	35018	●
1	1-1/4	6	1	3-3/8	34955	35019	●

- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Necked design with blended diameter transitions provide clearance to reach
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)



**43EB**  
FRACTIONAL SERIES

**1/4–3/8 DIAMETER**

$D_1 = +0.0000/-0.00035$

$D_2 = h_6$

**1/2–5/8 DIAMETER**

$D_1 = +0.0000/-0.00043$

$D_2 = h_6$

**3/4–1 DIAMETER**

$D_1 = +0.0000/-0.00051$

$D_2 = h_6$

$R = +0.0000/-0.0020$

NON-FERROUS

PLASTICS/COMPOSITES

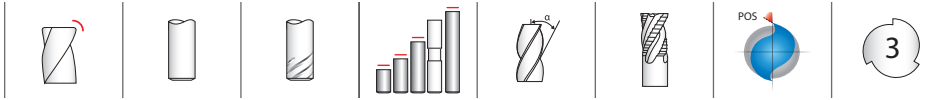
● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

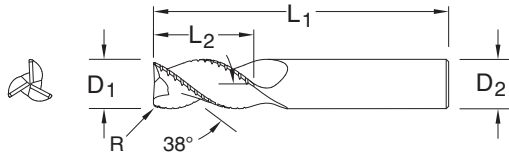
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	EDP NO.		STOCK
					UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/4	3/8	3	1/4	1-1/8	34942	35006	●
3/8	1/2	4	3/8	2-1/8	34944	35008	●
1/2	5/8	5	1/2	3-3/8	34947	35011	●
1/2	5/8	6	1/2	4-1/4	34948	35012	●
5/8	3/4	6	5/8	3-3/8	34950	35014	●
3/4	1	6	3/4	3-3/8	34952	35016	●
1	1-1/4	7	1	4-3/8	34956	35020	●

- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Necked design with blended diameter transitions provide clearance to reach
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

# FRACTIONAL S-Carb



## 43CB FRACTIONAL SERIES



- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Chip breakers reduce machine loads up to 15% for increased roughing feed rate capability
- Open fluting for deep slotting and profiling
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			EDP NO.		STOCK
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	CORNER RADIUS R	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/4	3/8	2-1/2	1/4	.020	33390	33450	●
1/4	1/2	2-1/2	1/4	.020	33391	33451	●
1/4	3/4	2-1/2	1/4	.020	33392	33452	●
1/4	1	3	1/4	.020	33393	33453	●
1/4	1-1/4	3-1/2	1/4	.020	33394	33454	●
1/4	1-3/4	4	1/4	.020	33395	33455	●
5/16	7/16	2-1/2	5/16	.020	33396	33456	●
5/16	11/16	2-1/2	5/16	.020	33397	33457	●
5/16	1	3	5/16	.020	33398	33458	●
5/16	2-1/8	4	5/16	.020	33400	33460	●
3/8	1/2	3	3/8	.020	33401	33461	●
3/8	1	2-1/2	3/8	.020	34300	34305	●
3/8	1-1/4	3-1/2	3/8	.020	33402	33462	●
3/8	1-1/2	4	3/8	.020	33403	33463	●
3/8	2	4	3/8	.020	33404	33464	●
1/2	5/8	3	1/2	.030	33406	33466	●
1/2	1	3	1/2	.030	33407	33467	●
1/2	1-1/4	3-1/4	1/2	.030	34301	34306	●
1/2	1-5/8	4	1/2	.030	33408	33468	●
1/2	2	4	1/2	.030	33409	33469	●
1/2	2-1/2	5	1/2	.030	33410	33470	●
1/2	3-1/8	6	1/2	.030	33411	33471	●
5/8	3/4	3-1/2	5/8	.030	33412	33472	●
5/8	1-5/8	3-3/4	5/8	.030	34302	34307	●
5/8	2-1/8	4	5/8	.030	33413	33473	●
5/8	3-1/4	6	5/8	.030	33415	33475	●
5/8	3-3/4	6	5/8	.030	33416	33476	●
3/4	1	4	3/4	.030	33417	33477	●
3/4	1-5/8	4	3/4	.030	34303	34308	●
3/4	2-1/4	4	3/4	.030	33418	33478	●
3/4	3-1/4	6	3/4	.030	33419	33479	●
3/4	4	6	3/4	.030	33420	33480	●
1	1-1/4	5	1	.030	33421	33481	●
1	2	4-1/2	1	.030	34304	34309	●
1	2-5/8	6	1	.030	33422	33482	●
1	3-1/4	6	1	.030	33423	33483	●
1	4-1/8	7	1	.030	33424	33484	●

### TOLERANCES (inch)

#### 1/4–3/8 DIAMETER

$D_1 = +0.0000/-0.00035$

$D_2 = h_6$

$R = +0.0000/-0.0020$

#### 1/2–5/8 DIAMETER

$D_1 = +0.0000/-0.00043$

$D_2 = h_6$

$R = +0.0000/-0.0020$

#### 3/4–1 DIAMETER

$D_1 = +0.0000/-0.00051$

$D_2 = h_6$

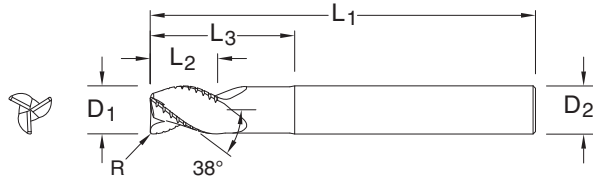
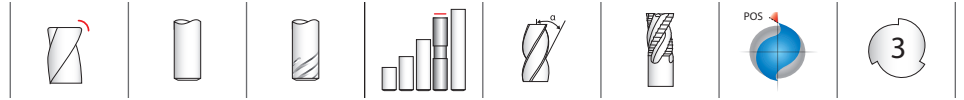
$R = +0.0000/-0.0020$

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



**43LCB**  
FRACTIONAL SERIES

**TOLERANCES (inch)**

**1/4–3/8 DIAMETER**

$D_1 = +0.0000/-0.00035$

$D_2 = h_6$

$R = +0.0000/-0.0020$

**1/2–5/8 DIAMETER**

$D_1 = +0.0000/-0.00043$

$D_2 = h_6$

$R = +0.0000/-0.0020$

**3/4–1 DIAMETER**

$D_1 = +0.0000/-0.00051$

$D_2 = h_6$

$R = +0.0000/-0.0020$

NON-FERROUS

PLASTICS/COMPOSITES

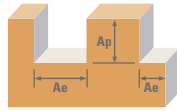
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	inch			EDP NO.		STOCK
			SHANK DIAMETER $D_2$	REACH $L_3$	CORNER RADIUS $R$	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/4	3/8	4	1/4	3/4	.020	33500	33540	●
1/4	3/8	4	1/4	1-1/8	.020	33501	33541	●
1/4	3/8	4	1/4	2-1/8	.020	33502	33542	●
5/16	7/16	4	5/16	1-1/8	.020	33503	33543	●
5/16	7/16	4	5/16	2-1/8	.020	33504	33544	●
3/8	1/2	4	3/8	1-1/8	.020	33507	33547	●
3/8	1/2	4	3/8	2-1/8	.020	33508	33548	●
1/2	5/8	4	1/2	1-3/8	.030	33511	33551	●
1/2	5/8	4	1/2	2-1/4	.030	33512	33552	●
1/2	5/8	6	1/2	3-3/8	.030	33513	33553	●
1/2	5/8	6	1/2	4-1/4	.030	33514	33554	●
5/8	3/4	4	5/8	1-5/8	.030	33515	33555	●
5/8	3/4	6	5/8	2-3/8	.030	33516	33556	●
5/8	3/4	6	5/8	3-3/8	.030	33517	33557	●
5/8	3/4	6	5/8	4-3/8	.030	33518	33558	●
3/4	1	4	3/4	2	.030	33519	33559	●
3/4	1	6	3/4	2-1/2	.030	33520	33560	●
3/4	1	6	3/4	3-3/8	.030	33521	33561	●
3/4	1	6	3/4	4-3/8	.030	33522	33562	●
1	1-1/4	6	1	2-5/8	.030	33523	33563	●
1	1-1/4	6	1	3-3/8	.030	33524	33564	●
1	1-1/4	7	1	4-3/8	.030	33525	33565	●

- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Chip breakers reduce machine loads up to 15% for increased roughing feed rate capability
- Open fluting for deep slotting and profiling
- Necked design with blended diameter transitions provide clearance to reach
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRc)

# FRACTIONAL S-Carb

Series  
43CR, 43CB, 43LC,  
43, 43L, 43LCB, 43B,  
43LB, 43ELB, 43EC  
Fractional



Material	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)		Diameter (D <sub>1</sub> ) (inch)							
						1/8	1/4	3/8	1/2	3/4	1		
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 7 HRc	Slot 	1	≤ 1	1600 (1280-1920)	RPM	48896	24448	16299	12224	8149	6112	
						Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085	
						Feed (ipm)	132	183	220	220	171	156	
		Profile 	≤ 0.5	≤ 1.5	2000 (1600-2400)	RPM	61120	30560	20373	15280	10187	7640	
						Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085	
						Feed (ipm)	165	229	275	275	214	195	
	HSM 	≤ 0.05	≤ 2	3300 (2640-3960)	RPM	100848	50424	33616	25212	16808	12606		
					Fz	0.0021	0.0055	0.0105	0.0140	0.0165	0.0195		
					Feed (ipm)	635	832	1059	1059	832	737		
	ALUMINUM DIE CAST ALLOYS (HIGH SILICONE) A-390, A-392, B-390	≤ 125 Bhn or ≤ 77 HRb	Slot 	1	≤ 1	600 (480-720)	RPM	18336	9168	6112	4584	3056	2292
							Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085
							Feed (ipm)	50	69	83	83	64	58
Profile 			≤ 0.5	≤ 1.5	750 (600-900)	RPM	22920	11460	7640	5730	3820	2865	
						Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085	
						Feed (ipm)	62	86	103	103	80	73	
HSM 		≤ 0.05	≤ 2	1240 (992-1488)	RPM	37894	18947	12631	9474	6316	4737		
					Fz	0.0021	0.0055	0.0105	0.0140	0.0165	0.0195		
					Feed (ipm)	239	313	398	398	313	277		
COPPER ALLOYS Aluminum Bronze Brass Naval Brass Red Brass		≤ 140 Bhn or ≤ 3 HRc	Slot 	1	≤ 1	865 (692-1038)	RPM	26434	13217	8811	6609	4406	3304
							Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
							Feed (ipm)	63	79	106	99	79	69
	Profile 		≤ 0.5	≤ 1.5	1080 (864-1296)	RPM	33005	16502	11002	8251	5501	4126	
						Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070	
						Feed (ipm)	79	99	132	124	99	87	
	HSM 	≤ 0.05	≤ 2	1780 (1424-2136)	RPM	54397	27198	18132	13599	9066	6800		
					Fz	0.0017	0.0045	0.0085	0.0115	0.0140	0.0160		
					Feed (ipm)	277	367	462	469	381	326		
	COPPER ALLOYS Beryllium Copper C110, Malleable Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc	Slot 	1	≤ 1	345 (276-414)	RPM	10543	5272	3514	2636	1757	1318
							Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
							Feed (ipm)	25	32	42	40	32	28
Profile 			≤ 0.5	≤ 1.5	430 (344-516)	RPM	13141	6570	4380	3285	2190	1643	
						Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070	
						Feed (ipm)	32	39	53	49	39	34	
HSM 		≤ 0.05	≤ 2	710 (568-852)	RPM	21698	10849	7233	5424	3616	2712		
					Fz	0.0017	0.0045	0.0085	0.0115	0.0140	0.0160		
					Feed (ipm)	111	146	184	187	152	130		
PLASTICS ABS, Polycarbonate, PVC, Polypropylene			Slot 	1	≤ 1	1600 (1280-1920)	RPM	48896	24448	16299	12224	8149	6112
							Fz	0.0015	0.0040	0.0075	0.0100	0.0120	0.0140
							Feed (ipm)	220	293	367	367	293	257
	Profile 		≤ 0.5	≤ 1.5	2000 (1600-2400)	RPM	61120	30560	20373	15280	10187	7640	
						Fz	0.0015	0.0040	0.0075	0.0100	0.0120	0.0140	
						Feed (ipm)	275	367	458	458	367	321	
	HSM 	≤ 0.05	≤ 2	3300 (2640-3960)	RPM	100848	50424	33616	25212	16808	12606		
					Fz	0.0034	0.0090	0.0170	0.0230	0.0275	0.0320		
					Feed (ipm)	1029	1361	1714	1740	1387	1210		

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B) HSM (High Speed Machining)

rpm = Vc x 3.82 / D<sub>1</sub>

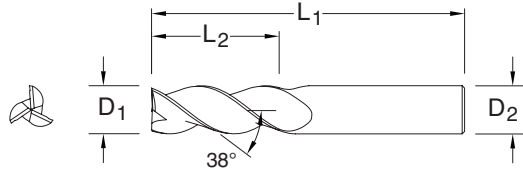
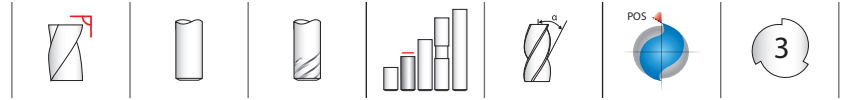
ipm = Fz x 3 x rpm

reduce speed and feed for materials harder than listed

reduce cut depth and feed by 50% for long flute and long reach tools

reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)

refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



**43M**  
METRIC SERIES

**TOLERANCES (mm)**

**6 DIAMETER**

$D_1 = +0,000/-0,008$

$D_2 = h_6$

**>6-10 DIAMETER**

$D_1 = +0,000/-0,009$

$D_2 = h_6$

**>10-18 DIAMETER**

$D_1 = +0,000/-0,011$

$D_2 = h_6$

**>18-20 DIAMETER**

$D_1 = +0,000/-0,013$

$D_2 = h_6$

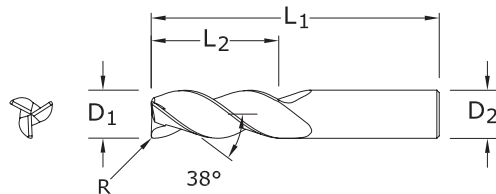
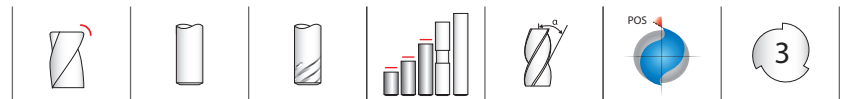
NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

mm				EDP NO.		STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
6,0	13,0	57,0	6,0	44701	44715	●
6,0	13,0	72,0	6,0	44702	44716	●
8,0	19,0	63,0	8,0	44703	44717	●
10,0	22,0	72,0	10,0	44705	44719	●
12,0	26,0	83,0	12,0	44708	44722	●
16,0	32,0	92,0	16,0	44711	44725	●
20,0	38,0	104,0	20,0	44714	44728	●



**43MCR**  
METRIC SERIES

**TOLERANCES (mm)**

**6 DIAMETER**

$D_1 = +0,000/-0,008$

$D_2 = h_6$

**>6-10 DIAMETER**

$D_1 = +0,000/-0,009$

$D_2 = h_6$

**>10-18 DIAMETER**

$D_1 = +0,000/-0,011$

$D_2 = h_6$

**>18-25 DIAMETER**

$D_1 = +0,000/-0,013$

$D_2 = h_6$

NON-FERROUS

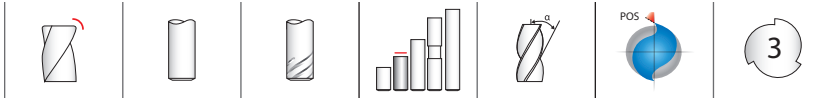
PLASTICS/COMPOSITES

● U.S. Stock Standard

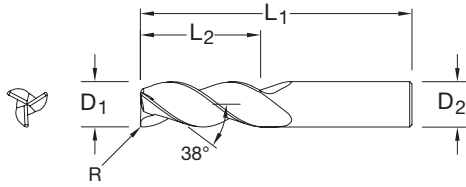
■ NOT STOCKED—  
Call for Delivery

mm					EDP NO.		STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	CORNER RADIUS R	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
6,0	13,0	57,0	6,0	1,5	—	44732	■
12,0	26,0	83,0	12,0	1,5	44814	44733	■
12,0	26,0	83,0	12,0	2,0	44815	44826	■
12,0	26,0	83,0	12,0	2,5	44816	44827	■
12,0	26,0	83,0	12,0	3,0	44817	44734	■
16,0	32,0	92,0	16,0	1,5	44818	44735	■
16,0	32,0	92,0	16,0	2,0	44819	44828	■
16,0	32,0	92,0	16,0	2,5	44820	44829	■
16,0	32,0	92,0	16,0	3,0	44821	44736	■
20,0	38,0	104,0	20,0	2,0	44822	44830	■
20,0	38,0	104,0	20,0	2,5	44823	44831	■
20,0	38,0	104,0	20,0	3,0	44824	44737	■
25,0	50,0	125,0	25,0	—	—	44731	■

# METRIC S-Carb



## 43MCR METRIC SERIES



- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Polished flutes maximize chip evacuation and provides enhanced finish
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRc)

mm						EDP NO.	STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R	POLISHED FLUTE	Ti-NAMITE-B (TiB <sub>2</sub> )	
6,0	13,0	57,0	6,0	0,5	•	44902	●
6,0	13,0	57,0	6,0	1,0	•	44894	●
6,0	13,0	72,0	6,0	0,8	•	44842	●
6,0	13,0	72,0	6,0	1,2	•	44843	●
8,0	19,0	63,0	8,0	0,3	•	44846	●
8,0	19,0	63,0	8,0	0,5	•	44847	●
8,0	19,0	63,0	8,0	1,0	•	44848	●
8,0	19,0	63,0	8,0	1,5	•	44849	●
10,0	22,0	72,0	10,0	0,3	•	44854	●
10,0	22,0	72,0	10,0	0,5	•	44855	●
10,0	22,0	72,0	10,0	1,0	•	44856	●
10,0	22,0	72,0	10,0	1,5	•	44857	●
14,0	30,0	89,0	14,0	1,0	•	44868	●
14,0	30,0	89,0	14,0	2,0	•	44869	●
14,0	30,0	89,0	14,0	3,0	•	44870	●
16,0	32,0	92,0	16,0	4,0	•	44871	●
20,0	38,0	104,0	20,0	4,0	•	44879	●

### TOLERANCES (mm)

#### 6 DIAMETER

D<sub>1</sub> = +0,000/-0,008

D<sub>2</sub> = h<sub>6</sub>

R = +0,00/-0,05

#### >6-10 DIAMETER

D<sub>1</sub> = +0,000/-0,009

D<sub>2</sub> = h<sub>6</sub>

R = +0,00/-0,05

#### >10-18 DIAMETER

D<sub>1</sub> = +0,000/-0,011

D<sub>2</sub> = h<sub>6</sub>

R = +0,00/-0,05

#### >18-20 DIAMETER

D<sub>1</sub> = +0,000/-0,013

D<sub>2</sub> = h<sub>6</sub>

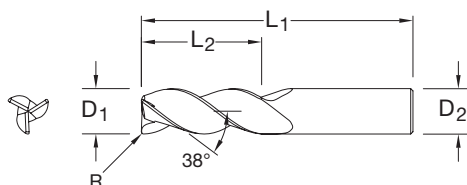
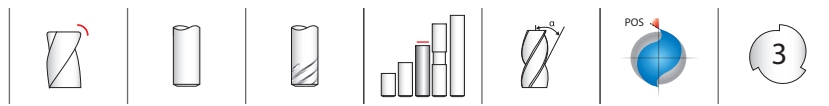
R = +0,00/-0,05

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



## 43MCR 4xD

METRIC SERIES

### TOLERANCES (mm)

#### 6 DIAMETER

$D_1 = +0,000/-0,008$

$D_2 = h_6$

$R = +0,00/-0,05$

#### >6-10 DIAMETER

$D_1 = +0,000/-0,009$

$D_2 = h_6$

$R = +0,00/-0,05$

#### >10-18 DIAMETER

$D_1 = +0,000/-0,011$

$D_2 = h_6$

$R = +0,00/-0,05$

#### >18-20 DIAMETER

$D_1 = +0,000/-0,013$

$D_2 = h_6$

$R = +0,00/-0,05$

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

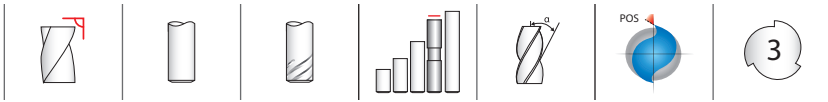
■ NOT STOCKED—  
Call for Delivery

mm						EDP NO.	Ti-NAMITE-B (TiB <sub>2</sub> )	STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R	POLISHED FLUTE			
6,0	24,0	75,0	6,0	0,5	●	44844	●	
6,0	24,0	75,0	6,0	1,0	●	44845	●	
8,0	32,0	75,0	8,0	0,5	●	44850	●	
8,0	32,0	75,0	8,0	1,0	●	44851	●	
8,0	32,0	75,0	8,0	1,5	●	44852	●	
8,0	32,0	75,0	8,0	2,0	●	44853	●	
10,0	40,0	100,0	10,0	0,5	●	44858	●	
10,0	40,0	100,0	10,0	1,0	●	44859	●	
10,0	40,0	100,0	10,0	1,5	●	44860	●	
10,0	40,0	100,0	10,0	2,0	●	44861	●	
12,0	48,0	100,0	12,0	0,5	●	44862	●	
12,0	48,0	100,0	12,0	1,0	●	44863	●	
12,0	48,0	100,0	12,0	1,5	●	44864	●	
12,0	48,0	100,0	12,0	2,0	●	44865	●	
12,0	48,0	100,0	12,0	2,5	●	44866	●	
12,0	48,0	100,0	12,0	3,0	●	44867	●	
16,0	64,0	125,0	16,0	0,5	●	44872	●	
16,0	64,0	125,0	16,0	1,0	●	44873	●	
16,0	64,0	125,0	16,0	1,5	●	44874	●	
16,0	64,0	125,0	16,0	2,0	●	44875	●	
16,0	64,0	125,0	16,0	2,5	●	44876	●	
16,0	64,0	125,0	16,0	3,0	●	44877	●	
16,0	64,0	125,0	16,0	4,0	●	44878	●	
20,0	80,0	150,0	20,0	0,5	●	44880	●	
20,0	80,0	150,0	20,0	1,0	●	44881	●	
20,0	80,0	150,0	20,0	1,5	●	44882	●	
20,0	80,0	150,0	20,0	2,0	●	44883	●	
20,0	80,0	150,0	20,0	2,5	●	44884	●	
20,0	80,0	150,0	20,0	3,0	●	44885	●	
20,0	80,0	150,0	20,0	4,0	●	44886	●	

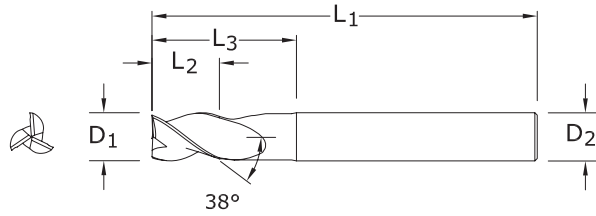
- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Polished flutes maximize chip evacuation and provides enhanced finish
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials ≤ 150 Bhn (≤ 7 HRC)



# METRIC S-Carb



## 43ML METRIC SERIES



- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Necked design with blended diameter transitions provide clearance to reach
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	mm			EDP NO.	STOCK
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	Ti-NAMITE-B (TiB <sub>2</sub> )	
6,0	10,0	75,0	6,0	20,0	42706	■
8,0	12,0	75,0	8,0	25,0	42707	■
10,0	14,0	100,0	10,0	35,0	42708	■
12,0	16,0	100,0	12,0	40,0	42709	■
16,0	20,0	125,0	16,0	50,0	42710	■
20,0	25,0	150,0	20,0	65,0	42711	■

### TOLERANCES (mm)

#### 6 DIAMETER

$D_1 = +0,000/-0,008$

$D_2 = h_6$

#### >6-10 DIAMETER

$D_1 = +0,000/-0,009$

$D_2 = h_6$

#### >10-18 DIAMETER

$D_1 = +0,000/-0,011$

$D_2 = h_6$

#### >18-20 DIAMETER

$D_1 = +0,000/-0,013$

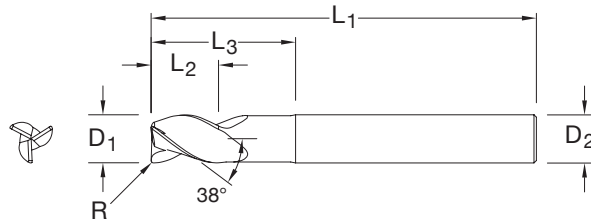
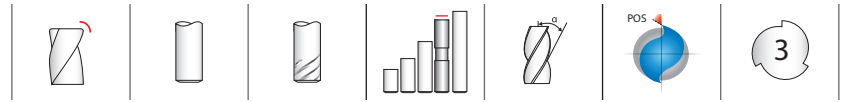
$D_2 = h_6$

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



**43MLC**  
METRIC SERIES

**TOLERANCES (mm)**

**6 DIAMETER**

$D_1 = +0,000/-0,008$

$D_2 = h_6$

$R = +0,00/-0,05$

**>6-10 DIAMETER**

$D_1 = +0,000/-0,009$

$D_2 = h_6$

$R = +0,00/-0,05$

**>10-18 DIAMETER**

$D_1 = +0,000/-0,011$

$D_2 = h_6$

$R = +0,00/-0,05$

**>18-20 DIAMETER**

$D_1 = +0,000/-0,013$

$D_2 = h_6$

$R = +0,00/-0,05$

NON-FERROUS

PLASTICS/COMPOSITES

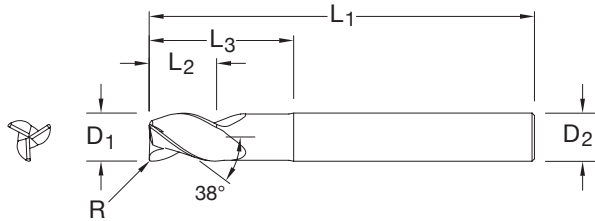
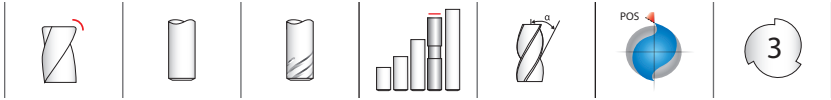
● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	CORNER RADIUS $R$	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
6,0	10,0	63,0	6,0	20,0	0,5	44769	44789	●
6,0	10,0	63,0	6,0	20,0	1,0	44770	44790	●
6,0	13,0	72,0	6,0	30,0	0,5	44771	44791	●
6,0	13,0	72,0	6,0	30,0	1,0	44772	44792	●
8,0	12,0	75,0	8,0	25,0	0,3	44773	44793	●
8,0	12,0	75,0	8,0	25,0	0,5	44774	44794	●
8,0	12,0	75,0	8,0	25,0	1,0	44775	44795	●
8,0	12,0	75,0	8,0	25,0	1,5	44776	44796	●
10,0	14,0	100,0	10,0	35,0	0,3	44777	44797	●
10,0	14,0	100,0	10,0	35,0	0,5	44778	44798	●
10,0	14,0	100,0	10,0	35,0	1,0	44779	44799	●
10,0	14,0	100,0	10,0	35,0	1,5	44780	44800	●
12,0	16,0	100,0	12,0	40,0	0,5	44781	44801	●
12,0	16,0	100,0	12,0	40,0	1,0	44782	44802	●
12,0	16,0	100,0	12,0	40,0	1,5	44783	44803	●
12,0	16,0	100,0	12,0	40,0	2,0	44784	44804	●
12,0	16,0	100,0	12,0	40,0	2,5	44832	44839	■
12,0	16,0	100,0	12,0	40,0	3,0	44833	44738	■
12,0	16,0	100,0	12,0	40,0	4,0	44834	44741	■
16,0	20,0	125,0	16,0	50,0	2,0	44785	44805	●
16,0	20,0	125,0	16,0	50,0	2,5	44835	44840	■
16,0	20,0	125,0	16,0	50,0	3,0	44836	44739	■
16,0	20,0	125,0	16,0	50,0	4,0	44786	44806	●
20,0	25,0	150,0	20,0	65,0	2,0	44787	44807	●
20,0	25,0	150,0	20,0	65,0	2,5	44837	44841	■
20,0	25,0	150,0	20,0	65,0	3,0	44838	44740	■
20,0	25,0	150,0	20,0	65,0	4,0	44788	44808	●

- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Necked design with blended diameter transitions provide clearance to reach
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

# S-Carb: Aero Radius Range



## 43MLC METRIC SERIES

- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Polished flutes maximize chip evacuation and provides enhanced finish
- Necked design with blended diameter transitions provide clearance to reach
- Enhanced corner geometry with tight tolerance corner radii
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	mm				CORNER RADIUS R	POLISHED FLUTE	EDP NO.	Ti-NAMITE-B (TiB <sub>2</sub> )	STOCK
			SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>							
8,0	12,0	75,0	8,0	25,0	0,8	•	44950	●			
8,0	12,0	75,0	8,0	25,0	1,2	•	44951	●			
8,0	12,0	75,0	8,0	25,0	1,6	•	44952	●			
10,0	14,0	100,0	10,0	35,0	0,8	•	44953	●			
10,0	14,0	100,0	10,0	35,0	1,2	•	44954	●			
10,0	14,0	100,0	10,0	35,0	1,6	•	44955	●			
10,0	14,0	100,0	10,0	35,0	2,4	•	44956	●			
12,0	16,0	100,0	12,0	40,0	0,8	•	44957	●			
12,0	16,0	100,0	12,0	40,0	1,2	•	44958	●			
12,0	16,0	100,0	12,0	40,0	1,6	•	44959	●			
12,0	16,0	100,0	12,0	40,0	2,4	•	44960	●			
14,0	18,0	125,0	14,0	45,0	1,0	•	44961	●			
14,0	18,0	125,0	14,0	45,0	2,0	•	44962	●			
14,0	18,0	125,0	14,0	45,0	3,0	•	44963	●			
14,0	18,0	125,0	14,0	45,0	4,0	•	44964	●			
16,0	20,0	125,0	16,0	50,0	0,8	•	44965	●			
16,0	20,0	125,0	16,0	50,0	1,2	•	44966	●			
16,0	20,0	125,0	16,0	50,0	1,6	•	44967	●			
16,0	20,0	125,0	16,0	50,0	2,4	•	44968	●			
16,0	20,0	125,0	16,0	50,0	3,2	•	44969	●			
20,0	25,0	150,0	20,0	65,0	0,8	•	44970	●			
20,0	25,0	150,0	20,0	65,0	1,2	•	44971	●			
20,0	25,0	150,0	20,0	65,0	1,6	•	44972	●			
20,0	25,0	150,0	20,0	65,0	2,4	•	44973	●			
20,0	25,0	150,0	20,0	65,0	3,2	•	44974	●			

### TOLERANCES (mm)

>6–10 DIAMETER  
D<sub>1</sub> = +0,000/–0,009

D<sub>2</sub> = h<sub>6</sub>  
R = +0,00/–0,05

>10–18 DIAMETER

D<sub>1</sub> = +0,000/–0,011

D<sub>2</sub> = h<sub>6</sub>  
R = +0,00/–0,05

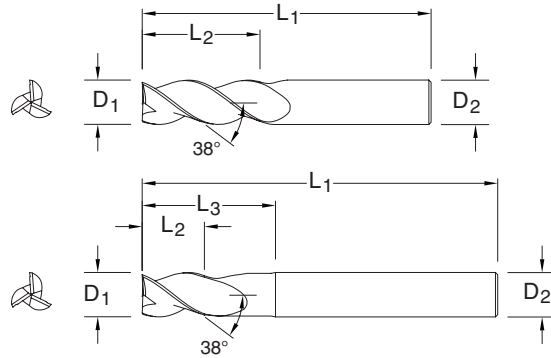
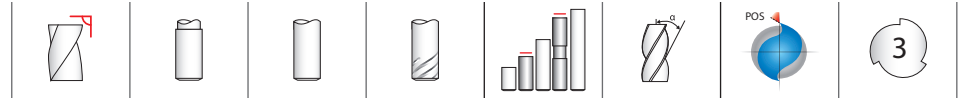
>18–20 DIAMETER

D<sub>1</sub> = +0,000/–0,013

D<sub>2</sub> = h<sub>6</sub>  
R = +0,00/–0,05



- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



**TOLERANCES (mm)**

**3 DIAMETER**

$D_1 = +0,000/-0,006$

$D_2 = h_6$

**>3-6 DIAMETER**

$D_1 = +0,000/-0,008$

$D_2 = h_6$

**>6-10 DIAMETER**

$D_1 = +0,000/-0,009$

$D_2 = h_6$

**>10-18 DIAMETER**

$D_1 = +0,000/-0,011$

$D_2 = h_6$

**>18-20 DIAMETER**

$D_1 = +0,000/-0,013$

$D_2 = h_6$

NON-FERROUS

PLASTICS/COMPOSITES

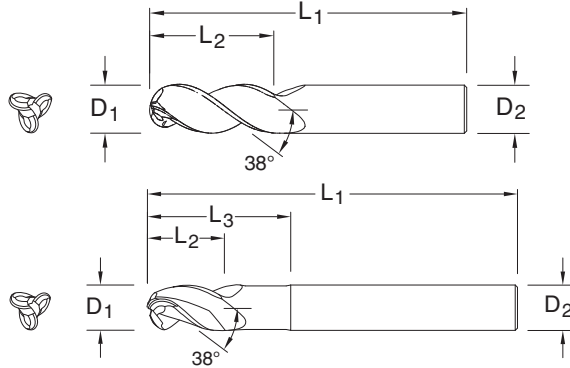
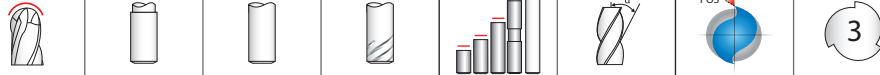
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

**43M**  
METRIC SERIES

mm						EDP NO.	STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	POLISHED FLUTE	Ti-NAMITE-B (TiB <sub>2</sub> )	
3,0	8,0	52,0	6,0	—	●	44890	●
4,0	11,0	55,0	6,0	—	●	44891	●
5,0	13,0	57,0	6,0	—	●	44892	●
6,0	24,0	75,0	6,0	—	●	44893	●
8,0	32,0	75,0	8,0	—	●	44895	●
10,0	40,0	100,0	10,0	—	●	44896	●
12,0	48,0	100,0	12,0	—	●	44897	●
14,0	30,0	89,0	14,0	—	●	44898	●
14,0	18,0	125,0	14,0	45,0	●	44899	●
16,0	64,0	125,0	16,0	—	●	44900	●
20,0	80,0	150,0	20,0	—	●	44901	●

- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Polished flutes maximize chip evacuation and provides enhanced finish
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

# METRIC S-Carb



## 43MB METRIC SERIES

- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Open fluting for deep slotting and profiling
- Polished flutes maximize chip evacuation and provides enhanced finish
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

mm					EDP NO.		STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	REACH L <sub>3</sub>	POLISHED FLUTE	Ti-NAMITE-B (TiB <sub>2</sub> )	
3,0	4,5	57,0	6,0	—	•	44916	●
3,0	6,0	57,0	6,0	10,0	•	44917	●
3,0	9,0	57,0	6,0	16,0	•	44918	●
4,0	6,0	57,0	6,0	—	•	44919	●
4,0	8,0	57,0	6,0	13,0	•	44920	●
4,0	12,0	57,0	6,0	21,0	•	44921	●
5,0	7,5	57,0	6,0	—	•	44922	●
5,0	10,0	63,0	6,0	16,0	•	44923	●
5,0	15,0	63,0	6,0	26,0	•	44924	●
6,0	9,0	57,0	6,0	—	•	44925	●
6,0	12,0	63,0	6,0	19,0	•	44926	●
6,0	18,0	75,0	6,0	31,0	•	44927	●
8,0	12,0	63,0	8,0	—	•	44928	●
8,0	16,0	75,0	8,0	25,0	•	44929	●
8,0	24,0	83,0	8,0	41,0	•	44930	●
10,0	15,0	75,0	10,0	—	•	44931	●
10,0	20,0	83,0	10,0	31,0	•	44932	●
10,0	30,0	100,0	10,0	51,0	•	44933	●
12,0	18,0	83,0	12,0	—	•	44934	●
12,0	24,0	100,0	12,0	37,0	•	44935	●
12,0	36,0	130,0	12,0	61,0	•	44936	●
16,0	24,0	100,0	16,0	—	•	44937	●
16,0	32,0	130,0	16,0	49,0	•	44938	●
16,0	48,0	150,0	16,0	81,0	•	44939	●
20,0	30,0	108,0	20,0	—	•	44940	●
20,0	40,0	130,0	20,0	61,0	•	44941	●
20,0	60,0	150,0	20,0	101,0	•	44942	●
25,0	37,5	127,0	25,0	—	•	44943	●
25,0	50,0	152,0	25,0	76,0	•	44944	●
25,0	75,0	170,0	25,0	126,0	•	44945	●

### TOLERANCES (mm)

#### 3 DIAMETER

D<sub>1</sub> = +0,000/-0,006  
D<sub>2</sub> = h<sub>6</sub>

#### >3-6 DIAMETER

D<sub>1</sub> = +0,000/-0,008  
D<sub>2</sub> = h<sub>6</sub>

#### >6-10 DIAMETER

D<sub>1</sub> = +0,000/-0,009  
D<sub>2</sub> = h<sub>6</sub>

#### >10-18 DIAMETER

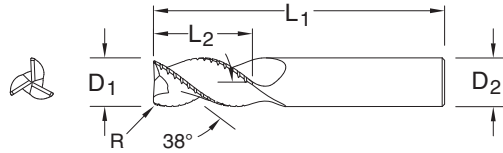
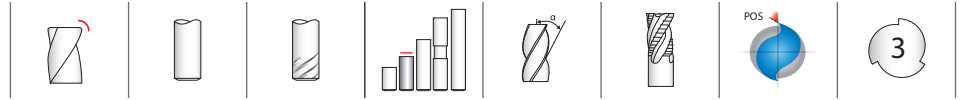
D<sub>1</sub> = +0,000/-0,011  
D<sub>2</sub> = h<sub>6</sub>

#### >18-25 DIAMETER

D<sub>1</sub> = +0,000/-0,013  
D<sub>2</sub> = h<sub>6</sub>

- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



**43MCB**  
METRIC SERIES

**TOLERANCES (mm)**

**>6–10 DIAMETER**

$D_1 = +0,000/-0,009$

$D_2 = h_6$

$R = +0,00/-0,05$

**>10–18 DIAMETER**

$D_1 = +0,000/-0,011$

$D_2 = h_6$

$R = +0,00/-0,05$

**>18–20 DIAMETER**

$D_1 = +0,000/-0,013$

$D_2 = h_6$

$R = +0,00/-0,05$

NON-FERROUS

PLASTICS/COMPOSITES

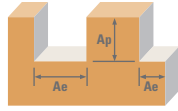
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	CORNER RADIUS $R$	EDP NO.		STOCK
					UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
6,0	19,0	63,0	6,0	0,3	—	44299	■
8,0	19,0	63,0	8,0	0,3	44300	44305	●
10,0	22,0	72,0	10,0	0,3	44301	44306	●
12,0	26,0	83,0	12,0	1,0	44302	44307	●
16,0	32,0	92,0	16,0	1,0	44303	44308	●
20,0	38,0	104,0	20,0	1,0	44304	44309	●

- Circular land allows for increased control at various speed and feed rates and reduces chatter
- Symmetrical end gashing for excellent balance at high speeds and aggressive plunging capability
- Chip breakers reduce machine loads up to 15% for increased roughing feed rate capability
- Open fluting for deep slotting and profiling
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

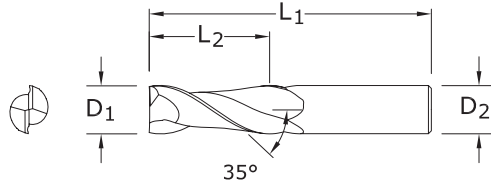
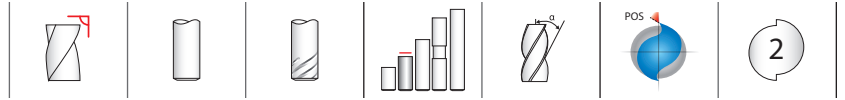
# METRIC S-Carb

Series  
43M, 43MB, 43MCR,  
43ML, 43MLC,  
43MCB  
Metric



Material	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)							
					3	6	10	16	20	25		
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 7 HRc	Slot 	1	≤ 1	490	RPM	52022	26011	15607	13005	7803	6243
					(392-588)	Fz	0.022	0.060	0.120	0.144	0.187	0.213
						Feed (mm/min)	3371	4682	5618	5618	4370	3980
		Profile 	≤ 0.5	≤ 1.5	610	RPM	64762	32381	19429	16190	9714	7771
					(488-732)	Fz	0.022	0.060	0.120	0.144	0.187	0.213
						Feed (mm/min)	4196	5828	6994	6994	5440	4955
		HSM 	≤ 0.05	≤ 2	1005	RPM	106698	53349	32009	26674	16005	12804
					(804-1206)	Fz	0.050	0.132	0.280	0.336	0.440	0.488
						Feed (mm/min)	16131	21124	26888	26885	21126	18726
ALUMINUM DIE CAST ALLOYS (HIGH SILICONE) A-390, A-392, B-390	≤ 125 Bhn or ≤ 77 HRb	Slot 	1	≤ 1	185	RPM	19641	9820	5892	4910	2946	2357
					(148-222)	Fz	0.022	0.060	0.120	0.144	0.187	0.213
						Feed (mm/min)	1273	1768	2121	2121	1650	1503
		Profile 	≤ 0.5	≤ 1.5	230	RPM	24418	12209	7326	6105	3663	2930
					(184-276)	Fz	0.022	0.060	0.120	0.144	0.187	0.213
						Feed (mm/min)	1582	2197	2637	2637	2051	1868
		HSM 	≤ 0.05	≤ 2	380	RPM	40343	20172	12103	10086	6052	4841
					(304-456)	Fz	0.050	0.132	0.280	0.336	0.440	0.488
						Feed (mm/min)	6099	7987	10166	10166	7988	7081
COPPER ALLOYS Aluminum Bronze Brass Naval Brass Red Brass	≤ 140 Bhn or ≤ 3 HRc	Slot 	1	≤ 1	265	RPM	28134	14067	8440	7034	4220	3376
					(212-318)	Fz	0.019	0.048	0.107	0.120	0.160	0.175
						Feed (mm/min)	1620	2025	2701	2532	2026	1773
		Profile 	≤ 0.5	≤ 1.5	330	RPM	35035	17518	10511	8759	5255	4204
					(264-396)	Fz	0.019	0.048	0.107	0.120	0.160	0.175
						Feed (mm/min)	2018	2522	3363	3153	2523	2207
		HSM 	≤ 0.05	≤ 2	545	RPM	57861	28930	17358	14465	8679	6943
					(436-654)	Fz	0.041	0.108	0.227	0.276	0.373	0.400
						Feed (mm/min)	7082	9373	11804	11976	9721	8332
COPPER ALLOYS Beryllium Copper C110, Manganese Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc	Slot 	1	≤ 1	105	RPM	11148	5574	3344	2787	1672	1338
					(84-126)	Fz	0.019	0.048	0.107	0.120	0.160	0.175
						Feed (mm/min)	642	803	1070	1003	803	702
		Profile 	≤ 0.5	≤ 1.5	130	RPM	13802	6901	4141	3450	2070	1656
					(104-156)	Fz	0.019	0.048	0.107	0.120	0.160	0.175
						Feed (mm/min)	795	994	1325	1242	994	870
		HSM 	≤ 0.05	≤ 2	215	RPM	22826	11413	6848	5706	3424	2739
					(172-258)	Fz	0.041	0.108	0.227	0.276	0.373	0.400
						Feed (mm/min)	2794	3697	4656	4725	3835	3287
PLASTICS ABS, Polycarbonate, PVC, Polypropylene		Slot 	1	≤ 1	490	RPM	52022	26011	15607	13005	7803	6243
					(392-588)	Fz	0.036	0.096	0.200	0.240	0.320	0.350
						Feed (mm/min)	5618	7490	9364	9363	7491	6555
		Profile 	≤ 0.5	≤ 1.5	610	RPM	64762	32381	19429	16190	9714	7771
					(488-732)	Fz	0.036	0.096	0.200	0.240	0.320	0.350
						Feed (mm/min)	6994	9325	11657	11656	9326	8160
		HSM 	≤ 0.05	≤ 2	1005	RPM	106698	53349	32009	26674	16005	12804
					(804-1206)	Fz	0.082	0.216	0.453	0.552	0.733	0.800
						Feed (mm/min)	26117	34567	43532	44169	35210	30730

Bhn (Brinell)    HRc (Rockwell C)    HRb (Rockwell B)    HSM (High Speed Machining)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fz \times 3 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce cut depth and feed by 50% for long flute and long reach tools  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



### TOLERANCES (inch)

#### 1/8–3/16 DIAMETER

$D_1 = +0.0000/-0.00032$

$D_2 = h_6$

#### 1/4–3/8 DIAMETER

$D_1 = +0.0000/-0.00035$

$D_2 = h_6$

#### 1/2–5/8 DIAMETER

$D_1 = +0.0000/-0.00043$

$D_2 = h_6$

#### 3/4–1 DIAMETER

$D_1 = +0.0000/-0.00051$

$D_2 = h_6$

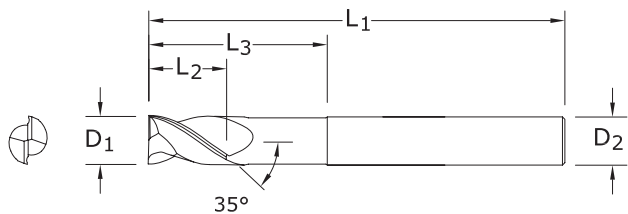
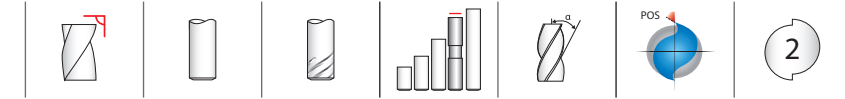
## 47 FRACTIONAL SERIES

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.		STOCK
				UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/8	3/8	1-1/2	1/8	34620	34660	●
3/16	9/16	2	3/16	34621	34661	●
1/4	3/4	2-1/2	1/4	34622	34662	●
5/16	13/16	2-1/2	5/16	34623	34663	●
3/8	1	2-1/2	3/8	34624	34664	●
1/2	1-1/4	3-1/4	1/2	34625	34665	●
5/8	1-5/8	3-3/4	5/8	34626	34666	●
3/4	1-5/8	4	3/4	34627	34667	●
1	2	4-1/2	1	34628	34668	●

- Circular land reduces edge aggressiveness for varied speed and feed rates
- 2 Flutes effectively manage the large size and volume of chips produced during the aggressive machining process
- Excellent balance at high speeds and aggressive plunging capability
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—Call for Delivery



### TOLERANCES (inch)

#### 1/4–3/8 DIAMETER

$D_1 = +0.0000/-0.00035$

$D_2 = h_6$

#### 1/2–5/8 DIAMETER

$D_1 = +0.0000/-0.00043$

$D_2 = h_6$

#### 3/4–1 DIAMETER

$D_1 = +0.0000/-0.00051$

$D_2 = h_6$

## 47L FRACTIONAL SERIES

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	EDP NO.		STOCK
					UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/4	3/8	4	1/4	2-1/8	34640	34678	●
3/8	1/2	4	3/8	2-1/8	34641	34679	●
1/2	5/8	6	1/2	2-1/8	34642	34680	●
1/2	5/8	6	1/2	3-3/8	34643	34681	●
5/8	3/4	6	5/8	2-3/8	34644	34682	●
5/8	3/4	6	5/8	3-3/8	34645	34683	●
3/4	1	6	3/4	2-1/2	34646	34684	●
3/4	1	6	3/4	3-3/8	34647	34685	●

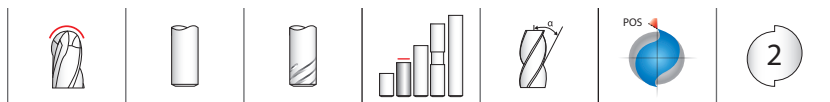
- Circular land reduces edge aggressiveness for varied speed and feed rates
- 2 Flutes effectively manage the large size and volume of chips produced during the aggressive machining process
- Excellent balance at high speeds and aggressive plunging capability
- Necked design with blended diameter transitions provide clearance to reach
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—Call for Delivery

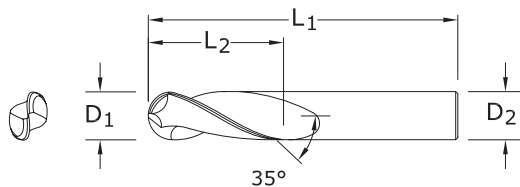


# FRACTIONAL S-Carb



## 47B

### FRACTIONAL SERIES



- Circular land reduces edge aggressiveness for varied speed and feed rates
- 2 Flutes effectively manage the large size and volume of chips produced during the aggressive machining process
- Excellent balance at high speeds and aggressive plunging capability
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

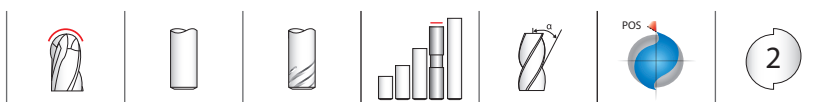
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.		STOCK
				UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/8	3/8	1-1/2	1/8	34630	34669	●
3/16	9/16	2	3/16	34631	34670	●
1/4	3/4	2-1/2	1/4	34632	34671	●
5/16	13/16	2-1/2	5/16	34633	34672	●
3/8	1	2-1/2	3/8	34634	34673	●
1/2	1-1/4	3-1/4	1/2	34635	34674	●
5/8	1-5/8	3-3/4	5/8	34636	34675	●
3/4	1-5/8	4	3/4	34637	34676	●
1	2	4-1/2	1	34638	34677	●

### TOLERANCES (inch)

- 1/8–3/16 DIAMETER**  
 $D_1 = +0.0000/-0.00032$   
 $D_2 = h_6$
- 1/4–3/8 DIAMETER**  
 $D_1 = +0.0000/-0.00035$   
 $D_2 = h_6$
- 1/2–5/8 DIAMETER**  
 $D_1 = +0.0000/-0.00043$   
 $D_2 = h_6$
- 3/4–1 DIAMETER**  
 $D_1 = +0.0000/-0.00051$   
 $D_2 = h_6$

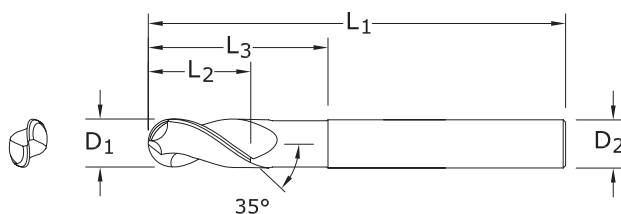


- U.S. Stock Standard
- NOT STOCKED— Call for Delivery



## 47LB

### FRACTIONAL SERIES



- Circular land reduces edge aggressiveness for varied speed and feed rates
- 2 Flutes effectively manage the large size and volume of chips produced during the aggressive machining process
- Excellent balance at high speeds and aggressive plunging capability
- Necked design with blended diameter transitions provide clearance to reach
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

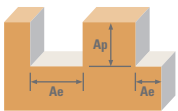















CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIA. $D_2$	REACH $L_3$	EDP NO.		STOCK
					UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/4	3/8	4	1/4	2-1/8	34650	34686	●
3/8	1/2	4	3/8	2-1/8	34651	34687	●
1/2	5/8	6	1/2	2-1/8	34652	34688	●
1/2	5/8	6	1/2	3-3/8	34653	34689	●
5/8	3/4	6	5/8	3-3/8	34654	34691	●
5/8	3/4	6	5/8	2-3/8	34655	34690	●
3/4	1	6	3/4	2-1/2	34656	34693	●
3/4	1	6	3/4	3-3/8	34657	34692	●

### TOLERANCES (inch)

- 1/4–3/8 DIAMETER**  
 $D_1 = +0.0000/-0.00035$   
 $D_2 = h_6$
- 1/2–5/8 DIAMETER**  
 $D_1 = +0.0000/-0.00043$   
 $D_2 = h_6$
- 3/4–1 DIAMETER**  
 $D_1 = +0.0000/-0.00051$   
 $D_2 = h_6$

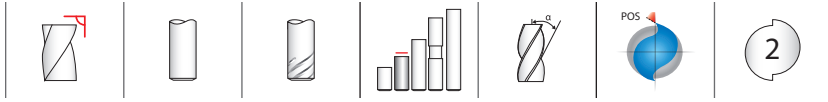


- U.S. Stock Standard
- NOT STOCKED— Call for Delivery

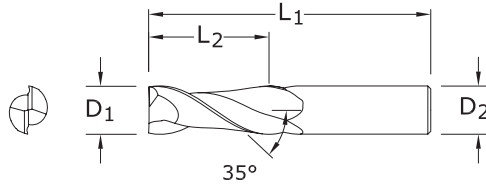
Series 47, 47B, 47L, 47LB Fractional	Hardness			Vc (sfm)	Diameter (D1) (inch)							
		Ae x D1	Ap x D1		1/8	1/4	3/8	1/2	3/4	1		
<b>ALUMINUM ALLOYS</b> 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 7 HRc	Slot 	1	≤ 1	1600	RPM	48896	24448	16299	12224	8149	6112
					(1280-1920)	Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085
						Feed (ipm)	88	122	147	147	114	104
	Profile 	≤ 0.5	≤ 1.5	2000	RPM	61120	30560	20373	15280	10187	7640	
				(1600-2400)	Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085	
					Feed (ipm)	110	153	183	183	143	130	
	HSM 	≤ 0.05	≤ 2	3300	RPM	100848	50424	33616	25212	16808	12606	
				(2640-3960)	Fz	0.0021	0.0055	0.0105	0.0140	0.0165	0.0195	
					Feed (ipm)	424	555	706	706	555	492	
<b>ALUMINUM DIE CAST ALLOYS</b> (HIGH SILICONE) A-390, A-392, B-390	≤ 125 Bhn or ≤ 77 HRb	Slot 	1	≤ 1	600	RPM	18336	9168	6112	4584	3056	2292
					(480-720)	Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085
						Feed (ipm)	33	46	55	55	43	39
	Profile 	≤ 0.5	≤ 1.5	750	RPM	22920	11460	7640	5730	3820	2865	
				(600-900)	Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085	
					Feed (ipm)	41	57	69	69	53	49	
	HSM 	≤ 0.05	≤ 2	1240	RPM	37894	18947	12631	9474	6316	4737	
				(992-1488)	Fz	0.0021	0.0055	0.0105	0.0140	0.0165	0.0195	
					Feed (ipm)	159	208	265	265	208	185	
<b>COPPER ALLOYS</b> Aluminum Bronze Brass Naval Brass Red Brass	≤ 140 Bhn or ≤ 3 HRc	Slot 	1	≤ 1	865	RPM	26434	13217	8811	6609	4406	3304
					(692-1038)	Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
						Feed (ipm)	42	53	70	66	53	46
	Profile 	≤ 0.5	≤ 1.5	1080	RPM	33005	16502	11002	8251	5501	4126	
				(864-1296)	Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070	
					Feed (ipm)	53	66	88	83	66	58	
	HSM 	≤ 0.05	≤ 2	1780	RPM	54397	27198	18132	13599	9066	6800	
				(1424-2136)	Fz	0.0017	0.0045	0.0085	0.0115	0.0140	0.0160	
					Feed (ipm)	185	245	308	313	254	218	
<b>COPPER ALLOYS</b> Beryllium Copper C110, Manganese Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc	Slot 	1	≤ 1	345	RPM	10543	5272	3514	2636	1757	1318
					(276-414)	Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
						Feed (ipm)	17	21	28	26	21	18
	Profile 	≤ 0.5	≤ 1.5	430	RPM	13141	6570	4380	3285	2190	1643	
				(344-516)	Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070	
					Feed (ipm)	21	26	35	33	26	23	
	HSM 	≤ 0.05	≤ 2	710	RPM	21698	10849	7233	5424	3616	2712	
				(568-852)	Fz	0.0017	0.0045	0.0085	0.0115	0.0140	0.0160	
					Feed (ipm)	74	98	123	125	101	87	
<b>PLASTICS</b> ABS, Polycarbonate, PVC, Polypropylene	≤ 150 Bhn or ≤ 7 HRc	Slot 	1	≤ 1	1600	RPM	48896	24448	16299	12224	8149	6112
					(1280-1920)	Fz	0.0015	0.0040	0.0075	0.0100	0.0120	0.0140
						Feed (ipm)	147	196	244	244	196	171
	Profile 	≤ 0.5	≤ 1.5	2000	RPM	61120	30560	20373	15280	10187	7640	
				(1600-2400)	Fz	0.0015	0.0040	0.0075	0.0100	0.0120	0.0140	
					Feed (ipm)	183	244	306	306	244	214	
	HSM 	≤ 0.05	≤ 2	3300	RPM	100848	50424	33616	25212	16808	12606	
				(2640-3960)	Fz	0.0034	0.0090	0.0170	0.0230	0.0275	0.0320	
					Feed (ipm)	686	908	1143	1160	924	807	

Bhn (Brinell)    HRc (Rockwell C)    HRb (Rockwell B)    HSM (High Speed Machining)  
 rpm = Vc x 3.82 / D1  
 ipm = Fz x 2 x rpm  
 reduce speed and feed for materials harder than listed  
 reduce cut depth and feed by 50% for long flute and long reach tools  
 reduce feed and Ae when finish milling (.02 x D1 maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# FRACTIONAL S-Carb



## 47M METRIC SERIES



- Circular land reduces edge aggressiveness for varied speed and feed rates
- 2 Flutes effectively manage the large size and volume of chips produced during the aggressive machining process
- Excellent balance at high speeds and aggressive plunging capability
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.		STOCK
				UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
3,0	8,0	38,0	3,0	44550	44587	●
4,0	11,0	50,0	4,0	44551	44588	●
5,0	13,0	50,0	5,0	44552	44589	●
6,0	13,0	57,0	6,0	44553	44590	●
8,0	19,0	63,0	8,0	44554	44591	●
10,0	22,0	72,0	10,0	44555	44592	●
12,0	26,0	83,0	12,0	44556	44593	●
14,0	26,0	83,0	14,0	44557	44594	●
16,0	32,0	92,0	16,0	44558	44595	●
20,0	38,0	104,0	20,0	44559	44596	●
25,0	44,0	104,0	25,0	44560	44597	●

### TOLERANCES (mm)

#### 3 DIAMETER

$D_1 = +0,000/-0,006$

$D_2 = h_6$

#### >3-6 DIAMETER

$D_1 = +0,000/-0,008$

$D_2 = h_6$

#### >6-10 DIAMETER

$D_1 = +0,000/-0,009$

$D_2 = h_6$

#### >10-18 DIAMETER

$D_1 = +0,000/-0,012$

$D_2 = h_6$

#### >18-25 DIAMETER

$D_1 = +0,000/-0,013$

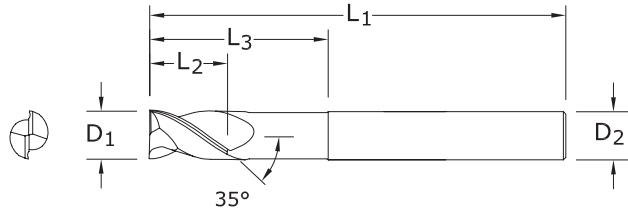
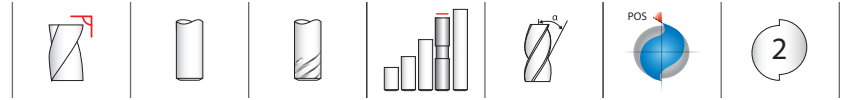
$D_2 = h_6$

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



**47ML**  
METRIC SERIES

**TOLERANCES (mm)**

**6 DIAMETER**

$D_1 = +0,000/-0,008$

$D_2 = h_6$

**>6-10 DIAMETER**

$D_1 = +0,000/-0,009$

$D_2 = h_6$

**>10-18 DIAMETER**

$D_1 = +0,000/-0,011$

$D_2 = h_6$

**>18-20 DIAMETER**

$D_1 = +0,000/-0,013$

$D_2 = h_6$

NON-FERROUS

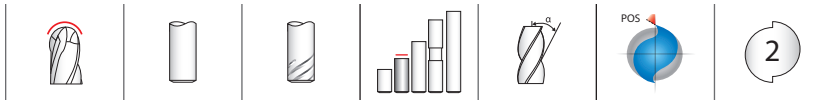
PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

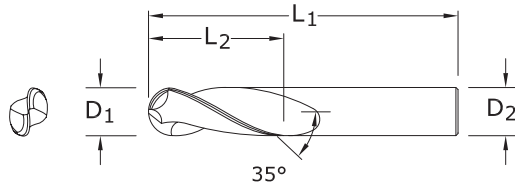
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	mm			EDP NO.		STOCK
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
6,0	10,0	100,0	6,0	54,0	44561	44609	●
8,0	12,0	100,0	8,0	54,0	44562	44610	●
10,0	12,0	100,0	10,0	54,0	44563	44611	●
12,0	16,0	150,0	12,0	80,0	44564	44612	●
16,0	20,0	150,0	16,0	80,0	44565	44613	●
20,0	25,0	150,0	20,0	80,0	44566	44614	●

- Circular land reduces edge aggressiveness for varied speed and feed rates
- 2 Flutes effectively manage the large size and volume of chips produced during the aggressive machining process
- Excellent balance at high speeds and aggressive plunging capability
- Necked design with blended diameter transitions provide clearance to reach
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

# METRIC S-Carb



## 47MB METRIC SERIES



- Circular land reduces edge aggressiveness for varied speed and feed rates
- 2 Flutes effectively manage the large size and volume of chips produced during the aggressive machining process
- Excellent balance at high speeds and aggressive plunging capability
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRc)

mm				EDP NO.		STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
3,0	8,0	38,0	3,0	44570	44598	●
4,0	11,0	50,0	4,0	44571	44599	●
5,0	13,0	50,0	5,0	44572	44600	●
6,0	13,0	57,0	6,0	44573	44601	●
8,0	19,0	63,0	8,0	44574	44602	●
10,0	22,0	72,0	10,0	44575	44603	●
12,0	26,0	83,0	12,0	44576	44604	●
14,0	26,0	83,0	14,0	44577	44605	●
16,0	32,0	92,0	16,0	44578	44606	●
20,0	38,0	104,0	20,0	44579	44607	●
25,0	44,0	104,0	25,0	44580	44608	●

### TOLERANCES (mm)

#### 3 DIAMETER

$D_1 = +0,000/-0,006$   
 $D_2 = h_6$

#### >3-6 DIAMETER

$D_1 = +0,000/-0,008$   
 $D_2 = h_6$

#### >6-10 DIAMETER

$D_1 = +0,000/-0,009$   
 $D_2 = h_6$

#### >10-18 DIAMETER

$D_1 = +0,000/-0,012$   
 $D_2 = h_6$

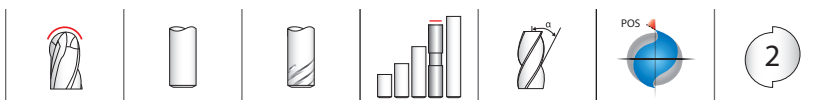
#### >18-25 DIAMETER

$D_1 = +0,000/-0,013$   
 $D_2 = h_6$

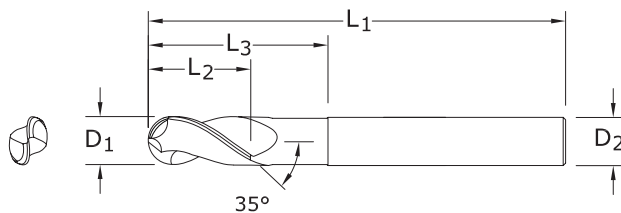
NON-FERROUS

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED— Call for Delivery



## 47MLB METRIC SERIES



- Circular land reduces edge aggressiveness for varied speed and feed rates
- 2 Flutes effectively manage the large size and volume of chips produced during the aggressive machining process
- Excellent balance at high speeds and aggressive plunging capability
- Necked design with blended diameter transitions provide clearance to reach
- Ball nose design ideal for finishing operations in complex workpieces
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRc)

mm					EDP NO.		STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
6,0	10,0	100,0	6,0	54,0	44581	44615	●
8,0	12,0	100,0	8,0	54,0	44582	44616	●
10,0	12,0	100,0	10,0	54,0	44583	44617	●
12,0	16,0	150,0	12,0	80,0	44584	44618	●
16,0	20,0	150,0	16,0	80,0	44585	44619	●
20,0	25,0	150,0	20,0	80,0	44586	44620	●

### TOLERANCES (mm)

#### 6 DIAMETER

$D_1 = +0,000/-0,008$   
 $D_2 = h_6$

#### >6-10 DIAMETER

$D_1 = +0,000/-0,009$   
 $D_2 = h_6$

#### >10-18 DIAMETER

$D_1 = +0,000/-0,011$   
 $D_2 = h_6$

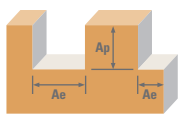
#### >18-20 DIAMETER

$D_1 = +0,000/-0,013$   
 $D_2 = h_6$

NON-FERROUS

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED— Call for Delivery

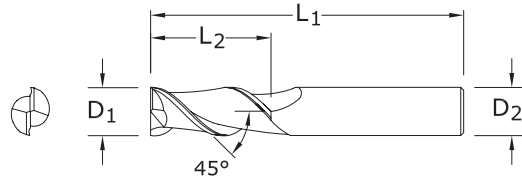


Series 47M, 47MB, 47ML, 47MLB Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)							
					3	6	10	12	20	25		
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 7 HRc	Slot 	1	≤ 1	490	RPM	52022	26011	15607	13005	7803	6243
					(392-588)	Fz	0.022	0.060	0.120	0.144	0.187	0.213
						Feed (mm/min)	2247	3121	3746	3745	2913	2653
	Profile 	≤ 0.5	≤ 1.5	610	RPM	64762	32381	19429	16190	9714	7771	
				(488-732)	Fz	0.022	0.060	0.120	0.144	0.187	0.213	
					Feed (mm/min)	2797	3885	4663	4662	3627	3303	
	HSM 	≤ 0.05	≤ 2	1005	RPM	106698	53349	32009	26674	16005	12804	
				(804-1206)	Fz	0.050	0.132	0.280	0.336	0.440	0.488	
					Feed (mm/min)	10754	14083	17925	17924	14084	12484	
ALUMINUM DIE CAST ALLOYS (HIGH SILICONE) A-390, A-392, B-390	≤ 125 Bhn or ≤ 77 HRb	Slot 	1	≤ 1	185	RPM	19641	9820	5892	4910	2946	2357
					(148-222)	Fz	0.022	0.060	0.120	0.144	0.187	0.213
						Feed (mm/min)	848	1178	1414	1414	1100	1002
	Profile 	≤ 0.5	≤ 1.5	230	RPM	24418	12209	7326	6105	3663	2930	
				(184-276)	Fz	0.022	0.060	0.120	0.144	0.187	0.213	
					Feed (mm/min)	1055	1465	1758	1758	1367	1245	
	HSM 	≤ 0.05	≤ 2	380	RPM	40343	20172	12103	10086	6052	4841	
				(304-456)	Fz	0.050	0.132	0.280	0.336	0.440	0.488	
					Feed (mm/min)	4066	5325	6778	6777	5325	4720	
COPPER ALLOYS Aluminum Bronze Brass Naval Brass Red Brass	≤ 140 Bhn or ≤ 3 HRc	Slot 	1	≤ 1	265	RPM	28134	14067	8440	7034	4220	3376
					(212-318)	Fz	0.019	0.048	0.107	0.120	0.160	0.175
						Feed (mm/min)	1080	1350	1801	1688	1350	1182
	Profile 	≤ 0.5	≤ 1.5	330	RPM	35035	17518	10511	8759	5255	4204	
				(264-396)	Fz	0.019	0.048	0.107	0.120	0.160	0.175	
					Feed (mm/min)	1345	1682	2242	2102	1682	1472	
	HSM 	≤ 0.05	≤ 2	545	RPM	57861	28930	17358	14465	8679	6943	
				(436-654)	Fz	0.041	0.108	0.227	0.276	0.373	0.400	
					Feed (mm/min)	4721	6248	7869	7984	6480	5555	
COPPER ALLOYS Beryllium Copper C110, Manganese Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc	Slot 	1	≤ 1	105	RPM	11148	5574	3344	2787	1672	1338
					(84-126)	Fz	0.019	0.048	0.107	0.120	0.160	0.175
						Feed (mm/min)	428	535	713	669	535	468
	Profile 	≤ 0.5	≤ 1.5	130	RPM	13802	6901	4141	3450	2070	1656	
				(104-156)	Fz	0.019	0.048	0.107	0.120	0.160	0.175	
					Feed (mm/min)	530	662	883	828	662	580	
	HSM 	≤ 0.05	≤ 2	215	RPM	22826	11413	6848	5706	3424	2739	
				(172-258)	Fz	0.041	0.108	0.227	0.276	0.373	0.400	
					Feed (mm/min)	1862	2465	3104	3150	2556	2191	
PLASTICS ABS, Polycarbonate, PVC, Polypropylene	≤ 150 Bhn or ≤ 7 HRc	Slot 	1	≤ 1	490	RPM	52022	26011	15607	13005	7803	6243
					(392-588)	Fz	0.036	0.096	0.200	0.240	0.320	0.350
						Feed (mm/min)	3745	4994	6243	6242	4994	4370
	Profile 	≤ 0.5	≤ 1.5	610	RPM	64762	32381	19429	16190	9714	7771	
				(488-732)	Fz	0.036	0.096	0.200	0.240	0.320	0.350	
					Feed (mm/min)	4662	6217	7771	7771	6217	5440	
	HSM 	≤ 0.05	≤ 2	1005	RPM	106698	53349	32009	26674	16005	12804	
				(804-1206)	Fz	0.082	0.216	0.453	0.552	0.733	0.800	
					Feed (mm/min)	17412	23045	29022	29446	23473	20487	

Bhn (Brinell)    HRc (Rockwell C)    HRb (Rockwell B)    HSM (High Speed Machining)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fz \times 2 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce cut depth and feed by 50% for long flute and long reach tools  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



**44**  
FRACTIONAL SERIES



- Polished ski land with primary and secondary flute wall design minimizes chip interference by directing chips away from secondary flute
- Circular land allows for increased control at various speed and feed rates ultimately reducing chatter
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

CUTTING DIA. $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIA. $D_2$	CORNER RADIUS* $R$	EDP NO.				STOCK
					UNCOATED W/FLAT	Ti-NAMITE-B (TiB <sub>2</sub> ) W/FLAT	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/4	3/4	2-7/16	3/8	.015-.060	34501	34502	32033	32053	●
1/4	1-1/4	3-1/16	3/8	.015-.060	34503	34504	32034	32054	●
1/4	1-3/4	3-9/16	3/8	.015-.060	34505	34506	32035	32055	●
5/16	1-3/8	3-1/8	3/8	.015-.060	34507	34508	32036	32056	●
3/8	3/4	2-1/2	3/8	.015-.060	34509	34510	32037	32057	●
3/8	1-1/2	3-1/4	3/8	.015-.060	34511	34512	32038	32058	●
3/8	2-1/2	4-1/4	3/8	.015-.060	34513	34514	32039	32059	●
1/2	1-1/4	3-1/4	1/2	.015-.125	34515	34516	32040	32060	●
1/2	2	4	1/2	.015-.125	34517	34518	32041	32061	●
1/2	3	5	1/2	.015-.125	34519	34520	32042	32062	●
5/8	1-5/8	3-3/4	5/8	.015-.125	34521	34522	32043	32063	●
5/8	2-1/2	4-5/8	5/8	.015-.125	34523	34524	32044	32064	●
3/4	1-5/8	3-7/8	3/4	.015-.125	34525	34526	32045	32065	●
3/4	3	5-1/4	3/4	.015-.125	34527	34528	32046	32066	●
3/4	4	6-1/4	3/4	.015-.125	34529	34530	32047	32067	●
1	2	4-1/2	1	.015-.125	34531	34532	32048	32068	●
1	4	6-1/2	1	.015-.125	34533	34534	32049	32069	●

\*Contact your KSPT Sales Representative for more information on Corner Radius options.

**TOLERANCES (inch)**

**1/4–3/8 DIAMETER**

$D_1 = +0.0000/-0.00035$   
 $D_2 = h_6$   
 $R = +0.0000/-0.0020$

**1/2–5/8 DIAMETER**

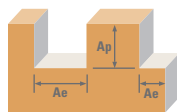
$D_1 = +0.0000/-0.00043$   
 $D_2 = h_6$   
 $R = +0.0000/-0.0020$
















**3/4–1 DIAMETER**

$D_1 = +0.0000/-0.00051$   
 $D_2 = h_6$   
 $R = +0.0000/-0.0020$

- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



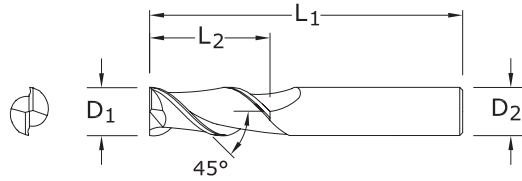
Series 44 Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)							
					1/8	1/4	3/8	1/2	3/4	1		
<b>ALUMINUM ALLOYS</b> 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 7 HRc	Slot 	1	≤ 1	1600	RPM	48896	24448	16299	12224	8149	6112
					(1280-1920)	Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085
						Feed (ipm)	88	122	147	147	114	104
	Profile 	≤ 0.5	≤ 1.5	2000	RPM	61120	30560	20373	15280	10187	7640	
				(1600-2400)	Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085	
					Feed (ipm)	110	153	183	183	143	130	
	HSM 	≤ 0.05	≤ 2	3300	RPM	100848	50424	33616	25212	16808	12606	
				(2640-3960)	Fz	0.0021	0.0055	0.0105	0.0140	0.0165	0.0195	
					Feed (ipm)	424	555	706	706	555	492	
<b>ALUMINUM DIE CAST ALLOYS</b> (HIGH SILICONE) A-390, A-392, B-390	≤ 125 Bhn or ≤ 77 HRb	Slot 	1	≤ 1	600	RPM	18336	9168	6112	4584	3056	2292
					(480-720)	Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085
						Feed (ipm)	33	46	55	55	43	39
	Profile 	≤ 0.5	≤ 1.5	750	RPM	22920	11460	7640	5730	3820	2865	
				(600-900)	Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085	
					Feed (ipm)	41	57	69	69	53	49	
	HSM 	≤ 0.05	≤ 2	1240	RPM	37894	18947	12631	9474	6316	4737	
				(992-1488)	Fz	0.0021	0.0055	0.0105	0.0140	0.0165	0.0195	
					Feed (ipm)	159	208	265	265	208	185	
<b>COPPER ALLOYS</b> Aluminum Bronze Brass Naval Brass Red Brass	≤ 140 Bhn or ≤ 3 HRc	Slot 	1	≤ 1	865	RPM	26434	13217	8811	6609	4406	3304
					(692-1038)	Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
						Feed (ipm)	42	53	70	66	53	46
	Profile 	≤ 0.5	≤ 1.5	1080	RPM	33005	16502	11002	8251	5501	4126	
				(864-1296)	Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070	
					Feed (ipm)	53	66	88	83	66	58	
	HSM 	≤ 0.05	≤ 2	1780	RPM	54397	27198	18132	13599	9066	6800	
				(1424-2136)	Fz	0.0017	0.0045	0.0085	0.0115	0.0140	0.0160	
					Feed (ipm)	185	245	308	313	254	218	
<b>COPPER ALLOYS</b> Beryllium Copper C110, Manganese Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc	Slot 	1	≤ 1	345	RPM	10543	5272	3514	2636	1757	1318
					(276-414)	Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
						Feed (ipm)	17	21	28	26	21	18
	Profile 	≤ 0.5	≤ 1.5	430	RPM	13141	6570	4380	3285	2190	1643	
				(344-516)	Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070	
					Feed (ipm)	21	26	35	33	26	23	
	HSM 	≤ 0.05	≤ 2	710	RPM	21698	10849	7233	5424	3616	2712	
				(568-852)	Fz	0.0017	0.0045	0.0085	0.0115	0.0140	0.0160	
					Feed (ipm)	74	98	123	125	101	87	
<b>PLASTICS</b> ABS, Polycarbonate, PVC, Polypropylene		Slot 	1	≤ 1	1600	RPM	48896	24448	16299	12224	8149	6112
					(1280-1920)	Fz	0.0015	0.0040	0.0075	0.0100	0.0120	0.0140
						Feed (ipm)	147	196	244	244	196	171
	Profile 	≤ 0.5	≤ 1.5	2000	RPM	61120	30560	20373	15280	10187	7640	
				(1600-2400)	Fz	0.0015	0.0040	0.0075	0.0100	0.0120	0.0140	
					Feed (ipm)	183	244	306	306	244	214	
	HSM 	≤ 0.05	≤ 2	3300	RPM	100848	50424	33616	25212	16808	12606	
				(2640-3960)	Fz	0.0034	0.0090	0.0170	0.0230	0.0275	0.0320	
					Feed (ipm)	686	908	1143	1160	924	807	

Bhn (Brinell)    HRc (Rockwell C)    HRb (Rockwell B)    HSM (High Speed Machining)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fz \times 2 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce cut depth and feed by 50% for long flute and long reach tools  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))





**44M**  
METRIC SERIES



- Polished ski land with primary and secondary flute wall design minimizes chip interference by directing chips away from secondary flute
- Circular land allows for increased control at various speed and feed rates ultimately reducing chatter
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

CUTTING DIA. D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIA. D <sub>2</sub>	CORNER RADIUS* R	EDP NO.				STOCK
					UNCOATED W/FLAT	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> ) W/FLAT	Ti-NAMITE-B (TiB <sub>2</sub> )	
3,0	8,0	52,0	6,0	0,36–0,76	44505	49663	44506	49674	●
4,0	11,0	55,0	6,0	0,36–0,76	44509	49664	44510	49675	●
5,0	13,0	57,0	6,0	0,36–0,76	44513	49665	44514	49676	●
6,0	13,0	57,0	6,0	0,36–0,76	44517	49666	44518	49677	●
8,0	19,0	69,0	10,0	0,38–1,52	44521	49667	44522	49678	●
10,0	22,0	72,0	10,0	0,38–1,52	44525	49668	44526	49679	●
12,0	26,0	83,0	12,0	0,38–3,17	44529	49669	44530	49680	●
14,0	26,0	83,0	14,0	0,38–3,17	44533	49670	44534	49681	●
16,0	32,0	92,0	16,0	0,38–3,17	44537	49671	44538	49682	●
18,0	32,0	92,0	18,0	0,38–3,17	44541	49672	44542	49683	●
20,0	38,0	104,0	20,0	0,38–3,17	44545	49673	44546	49684	●

\*Contact your KSPT Sales Representative for more information on Corner Radius options.

**TOLERANCES (mm)**

**≤3 DIAMETER**

D<sub>1</sub> = +0,000/–0,006  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/–0,050

**>3–6 DIAMETER**

D<sub>1</sub> = +0,000/–0,008  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/–0,050

**>6–10 DIAMETER**

D<sub>1</sub> = +0,000/–0,009  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/–0,050

**>10–18 DIAMETER**

D<sub>1</sub> = +0,000/–0,011  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/–0,050

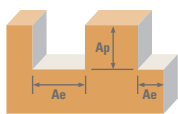
**>18–20 DIAMETER**

D<sub>1</sub> = +0,000/–0,013  
D<sub>2</sub> = h<sub>6</sub>  
R = +0,000/–0,050

NON-FERROUS

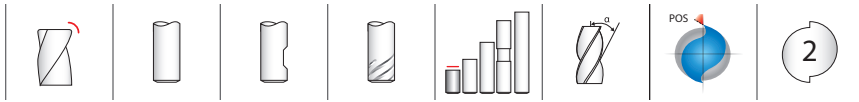
PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

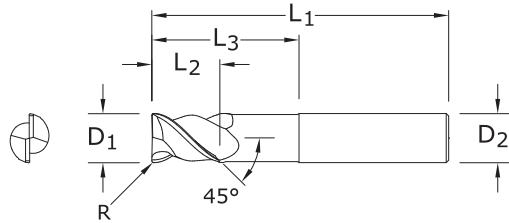


Series 44M Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
					3	6	10	12	20	25			
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 7 HRc	Slot	1	≤ 1	490	RPM	52022	26011	15607	13005	7803	6243	
					(392-588)	Fz	0.022	0.060	0.120	0.144	0.187	0.213	
						Feed (mm/min)	2247	3121	3746	3745	2913	2653	
		Profile	≤ 0.5	≤ 1.5	610	RPM	64762	32381	19429	16190	9714	7771	
					(488-732)	Fz	0.022	0.060	0.120	0.144	0.187	0.213	
						Feed (mm/min)	2797	3885	4663	4662	3627	3303	
	HSM	≤ 0.05	≤ 2	1005	RPM	106698	53349	32009	26674	16005	12804		
				(804-1206)	Fz	0.050	0.132	0.280	0.336	0.440	0.488		
					Feed (mm/min)	10754	14083	17925	17924	14084	12484		
	ALUMINUM DIE CAST ALLOYS (HIGH SILICONE) A-390, A-392, B-390	≤ 125 Bhn or ≤ 77 HRb	Slot	1	≤ 1	185	RPM	19641	9820	5892	4910	2946	2357
						(148-222)	Fz	0.022	0.060	0.120	0.144	0.187	0.213
							Feed (mm/min)	848	1178	1414	1414	1100	1002
Profile			≤ 0.5	≤ 1.5	230	RPM	24418	12209	7326	6105	3663	2930	
					(184-276)	Fz	0.022	0.060	0.120	0.144	0.187	0.213	
						Feed (mm/min)	1055	1465	1758	1758	1367	1245	
HSM		≤ 0.05	≤ 2	380	RPM	40343	20172	12103	10086	6052	4841		
				(304-456)	Fz	0.050	0.132	0.280	0.336	0.440	0.488		
					Feed (mm/min)	4066	5325	6778	6777	5325	4720		
COPPER ALLOYS Aluminum Bronze Brass Naval Brass Red Brass		≤ 140 Bhn or ≤ 3 HRc	Slot	1	≤ 1	265	RPM	28134	14067	8440	7034	4220	3376
						(212-318)	Fz	0.019	0.048	0.107	0.120	0.160	0.175
							Feed (mm/min)	1080	1350	1801	1688	1350	1182
	Profile		≤ 0.5	≤ 1.5	330	RPM	35035	17518	10511	8759	5255	4204	
					(264-396)	Fz	0.019	0.048	0.107	0.120	0.160	0.175	
						Feed (mm/min)	1345	1682	2242	2102	1682	1472	
	HSM	≤ 0.05	≤ 2	545	RPM	57861	28930	17358	14465	8679	6943		
				(436-654)	Fz	0.041	0.108	0.227	0.276	0.373	0.400		
					Feed (mm/min)	4721	6248	7869	7984	6480	5555		
	COPPER ALLOYS Beryllium Copper C110, Manganese Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc	Slot	1	≤ 1	105	RPM	11148	5574	3344	2787	1672	1338
						(84-126)	Fz	0.019	0.048	0.107	0.120	0.160	0.175
							Feed (mm/min)	428	535	713	669	535	468
Profile			≤ 0.5	≤ 1.5	130	RPM	13802	6901	4141	3450	2070	1656	
					(104-156)	Fz	0.019	0.048	0.107	0.120	0.160	0.175	
						Feed (mm/min)	530	662	883	828	662	580	
HSM		≤ 0.05	≤ 2	215	RPM	22826	11413	6848	5706	3424	2739		
				(172-258)	Fz	0.041	0.108	0.227	0.276	0.373	0.400		
					Feed (mm/min)	1862	2465	3104	3150	2556	2191		
PLASTICS ABS, Polycarbonate, PVC, Polypropylene			Slot	1	≤ 1	490	RPM	52022	26011	15607	13005	7803	6243
						(392-588)	Fz	0.036	0.096	0.200	0.240	0.320	0.350
							Feed (mm/min)	3745	4994	6243	6242	4994	4370
	Profile		≤ 0.5	≤ 1.5	610	RPM	64762	32381	19429	16190	9714	7771	
					(488-732)	Fz	0.036	0.096	0.200	0.240	0.320	0.350	
						Feed (mm/min)	4662	6217	7771	7771	6217	5440	
	HSM	≤ 0.05	≤ 2	1005	RPM	106698	53349	32009	26674	16005	12804		
				(804-1206)	Fz	0.082	0.216	0.453	0.552	0.733	0.800		
					Feed (mm/min)	17412	23045	29022	29446	23473	20487		

Bhn (Brinell)    HRc (Rockwell C)    HRb (Rockwell B)    HSM (High Speed Machining)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fz \times 2 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce cut depth and feed by 50% for long flute and long reach tools  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



**45**  
FRACTIONAL SERIES



- Polished ski land with primary and secondary flute wall design minimizes chip interference by directing chips away from secondary flute
- Circular land allows for increased control at various speed and feed rates ultimately reducing chatter
- Recommended for materials  $\leq 150$  Bhn ( $\leq 7$  HRC)

inch						EDP NO.				STOCK
CUTTING DIA. D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIA. D <sub>2</sub>	REACH* L <sub>3</sub>	CORNER RADIUS R	UNCOATED W/FLAT	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> ) W/FLAT	Ti-NAMITE-B (TiB <sub>2</sub> )	
1/4	3/8	2-1/2	3/8	1	.010	91257	91250	91242	91235	●
5/16	7/16	2-1/2	3/8	1-1/8	.012	91258	91251	91243	91236	●
3/8	9/16	2-1/2	3/8	1-1/8	.015	91259	91252	91244	91237	●
1/2	3/4	3	1/2	1-1/2	.020	91260	91253	91245	91238	●
5/8	7/8	3-1/2	5/8	1-3/4	.025	91261	91254	91246	91239	●
3/4	1	4	3/4	2	.030	91262	91255	91247	91240	●
1	1-1/4	4	1	2-1/8	.040	91263	91256	91248	91241	●

\*Reach (Optional)

**TOLERANCES (inch)**

**1/4–3/8 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00035  
D<sub>2</sub> = h<sub>6</sub>  
R = +0.0000/–0.0020

**1/2–5/8 DIAMETER**

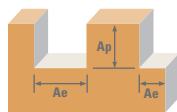
D<sub>1</sub> = +0.0000/–0.00043  
D<sub>2</sub> = h<sub>6</sub>  
R = +0.0000/–0.0020

**3/4–1 DIAMETER**

D<sub>1</sub> = +0.0000/–0.00051  
D<sub>2</sub> = h<sub>6</sub>  
R = +0.0000/–0.0020

- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



Series 45 Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)						
					1/8	1/4	3/8	1/2	3/4	1	
<b>ALUMINUM ALLOYS</b> 2024, 5052, 5086, 6061, 6073, 7075	≤ 150 Bhn or ≤ 7 HRc	1	≤ 1	1600 (1280-1920)	RPM	48896	24448	16299	12224	8149	6112
					Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085
					Feed (ipm)	88	122	147	147	114	104
	Profile	≤ 0.5	≤ 1.5	2000 (1600-2400)	RPM	61120	30560	20373	15280	10187	7640
					Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085
					Feed (ipm)	110	153	183	183	143	130
	HSM	≤ 0.05	≤ 2	3300 (2640-3960)	RPM	100848	50424	33616	25212	16808	12606
					Fz	0.0021	0.0055	0.0105	0.0140	0.0165	0.0195
					Feed (ipm)	424	555	706	706	555	492
<b>ALUMINUM DIE CAST ALLOYS</b> (HIGH SILICONE) A-390, A-392, B-390	≤ 125 Bhn or ≤ 77 HRb	1	≤ 1	600 (480-720)	RPM	18336	9168	6112	4584	3056	2292
					Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085
					Feed (ipm)	33	46	55	55	43	39
	Profile	≤ 0.5	≤ 1.5	750 (600-900)	RPM	22920	11460	7640	5730	3820	2865
					Fz	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085
					Feed (ipm)	41	57	69	69	53	49
	HSM	≤ 0.05	≤ 2	1240 (992-1488)	RPM	37894	18947	12631	9474	6316	4737
					Fz	0.0021	0.0055	0.0105	0.0140	0.0165	0.0195
					Feed (ipm)	159	208	265	265	208	185
<b>COPPER ALLOYS</b> Aluminum Bronze Brass Naval Brass Red Brass	≤ 140 Bhn or ≤ 3 HRc	1	≤ 1	865 (692-1038)	RPM	26434	13217	8811	6609	4406	3304
					Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
					Feed (ipm)	42	53	70	66	53	46
	Profile	≤ 0.5	≤ 1.5	1080 (864-1296)	RPM	33005	16502	11002	8251	5501	4126
					Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
					Feed (ipm)	53	66	88	83	66	58
	HSM	≤ 0.05	≤ 2	1780 (1424-2136)	RPM	54397	27198	18132	13599	9066	6800
					Fz	0.0017	0.0045	0.0085	0.0115	0.0140	0.0160
					Feed (ipm)	185	245	308	313	254	218
<b>COPPER ALLOYS</b> Beryllium Copper C110, Manganese Bronze, Tin Bronze	≤ 200 Bhn or ≤ 23 HRc	1	≤ 1	345 (276-414)	RPM	10543	5272	3514	2636	1757	1318
					Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
					Feed (ipm)	17	21	28	26	21	18
	Profile	≤ 0.5	≤ 1.5	430 (344-516)	RPM	13141	6570	4380	3285	2190	1643
					Fz	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
					Feed (ipm)	21	26	35	33	26	23
	HSM	≤ 0.05	≤ 2	710 (568-852)	RPM	21698	10849	7233	5424	3616	2712
					Fz	0.0017	0.0045	0.0085	0.0115	0.0140	0.0160
					Feed (ipm)	74	98	123	125	101	87
<b>PLASTICS</b> ABS, Polycarbonate, PVC, Polypropylene	1	≤ 1	1600 (1280-1920)	RPM	48896	24448	16299	12224	8149	6112	
				Fz	0.0015	0.0040	0.0075	0.0100	0.0120	0.0140	
				Feed (ipm)	147	196	244	244	196	171	
	Profile	≤ 0.5	≤ 1.5	2000 (1600-2400)	RPM	61120	30560	20373	15280	10187	7640
					Fz	0.0015	0.0040	0.0075	0.0100	0.0120	0.0140
					Feed (ipm)	183	244	306	306	244	214
	HSM	≤ 0.05	≤ 2	3300 (2640-3960)	RPM	100848	50424	33616	25212	16808	12606
					Fz	0.0034	0.0090	0.0170	0.0230	0.0275	0.0320
					Feed (ipm)	686	908	1143	1160	924	807

Bhn (Brinell)    HRc (Rockwell C)    HRb (Rockwell B)    HSM (High Speed Machining)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fz \times 2 \times rpm$   
 reduce speed and feed for materials harder than listed  
 reduce cut depth and feed by 50% for long flute and long reach tools  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

## General Purpose End Mills





# Milling

SERIES	GENERAL PURPOSE END MILLS DESCRIPTION	PAGE
16	4 Flute Square End Stub Fractional	180
16M	4 Flute Square End Stub Metric	210
1	4 Flute Square End Standard Length Fractional	181
1L	4 Flute Square End Long Reach Fractional	181
1EL	4 Flute Square End Extended Length Fractional	181
1M	4 Flute Square End Standard Length Metric	211
1XLM	4 Flute Square End Extra Long Reach Metric	211
14	4 Flute Double End Square Stub Fractional	185
14M	4 Flute Double End Square Stub Metric	213
1B	4 Flute Ball End Standard Length Fractional	186
1LB	4 Flute Ball End Long Reach Fractional	186
1ELB	4 Flute Ball End Extended Length Fractional	186
1MB	4 Flute Ball End Standard Length Metric	214
1XLMB	4 Flute Ball End Extra Long Reach Metric	214
14B	4 Flute Double End Ball Stub Fractional	188
14MB	4 Flute Double End Ball Stub Metric	215
1CR	4 Flute Corner Radius Standard Length Fractional	183
1MCR	4 Flute Corner Radius Standard Length Metric	212
54	4 Flute High Shear Square End Standard Length Fractional	197
54M	4 Flute High Shear Square End Standard Length Metric	223
17	2 Flute Square End Stub Fractional	166
17M	2 Flute Square End Stub Metric	201
3	2 Flute Square End Standard Length Fractional	167
3L	2 Flute Square End Long Reach Fractional	167
3EL	2 Flute Square End Extended Length Fractional	167
3M	2 Flute Square End Standard Length Metric	202
3XLM	2 Flute Square End Extra Long Reach Metric	202
59	2 Flute Square End Long Reach Fractional	169
59M	2 Flute Square End Long Reach Metric	203
15	2 Flute Double End Square Stub Fractional	171
15M	2 Flute Double End Square Stub Metric	204
3B	2 Flute Ball End Standard Length Fractional	172
3LB	2 Flute Ball End Long Reach Fractional	172
3ELB	2 Flute Ball End Extended Length Fractional	172
3MB	2 Flute Ball End Standard Length Metric	205
3XLMB	2 Flute Ball End Extra Long Reach Metric	205
59B	2 Flute Ball End Long Reach Fractional	174
59MB	2 Flute Ball End Long Reach Metric	206
15B	2 Flute Double End Ball Stub Fractional	175
15MB	2 Flute Double End Ball Stub Metric	207
3CR	2 Flute Corner Radius Standard Length Fractional	170

*Speed & Feed Recommendations listed after each series*

SERIES	GENERAL PURPOSE END MILLS DESCRIPTION	PAGE
52	2 Flute High Shear Square End Standard Length Fractional	196
52M	2 Flute High Shear Square End Standard Length Metric	222
5	3 Flute Square End Standard Length Fractional	176
5M	3 Flute Square End Standard Length Metric	208
5XLM	3 Flute Square End Extra Long Reach Metric	208
5B	3 Flute Ball End Standard Length Fractional	177
5MB	3 Flute Ball End Standard Length Metric	209
5XLMB	3 Flute Ball End Extra Long Reach Metric	209
61	Multi-Flute Coarse Pitch Rougher Fractional	194
61M	Multi-Flute Coarse Pitch Rougher Metric	220
62	Multi-Flute Fine Pitch Rougher Fractional	192
62M	Multi-Flute Fine Pitch Rougher Metric	218
23	3 Flute Tapered Square End Standard Length Fractional	178
24	3 Flute Tapered Corner Radius Standard Length Fractional	179
End Mill Sets	2, 3, & 4 Flute Square End Series 1, 3, 5, 14, 15	199
	2, 3, & 4 Flute Ball End Series 1B, 3B, 5B, 14B ,15B	200

*Speed & Feed Recommendations listed after each series*

## Fresado

SERIE	DESCRIPCIÓN DE FRESAS DE USO GENERAL	PÁGINA
16	4 filos, pieza de punta cuadrada, fraccional	180
16M	4 filos, pieza de punta cuadrada, métrico	210
1	4 filos, punta cuadrada, longitud estándar, fraccional	181
1L	4 filos, punta cuadrada, largo alcance, fraccional	181
1EL	4 filos, punta cuadrada, longitud extendida, fraccional	181
1M	4 filos, punta cuadrada, longitud estándar, métrico	211
1XLM	4 filos, punta cuadrada, alcance extralargo, métrico	211
14	4 filos, pieza doble de punta cuadrada, fraccional	185
14M	4 filos, pieza doble de punta cuadrada, métrico	213
1B	4 filos, punta esférica, longitud estándar, fraccional	186
1LB	4 filos, punta esférica, largo alcance, fraccional	186
1ELB	4 filos, punta esférica, longitud extendida, fraccional	186
1MB	4 filos, punta esférica, longitud estándar, métrico	214
1XLMB	4 filos, punta esférica, alcance extralargo, métrico	214
14B	4 filos, pieza doble de punta esférica, fraccional	188
14MB	4 filos, pieza doble de punta esférica, métrico	215
1CR	4 filos, radio angulado, longitud estándar, fraccional	183
1MCR	4 filos, radio angulado, longitud estándar, métrico	212

*Recomendaciones de velocidades y avances mostradas tras cada serie*

SERIE	DESCRIPCIÓN DE FRESAS DE USO GENERAL	PÁGINA
54	4 filos, alto rendimiento, punta cuadrada, longitud estándar, fraccional	197
54M	4 filos, alto rendimiento, punta cuadrada, longitud estándar, métrico	223
17	2 filos, pieza de punta cuadrada, fraccional	166
17M	2 filos, pieza de punta cuadrada, métrico	201
3	2 filos, punta cuadrada, longitud estándar, fraccional	167
3L	2 filos, punta cuadrada, largo alcance, fraccional	167
3EL	2 filos, punta cuadrada, longitud extendida, fraccional	167
3M	2 filos, punta cuadrada, longitud estándar, métrico	202
3XLM	2 filos, punta cuadrada, alcance extralargo, métrico	202
59	2 filos, punta cuadrada, largo alcance, fraccional	169
59M	2 filos, punta cuadrada, largo alcance, métrico	203
15	2 filos, pieza doble de punta cuadrada, fraccional	171
15M	2 filos, pieza doble de punta cuadrada, métrico	204
3B	2 filos, punta esférica, longitud estándar, fraccional	172
3LB	2 filos, punta esférica, largo alcance, fraccional	172
3ELB	2 filos, punta esférica, longitud extendida, fraccional	172
3MB	2 filos, punta esférica, longitud estándar, métrico	205
3XLMB	2 filos, punta esférica, alcance extralargo, métrico	205
59B	2 filos, punta esférica, largo alcance, fraccional	174
59MB	2 filos, punta esférica, largo alcance, métrico	206
15B	2 filos, pieza doble de punta esférica, fraccional	175
15MB	2 filos, pieza doble de punta esférica, métrico	207
3CR	2 filos, radio angulado, longitud estándar, fraccional	170
52	2 filos, alto rendimiento, punta cuadrada, longitud estándar, fraccional	196
52M	2 filos, alto rendimiento, punta cuadrada, longitud estándar, métrico	222
5	3 filos, punta cuadrada, longitud estándar, fraccional	176
5M	3 filos, punta cuadrada, longitud estándar, métrico	208
5XLM	3 filos, punta cuadrada, alcance extralargo, métrico	208
5B	3 filos, punta esférica, longitud estándar, fraccional	177
5MB	3 filos, punta esférica, longitud estándar, métrico	209
5XLMB	3 filos, punta esférica, alcance extralargo, métrico	209
61	Filo múltiple, paso grueso, desbastador, fraccional	194
61M	Filo múltiple, paso grueso, desbastador, métrico	220
62	Filo múltiple, paso fino, desbastador, fraccional	192
62M	Filo múltiple, paso fino, desbastador, métrico	218
23	3 filos, cónico, punta cuadrada, longitud estándar, fraccional	178
24	3 filos, cónico, radio angulado, longitud estándar, fraccional	179
Juegos de fresas	2, 3 y 4 filos, punta cuadrada, series 1, 3, 5, 14, 15	199
	2, 3 y 4 filos, punta esférica, series 1B, 3B, 5B, 14B, 15B	200

*Recomendaciones de velocidades y avances mostradas tras cada serie*



# Fraissage

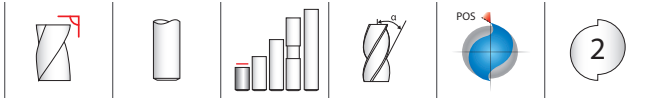
SERIES	DESCRIPTION DE FRAISES À USAGE GÉNÉRAL	PAGE
16	4 dents à bout plat court (fractionnel)	180
16M	4 dents à bout plat court (métrique)	210
1	4 dents à bout plat longueur standard (fractionnel)	181
1L	4 dents à bout plat longue portée (fractionnel)	181
1EL	4 dents à bout plat extra-long (fractionnel)	181
1M	4 dents à bout plat longueur standard (métrique)	211
1XLM	4 dents à bout plat portée extra-longue (métrique)	211
14	4 dents à double bouts plats court (fractionnel)	185
14M	4 dents à double bouts plats court (métrique)	213
1B	4 dents à bout hémisphérique longueur standard (fractionnel)	186
1LB	4 dents à bout hémisphérique longue portée (fractionnel)	186
1ELB	4 dents à bout hémisphérique extra-long (fractionnel)	186
1MB	4 dents à bout hémisphérique longueur standard (métrique)	214
1XLMB	4 dents à bout hémisphérique portée extra-longue (métrique)	214
14B	4 dents à double bouts hémisphériques court (fractionnel)	188
14MB	4 dents à double bouts hémisphériques court (métrique)	215
1CR	4 dents rayon en coin longueur standard (fractionnel)	183
1MCR	4 dents rayon en coin longueur standard (métrique)	212
54	4 dents cisaillement élevé à bout plat longueur standard (fractionnel)	197
54M	4 dents cisaillement élevé à bout plat longueur standard (métrique)	223
17	2 dents à bout plat court (fractionnel)	166
17M	2 dents à bout plat court (métrique)	201
3	2 dents à bout plat longueur standard (fractionnel)	167
3L	2 dents à bout plat longue portée (fractionnel)	167
3EL	2 dents à bout plat extra-long (fractionnel)	167
3M	2 dents à bout plat longueur standard (métrique)	202
3XLM	2 dents à bout plat portée extra-longue (métrique)	202
59	2 dents à bout plat longue portée (fractionnel)	169
59M	2 dents à bout plat longue portée (métrique)	203
15	2 dents à double bouts plats court (fractionnel)	171
15M	2 dents à double bouts plats court (métrique)	204
3B	2 dents à bout hémisphérique longueur standard (fractionnel)	172
3LB	2 dents à bout hémisphérique longue portée (fractionnel)	172
3ELB	2 dents à bout hémisphérique extra-long (fractionnel)	172
3MB	2 dents à bout hémisphérique longueur standard (métrique)	205
3XLMB	2 dents à bout hémisphérique portée extra-longue (métrique)	205
59B	2 dents à bout hémisphérique longue portée (fractionnel)	174
59MB	2 dents à bout hémisphérique longue portée (métrique)	206
15B	2 dents à double bouts hémisphériques court (fractionnel)	175
15MB	2 dents à double bouts hémisphériques court (métrique)	207
3CR	2 dents rayon en coin longueur standard (fractionnel)	170
52	2 dents cisaillement élevé à bout plat longueur standard (fractionnel)	196
52M	2 dents cisaillement élevé à bout plat longueur standard (métrique)	222

*Recommandations de vitesse et avance indiquées après chaque série*

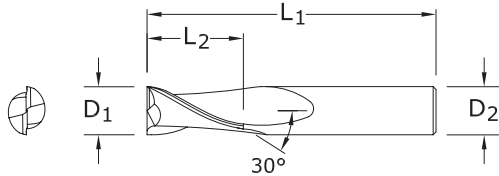
SERIES	DESCRIPTION DE FRAISES À USAGE GÉNÉRAL	PAGE
5	3 dents à bout plat longueur standard (fractionnel)	176
5M	3 dents à bout plat longueur standard (métrique)	208
5XLM	3 dents à bout plat portée extra-longue (métrique)	208
5B	3 dents à bout hémisphérique longueur standard (fractionnel)	177
5MB	3 dents à bout hémisphérique longueur standard (métrique)	209
5XLMB	3 dents à bout hémisphérique portée extra-longue (métrique)	209
61	Multi-dents à pas gros d'ébauche (fractionnel)	194
61M	Multi-dents à pas gros d'ébauche (métrique)	220
62	Multi-dents à pas fin d'ébauche (fractionnel)	192
62M	Multi-dents à pas fin d'ébauche (métrique)	218
23	3 dents conique à bout plat longueur standard (fractionnel)	178
24	3 dents conique rayon en coin longueur standard (fractionnel)	179
Jeux de fraises	2, 3, & 4 Série goujure à bout plat 1,3,5,14,15	199
	2, 3, & 4 Série goujure à bout hémisphérique 15B, 15MB, 15B, 15MB, 15B, 15MB	200

*Recommandations de vitesse et avance indiquées après chaque série*

# 2 Flute Square End Stub



**17**  
FRACTIONAL SERIES



**TOLERANCES (inch)**

$D_1 = +0.0000/-0.0020$

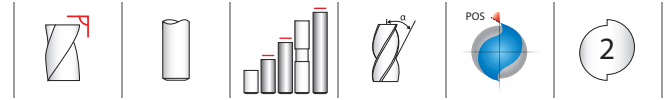
$D_2 = h_6$

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

inch				EDP NO.				STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/16	1/8	1-1/2	1/8	31701	31750	31303	31358	●
3/32	3/16	1-1/2	1/8	31703	31751	31304	31359	●
1/8	1/4	1-1/2	1/8	31705	31752	31305	31360	●
5/32	5/16	2	3/16	31707	31753	31306	31361	●
3/16	3/8	2	3/16	31709	31754	31307	31362	●
7/32	7/16	2	1/4	31711	31755	31308	31363	●
1/4	1/2	2	1/4	31713	31756	31309	31364	●
5/16	1/2	2	5/16	31715	31757	31310	31365	●
3/8	5/8	2	3/8	31717	31758	31311	31366	●
7/16	5/8	2-1/2	7/16	31719	31759	31312	31367	●
1/2	5/8	2-1/2	1/2	31721	31760	31313	31368	●
5/8	3/4	3	5/8	31723	31761	31314	31369	●
3/4	1	3	3/4	31725	31762	31315	31370	●

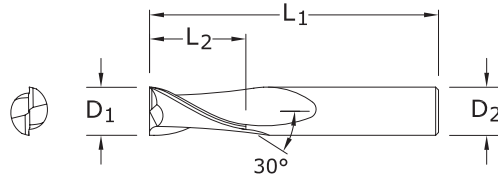
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# FRACTIONAL 2 Flute Square End



### TOLERANCES (inch)

$D_1 = +0.0000/-0.0020$   
 $D_2 = h_6$



## 3·3L·3EL FRACTIONAL SERIES

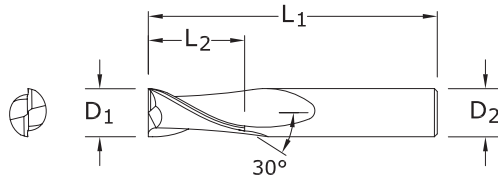
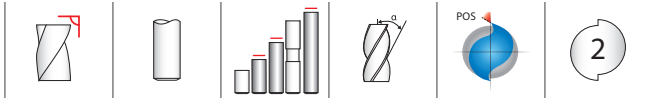
inch				EDP NO.					STOCK	SERIES
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Di-NAMITE (Diamond)		
1/64	1/32	1-1/2	1/8	30301	39301	39501	30397	—	●	3
1/32	5/64	1-1/2	1/8	30303	39303	39503	30398	—	●	3
3/64	7/64	1-1/2	1/8	30305	39305	39505	30399	—	●	3
1/16	3/16	1-1/2	1/8	30307	39307	39507	30400	91266	●	3
5/64	3/16	1-1/2	1/8	30309	39309	39509	30435	—	●	3
3/32	9/32	1-1/2	1/8	30311	39311	39511	30436	—	●	3
7/64	3/8	1-1/2	1/8	30313	39313	39513	30437	—	●	3
1/8	3/8	1-1/2	1/8	30377	39377	39577	30469	—	●	3
*1/8	1/2	1-1/2	1/8	30315	39315	39515	30438	91270	●	3
1/8	3/4	2-1/4	1/8	33341	31800	31810	31850	—	●	3L
1/8	1	3	1/8	33343	31938	31948	31958	—	●	3EL
9/64	1/2	2	3/16	30317	39317	39517	30439	—	●	3
5/32	1/2	2	3/16	30319	39319	39519	30440	—	●	3
11/64	5/8	2	3/16	30321	39321	39521	30441	—	●	3
*3/16	5/8	2	3/16	30323	39323	39523	30442	91274	●	3
3/16	3/4	2-1/2	3/16	33301	31820	31825	31851	—	●	3L
3/16	1-1/8	3	3/16	33321	31939	31949	31959	—	●	3EL
13/64	5/8	2-1/2	1/4	30325	39325	39525	30443	—	●	3
7/32	5/8	2-1/2	1/4	30327	39327	39527	30444	—	●	3
15/64	3/4	2-1/2	1/4	30329	39329	39529	30445	—	●	3
*1/4	3/4	2-1/2	1/4	30331	39331	39531	30446	91278	●	3
1/4	1-1/8	3	1/4	33303	31802	31812	31852	—	●	3L
1/4	1-1/2	4	1/4	33323	31940	31950	31960	—	●	3EL
17/64	3/4	2-1/2	5/16	30333	39333	39533	30447	—	●	3
9/32	3/4	2-1/2	5/16	30335	39335	39535	30448	—	●	3
19/64	13/16	2-1/2	5/16	30337	39337	39537	30449	—	●	3
*5/16	13/16	2-1/2	5/16	30339	39339	39539	30450	91282	●	3
5/16	1-1/8	3	5/16	33305	31821	31826	31853	—	●	3L
5/16	1-5/8	4	5/16	33325	31941	31951	31961	—	●	3EL
21/64	1	2-1/2	3/8	30341	39341	39541	30451	—	●	3
11/32	1	2-1/2	3/8	30343	39343	39543	30452	—	●	3
23/64	1	2-1/2	3/8	30345	39345	39545	30453	—	●	3
*3/8	1	2-1/2	3/8	30347	39347	39547	30454	91286	●	3
3/8	1-1/8	3	3/8	33307	31804	31814	31854	—	●	3L

continued on next page

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# 2 Flute Square End



**3·3L·3EL**  
FRACTIONAL SERIES

**TOLERANCES (inch)**

D<sub>1</sub> = +0.0000/-0.0020  
D<sub>2</sub> = h<sub>6</sub>

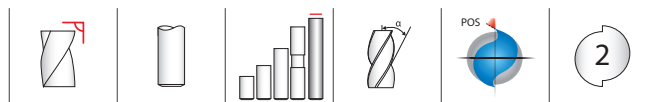
CONTINUED

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	EDP NO.					STOCK	SERIES
				UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Di-NAMITE (Diamond)		
3/8	1-3/4	4	3/8	33327	31942	31952	31962	—	●	3EL
25/64	1	2-3/4	7/16	30349	39349	39549	30455	—	●	3
13/32	1	2-3/4	7/16	30351	39351	39551	30456	—	●	3
27/64	1	2-3/4	7/16	30353	39353	39553	30457	—	●	3
7/16	1	2-3/4	7/16	30355	39355	39555	30458	—	●	3
7/16	2	4-1/2	7/16	33309	31822	31827	31855	—	●	3L
7/16	3	6	7/16	33329	31943	31953	31963	—	●	3EL
29/64	1	3	1/2	30357	39357	39557	30459	—	●	3
15/32	1	3	1/2	30359	39359	39559	30460	—	●	3
31/64	1	3	1/2	30361	39361	39561	30461	—	●	3
*1/2	1	3	1/2	30363	39363	39563	30462	91290	●	3
1/2	2	4-1/2	1/2	33311	31806	31816	31856	—	●	3L
1/2	3	6	1/2	33331	31944	31954	31964	—	●	3EL
9/16	1-1/8	3-1/2	9/16	30365	39365	39565	30463	—	●	3
5/8	1-1/4	3-1/2	5/8	30367	39367	39567	30464	—	●	3
5/8	2-1/4	5	5/8	33313	31823	31817	31857	—	●	3L
5/8	3	6	5/8	33333	31945	31955	31965	—	●	3EL
11/16	1-3/8	4	3/4	30369	39369	39569	30465	—	●	3
3/4	1-1/2	4	3/4	30371	39371	39571	30466	—	●	3
3/4	2-1/4	5	3/4	33315	31808	31818	31858	—	●	3L
3/4	3	6	3/4	33335	31946	31956	31966	—	●	3EL
7/8	1-1/2	4	7/8	30373	39373	39573	30467	—	●	3
1	1-1/2	4	1	30375	39375	39575	30468	—	●	3
1	2-1/4	5	1	33317	31824	31819	31859	—	●	3L
1	3	6	1	33337	31947	31957	31967	—	●	3EL
*Series 3 Set				30389	39389	39589	30470	—	●	3

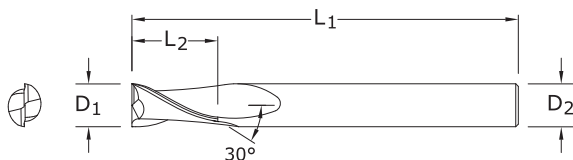
# 2 Flute Square End Long Reach



**TOLERANCES (inch)**

$D_1 = +0.0000/-0.0020$

$D_2 = h_6$



**59**  
FRACTIONAL SERIES

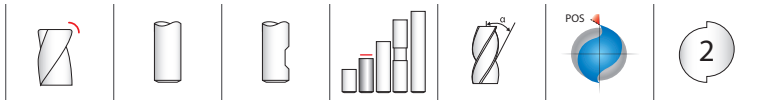
CUTTING DIAMETER $D_1$	inch			EDP NO.			STOCK
	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/8	3/8	2-1/2	1/4	32280	32260	32270	●
3/16	9/16	3	1/4	32281	32261	32271	●
1/4	5/8	3-1/2	1/4	32282	32262	32272	●
5/16	11/16	4	5/16	32283	32263	32273	●
3/8	7/8	4	3/8	32284	32264	32274	●
1/2	1	4-1/2	1/2	32285	32265	32275	●
5/8	1-1/8	5	5/8	32286	32266	32276	●
3/4	1-3/8	5-1/4	3/4	32287	32267	32277	●

Neck Option Available

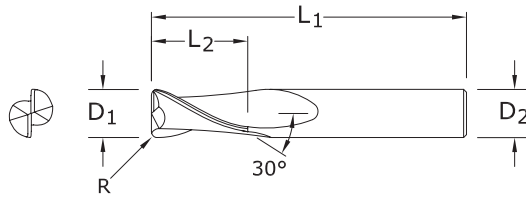
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# 2 Flute Corner Radius



**3CR**  
FRACTIONAL SERIES



**TOLERANCES (inch)**

D<sub>1</sub> = +0.0000/-0.0020  
D<sub>2</sub> = h<sub>6</sub>  
R = +0.0000/-0.0020

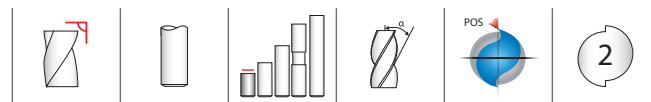
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

NOMINAL CUTTING DIA. D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIA. D <sub>2</sub>	CORNER RADIUS R	EDP NO.				STOCK
					UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/8*	1/2	1-1/2	1/8	.015	38201	38202	38315	38357	●
1/8*	1/2	1-1/2	1/8	.020	38203	38204	38316	38358	●
3/16*	5/8	2	3/16	.015	38209	38210	38317	38359	●
3/16*	5/8	2	3/16	.020	38211	38212	38318	38360	●
3/16*	5/8	2	3/16	.030	38213	38214	38319	38361	●
1/4*	3/4	2-1/2	1/4	.015	38219	38220	38320	38362	●
1/4*	3/4	2-1/2	1/4	.020	38221	38222	38321	38363	●
1/4*	3/4	2-1/2	1/4	.030	38223	38224	38322	38364	●
1/4*	3/4	2-1/2	1/4	.045	38225	38226	38323	38365	●
5/16*	13/16	2-1/2	5/16	.015	38231	38232	38324	38366	●
5/16*	13/16	2-1/2	5/16	.020	38233	38234	38325	38367	●
5/16*	13/16	2-1/2	5/16	.030	38235	38236	38326	38368	●
5/16*	13/16	2-1/2	5/16	.045	38237	38238	38327	38369	●
3/8	1	2-1/2	3/8	.015	38245	38246	38328	38370	●
3/8	1	2-1/2	3/8	.020	38247	38248	38329	38371	●
3/8	1	2-1/2	3/8	.030	38249	38250	38330	38372	●
3/8	1	2-1/2	3/8	.045	38251	38252	38331	38373	●
1/2	1	3	1/2	.015	38259	38260	38332	38374	●
1/2	1	3	1/2	.020	38261	38262	38333	38375	●
1/2	1	3	1/2	.030	38263	38264	38334	38376	●
1/2	1	3	1/2	.045	38265	38266	38335	38377	●
1/2	1	3	1/2	.060	38267	38268	38336	38378	●
5/8	1-1/4	3-1/2	5/8	.015	38273	38274	38337	38379	●
5/8	1-1/4	3-1/2	5/8	.020	38275	38276	38338	38380	●
5/8	1-1/4	3-1/2	5/8	.030	38277	38278	38339	38381	●
5/8	1-1/4	3-1/2	5/8	.045	38279	38280	38340	38382	●
5/8	1-1/4	3-1/2	5/8	.060	38281	38282	38341	38383	●
5/8	1-1/4	3-1/2	5/8	.090	38283	38284	38342	38384	●
3/4	1-1/2	4	3/4	.015	38287	38288	38343	38385	●
3/4	1-1/2	4	3/4	.020	38289	38290	38344	38386	●
3/4	1-1/2	4	3/4	.030	38291	38292	38345	38387	●
3/4	1-1/2	4	3/4	.045	38293	38294	38346	38388	●
3/4	1-1/2	4	3/4	.060	38295	38296	38347	38389	●
3/4	1-1/2	4	3/4	.090	38297	38298	38348	38390	●
3/4	1-1/2	4	3/4	.125	38299	38300	38349	38391	●
1	1-1/2	4	1	.015	38301	38302	38350	38392	●
1	1-1/2	4	1	.020	38303	38304	38351	38393	●
1	1-1/2	4	1	.030	38305	38306	38352	38394	●
1	1-1/2	4	1	.045	38307	38308	38353	38395	●
1	1-1/2	4	1	.060	38309	38310	38354	38396	●
1	1-1/2	4	1	.090	38311	38312	38355	38397	●
1	1-1/2	4	1	.125	38313	38314	38356	38398	●

\*Without Flat

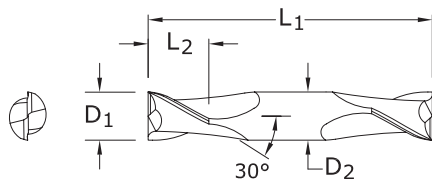
# 2 Flute Double End Mills



**TOLERANCES (inch)**

$D_1 = +0.0000/-0.0020$

$D_2 = h_6$



**15**  
FRACTIONAL SERIES

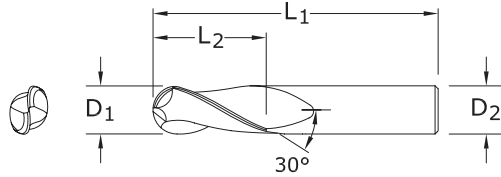
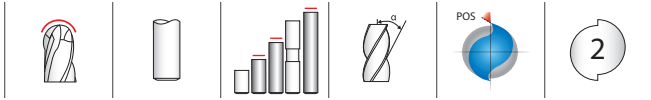
inch				EDP NO.				STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/32	1/16	1-1/2	1/8	31501	31541	39651	31316	●
3/64	3/32	1-1/2	1/8	31503	31543	39653	31317	●
1/16	1/8	1-1/2	1/8	31505	31545	39655	31318	●
5/64	1/8	1-1/2	1/8	31507	31547	39657	31319	●
3/32	3/16	1-1/2	1/8	31509	31549	39659	31320	●
7/64	3/16	1-1/2	1/8	31511	31551	39661	31321	●
*1/8	1/4	1-1/2	1/8	31513	31553	39663	31322	●
9/64	5/16	2	3/16	31515	31555	39665	31323	●
5/32	5/16	2	3/16	31517	31557	39667	31324	●
11/64	5/16	2	3/16	31519	31559	39669	31325	●
*3/16	3/8	2	3/16	31521	31561	39671	31326	●
13/64	1/2	2-1/2	1/4	31523	31563	39673	31327	●
7/32	1/2	2-1/2	1/4	31525	31565	39675	31328	●
15/64	1/2	2-1/2	1/4	31527	31567	39677	31329	●
*1/4	1/2	2-1/2	1/4	31529	31569	39679	31330	●
9/32	1/2	2-1/2	5/16	31531	31571	39681	31331	●
*5/16	1/2	2-1/2	5/16	31533	31573	39683	31332	●
*3/8	9/16	2-1/2	3/8	31535	31575	39685	31333	●
7/16	9/16	2-3/4	7/16	31537	31577	39687	31334	●
*1/2	5/8	3	1/2	31539	31579	39689	31335	●
*Series 15 Set				31589	31581	39691	31336	●

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

● U.S. Stock Standard  
 ■ NOT STOCKED—  
 Call for Delivery



# 2 Flute Ball End



## 3B•3LB•3ELB

FRACTIONAL SERIES

**TOLERANCES (inch)**

D<sub>1</sub> = +0.0000/-0.0020  
D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

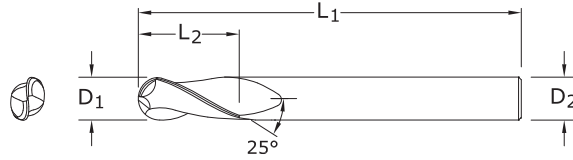
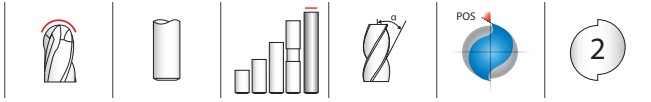
inch				EDP NO.				STOCK	SERIES
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)		
1/64	1/32	1-1/2	1/8	30302	39302	39502	30471	●	3B
1/32	5/64	1-1/2	1/8	30304	39304	39504	30472	●	3B
3/64	7/64	1-1/2	1/8	30306	39306	39506	30473	●	3B
1/16	3/16	1-1/2	1/8	30308	39308	39508	30474	●	3B
5/64	3/16	1-1/2	1/8	30310	39310	39510	30475	●	3B
3/32	9/32	1-1/2	1/8	30312	39312	39512	30476	●	3B
7/64	3/8	1-1/2	1/8	30314	39314	39514	30477	●	3B
1/8	3/8	1-1/2	1/8	30378	39378	39578	30599	●	3B
*1/8	1/2	1-1/2	1/8	30316	39316	39516	30478	●	3B
1/8	3/4	2-1/4	1/8	33342	31830	31840	31890	●	3LB
1/8	1	3	1/8	33344	31968	31978	31988	●	3ELB
9/64	1/2	2	3/16	30318	39318	39518	30479	●	3B
5/32	1/2	2	3/16	30320	39320	39520	30480	●	3B
11/64	5/8	2	3/16	30322	39322	39522	30481	●	3B
*3/16	5/8	2	3/16	30324	39324	39524	30482	●	3B
3/16	3/4	2-1/2	3/16	33302	31831	31841	31891	●	3LB
3/16	1-1/8	3	3/16	33322	31969	31979	31989	●	3ELB
13/64	5/8	2-1/2	1/4	30326	39326	39526	30483	●	3B
7/32	5/8	2-1/2	1/4	30328	39328	39528	30484	●	3B
15/64	3/4	2-1/2	1/4	30330	39330	39530	30485	●	3B
*1/4	3/4	2-1/2	1/4	30332	39332	39532	30486	●	3B
1/4	1-1/8	3	1/4	33304	31832	31842	31892	●	3LB
1/4	1-1/2	4	1/4	33324	31970	31980	31990	●	3ELB
17/64	3/4	2-1/2	5/16	30334	39334	39534	30487	●	3B
9/32	3/4	2-1/2	5/16	30336	39336	39536	30488	●	3B
19/64	13/16	2-1/2	5/16	30338	39338	39538	30489	●	3B
*5/16	13/16	2-1/2	5/16	30340	39340	39540	30490	●	3B
5/16	1-1/8	3	5/16	33306	31833	31843	31893	●	3LB
5/16	1-5/8	4	5/16	33326	31971	31981	31991	●	3ELB
21/64	1	2-1/2	3/8	30342	39342	39542	30491	●	3B

continued on next page

**3B•3LB•3ELB**  
FRACTIONAL SERIES

inch				EDP NO.				STOCK	SERIES	CONTINUED
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)			
11/32	1	2-1/2	3/8	30344	39344	39544	30492	●	3B	
23/64	1	2-1/2	3/8	30346	39346	39546	30493	●	3B	
*3/8	1	2-1/2	3/8	30348	39348	39548	30494	●	3B	
3/8	1-1/8	3	3/8	33308	31834	31844	31894	●	3LB	
3/8	1-3/4	4	3/8	33328	31972	31982	31992	●	3ELB	
25/64	1	2-3/4	7/16	30350	39350	39550	30495	●	3B	
13/32	1	2-3/4	7/16	30352	39352	39552	30496	●	3B	
27/64	1	2-3/4	7/16	30354	39354	39554	30497	●	3B	
7/16	1	2-3/4	7/16	30356	39356	39556	30498	●	3B	
7/16	2	4-1/2	7/16	33310	31835	31845	31895	●	3LB	
7/16	3	6	7/16	33330	31973	31983	31993	●	3ELB	
29/64	1	3	1/2	30358	39358	39558	30499	●	3B	
15/32	1	3	1/2	30360	39360	39560	30500	●	3B	
31/64	1	3	1/2	30362	39362	39562	30591	●	3B	
*1/2	1	3	1/2	30364	39364	39564	30592	●	3B	
1/2	2	4-1/2	1/2	33312	31836	31846	31896	●	3LB	
1/2	3	6	1/2	33332	31974	31984	31994	●	3ELB	
9/16	1-1/8	3-1/2	9/16	30366	39366	39566	30593	●	3B	
5/8	1-1/4	3-1/2	5/8	30368	39368	39568	30594	●	3B	
5/8	2-1/4	5	5/8	33314	31837	31847	31897	●	3LB	
5/8	3	6	5/8	33334	31975	31985	31995	●	3ELB	
11/16	1-3/8	4	3/4	30370	39370	39570	30595	●	3B	
3/4	1-1/2	4	3/4	30372	39372	39572	30596	●	3B	
3/4	2-1/4	5	3/4	33316	31838	31848	31898	●	3LB	
3/4	3	6	3/4	33336	31976	31986	31996	●	3ELB	
7/8	1-1/2	4	7/8	30374	39374	39574	30597	●	3B	
1	1-1/2	4	1	30376	39376	39576	30598	●	3B	
1	2-1/4	5	1	33318	31839	31849	31899	●	3LB	
1	3	6	1	33338	31977	31987	31997	●	3ELB	
*Series 3B Set				30390	39390	39590	30600	●	3B	

# 2 Flute Ball End Long Reach



**TOLERANCES (inch)**

D<sub>1</sub> = +0.0000/-0.0020  
D<sub>2</sub> = h<sub>6</sub>

## 59B

FRACTIONAL SERIES

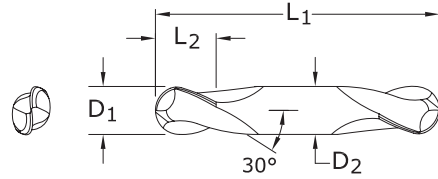
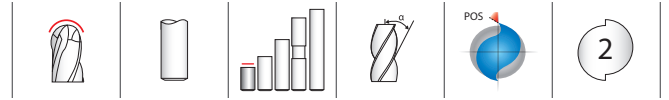
inch				EDP NO.			STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/8	3/8	2-1/2	1/4	32210	32290	32200	●
3/16	9/16	3	1/4	32211	32291	32201	●
1/4	5/8	3-1/2	1/4	32212	32292	32202	●
5/16	11/16	4	5/16	32213	32293	32203	●
3/8	7/8	4	3/8	32214	32294	32204	●
1/2	1	4-1/2	1/2	32215	32295	32205	●
5/8	1-1/8	5	5/8	32216	32296	32206	●
3/4	1-3/8	5-1/4	3/4	32217	32297	32207	●

Neck Option Available

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# FRACTIONAL 2 Flute Double End Ball End



**TOLERANCES (inch)**

$D_1 = +0.0000/-0.0020$   
 $D_2 = h_6$

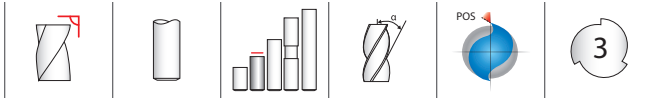
**15B**  
FRACTIONAL SERIES

inch				EDP NO.				STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/32	1/16	1-1/2	1/8	31502	31542	39652	31337	●
3/64	3/32	1-1/2	1/8	31504	31544	39654	31338	●
1/16	1/8	1-1/2	1/8	31506	31546	39656	31339	●
5/64	1/8	1-1/2	1/8	31508	31548	39658	31340	●
3/32	3/16	1-1/2	1/8	31510	31550	39660	31341	●
7/64	3/16	1-1/2	1/8	31512	31552	39662	31342	●
*1/8	1/4	1-1/2	1/8	31514	31554	39664	31343	●
9/64	5/16	2	3/16	31516	31556	39666	31344	●
5/32	5/16	2	3/16	31518	31558	39668	31345	●
11/64	5/16	2	3/16	31520	31560	39760	31346	●
*3/16	3/8	2	3/16	31522	31562	39672	31347	●
13/64	1/2	2-1/2	1/4	31524	31564	39674	31348	●
7/32	1/2	2-1/2	1/4	31526	31566	39676	31349	●
15/64	1/2	2-1/2	1/4	31528	31568	39678	31350	●
*1/4	1/2	2-1/2	1/4	31530	31570	39680	31351	●
9/32	1/2	2-1/2	5/16	31532	31572	39682	31352	●
*5/16	1/2	2-1/2	5/16	31534	31574	39684	31353	●
*3/8	9/16	2-1/2	3/8	31536	31576	39686	31354	●
7/16	9/16	2-3/4	7/16	31538	31578	39688	31355	●
*1/2	5/8	3	1/2	31540	31580	39690	31356	●
*Series 15B Set				31590	31582	39692	31357	●

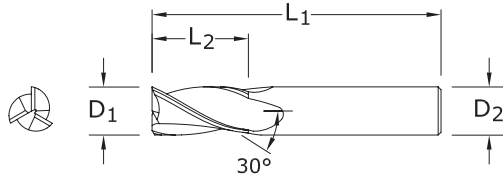
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

● U.S. Stock Standard  
 ■ NOT STOCKED—  
 Call for Delivery

# 3 Flute Square End



## 5 FRACTIONAL SERIES



**TOLERANCES (inch)**

D<sub>1</sub> = +0.0000/-0.0020  
D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

inch				EDP NO.				STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/64	1/32	1-1/2	1/8	30501	39701	30771	30811	●
1/32	5/64	1-1/2	1/8	30503	39703	30772	30812	●
3/64	7/64	1-1/2	1/8	30505	39705	30773	30813	●
1/16	3/16	1-1/2	1/8	30507	39707	30774	30814	●
5/64	3/16	1-1/2	1/8	30509	39709	30775	30815	●
3/32	9/32	1-1/2	1/8	30511	39711	30776	30816	●
7/64	3/8	1-1/2	1/8	30513	39713	30777	30817	●
1/8	3/8	1-1/2	1/8	30577	39777	30809	30849	●
1/8	1/2	1-1/2	1/8	30515	39715	30778	30818	●
9/64	1/2	2	3/16	30517	39717	30779	30819	●
5/32	1/2	2	3/16	30519	39719	30780	30820	●
11/64	5/8	2	3/16	30521	39721	30781	30821	●
3/16	5/8	2	3/16	30523	39723	30782	30822	●
13/64	5/8	2-1/2	1/4	30525	39725	30783	30823	●
7/32	5/8	2-1/2	1/4	30527	39727	30784	30824	●
15/64	3/4	2-1/2	1/4	30529	39729	30785	30825	●
1/4	3/4	2-1/2	1/4	30531	39731	30786	30826	●
17/64	3/4	2-1/2	5/16	30533	39733	30787	30827	●
9/32	3/4	2-1/2	5/16	30535	39735	30788	30828	●
19/64	13/16	2-1/2	5/16	30537	39737	30789	30829	●
5/16	13/16	2-1/2	5/16	30539	39739	30790	30830	●
21/64	1	2-1/2	3/8	30541	39741	30791	30831	●
11/32	1	2-1/2	3/8	30543	39743	30792	30832	●
23/64	1	2-1/2	3/8	30545	39745	30793	30833	●
3/8	1	2-1/2	3/8	30547	39747	30794	30834	●
25/64	1	2-3/4	7/16	30549	39749	30795	30835	●
13/32	1	2-3/4	7/16	30551	39751	30796	30836	●
27/64	1	2-3/4	7/16	30553	39753	30797	30837	●
7/16	1	2-3/4	7/16	30555	39755	30798	30838	●
29/64	1	3	1/2	30557	39757	30799	30839	●
15/32	1	3	1/2	30559	39759	30800	30840	●
31/64	1	3	1/2	30561	39761	30801	30841	●
1/2	1	3	1/2	30563	39763	30802	30842	●
9/16	1-1/8	3-1/2	9/16	30565	39765	30803	30843	●
5/8	1-1/4	3-1/2	5/8	30567	39767	30804	30844	●
11/16	1-3/8	4	3/4	30569	39769	30805	30845	●
3/4	1-1/2	4	3/4	30571	39771	30806	30846	●
7/8	1-1/2	4	7/8	30573	39773	30807	30847	●
1	1-1/2	4	1	30575	39775	30808	30848	●

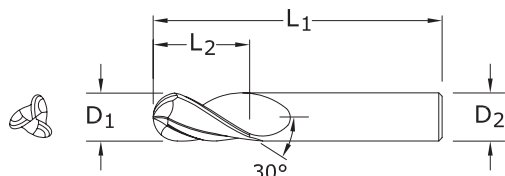
# FRACTIONAL 3 Flute Ball End



## TOLERANCES (inch)

$D_1 = +0.0000/-0.0020$

$D_2 = h_6$



# 5B

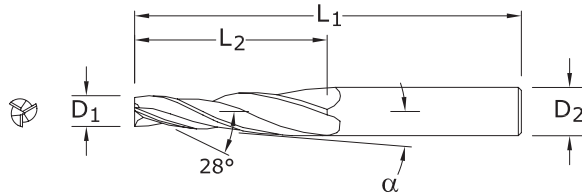
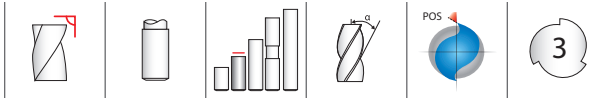
FRACTIONAL SERIES

inch				EDP NO.				STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/64	1/32	1-1/2	1/8	30502	30851	30602	31130	●
1/32	5/64	1-1/2	1/8	30504	30852	30604	31131	●
3/64	7/64	1-1/2	1/8	30506	30853	30606	31132	●
1/16	3/16	1-1/2	1/8	30508	30854	30608	31133	●
5/64	3/16	1-1/2	1/8	30510	30855	30610	31134	●
3/32	9/32	1-1/2	1/8	30512	30856	30612	31135	●
7/64	3/8	1-1/2	1/8	30514	30857	30902	31136	●
1/8	3/8	1-1/2	1/8	30578	30889	30943	31168	●
1/8	1/2	1-1/2	1/8	30516	30858	30904	31137	●
9/64	1/2	2	3/16	30518	30859	30906	31138	●
5/32	1/2	2	3/16	30520	30860	30908	31139	●
11/64	5/8	2	3/16	30522	30861	30910	31140	●
3/16	5/8	2	3/16	30524	30862	30912	31141	●
13/64	5/8	2-1/2	1/4	30526	30863	30914	31142	●
7/32	5/8	2-1/2	1/4	30528	30864	30916	31143	●
15/64	3/4	2-1/2	1/4	30530	30865	30918	31144	●
1/4	3/4	2-1/2	1/4	30532	30866	30920	31145	●
17/64	3/4	2-1/2	5/16	30534	30867	30921	31146	●
9/32	3/4	2-1/2	5/16	30536	30868	30922	31147	●
19/64	13/16	2-1/2	5/16	30538	30869	30923	31148	●
5/16	13/16	2-1/2	5/16	30540	30870	30924	31149	●
21/64	1	2-1/2	3/8	30542	30871	30925	31150	●
11/32	1	2-1/2	3/8	30544	30872	30926	31151	●
23/64	1	2-1/2	3/8	30546	30873	30927	31152	●
3/8	1	2-1/2	3/8	30548	30874	30928	31153	●
25/64	1	2-3/4	7/16	30550	30875	30929	31154	●
13/32	1	2-3/4	7/16	30552	30876	30930	31155	●
27/64	1	2-3/4	7/16	30554	30877	30931	31156	●
7/16	1	2-3/4	7/16	30556	30878	30932	31157	●
29/64	1	3	1/2	30558	30879	30933	31158	●
15/32	1	3	1/2	30560	30880	30934	31159	●
31/64	1	3	1/2	30562	30881	30935	31160	●
1/2	1	3	1/2	30564	30882	30936	31161	●
9/16	1-1/8	3-1/2	9/16	30566	30883	30937	31162	●
5/8	1-1/4	3-1/2	5/8	30568	30884	30938	31163	●
11/16	1-3/8	4	3/4	30570	30885	30939	31164	●
3/4	1-1/2	4	3/4	30572	30886	30940	31165	●
7/8	1-1/2	4	7/8	30574	30887	30941	31166	●
1	1-1/2	4	1	30576	30888	30942	31167	●
*Series 5B Set				30590	30900	30944	31169	●

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# Tapered Square End



**23**  
FRACTIONAL SERIES

**TOLERANCES (inch)**

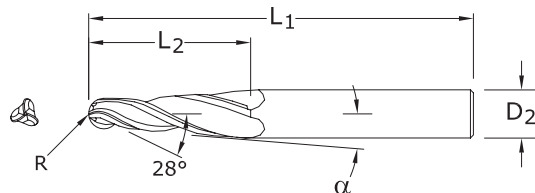
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D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

SHANK DIAMETER D <sub>2</sub>	CENTER LINE ANGLE α	SMALL DIAMETER D <sub>1</sub>	inch		EDP NO.				STOCK
			LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/4	1°	1/8	1-1/2	3	32301	32370	32302	32345	●
1/4	1°30'	1/8	1-1/2	3	32303	32371	32304	32346	●
1/4	2°	1/8	1-1/4	3	32305	32372	32306	32347	●
1/4	3°	1/8	1	3	32307	32373	32308	32348	●
1/4	5°	1/8	3/4	3	32309	32374	32310	32349	●
1/4	7°	1/8	1/2	3	32311	32375	32312	32350	●
1/4	10°	3/32	1/2	3	32313	32376	32314	32351	●
3/8	1°	3/16	1-3/4	3-1/2	32315	32377	32316	32352	●
3/8	1°30'	3/16	1-3/4	3-1/2	32317	32378	32318	32353	●
3/8	2°	3/16	1-3/4	3-1/2	32319	32379	32320	32354	●
3/8	3°	5/32	1-3/4	3-1/2	32321	32380	32322	32355	●
3/8	5°	1/8	1-1/2	3-1/2	32323	32381	32324	32356	●
3/8	7°	1/8	1	3-1/2	32325	32382	32326	32357	●
3/8	10°	1/8	3/4	3-1/2	32327	32383	32328	32358	●
1/2	1°	1/4	2	4	32329	32384	32330	32359	●
1/2	2°	1/4	2	4	32333	32385	32334	32360	●
1/2	3°	1/4	2	4	32335	32386	32336	32361	●
1/2	5°	1/4	1-1/4	4	32337	32387	32388	32362	●
1/2	7°	1/4	1-1/4	4	32339	32388	32340	32363	●
1/2	10°	1/8	1	4	32341	32389	32342	32364	●

# Tapered Radius End



**TOLERANCES (inch)**

$D_2 = h_6$   
 $R = +0.0005/-0.0010$

**24**  
 FRACTIONAL SERIES

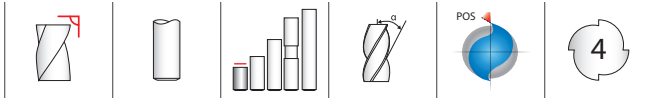
SHANK DIAMETER $D_2$	CENTER LINE ANGLE $\alpha$	inch			EDP NO.				STOCK
		RADIUS R	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/4	1°	0.062	1-1/2	3	32402	32403	32445	32470	●
1/4	1°30'	0.062	1-1/2	3	32404	32405	32446	32471	●
1/4	2°	0.062	1-1/4	3	32406	32407	32447	32472	●
1/4	3°	0.062	1	3	32408	32409	32448	32473	●
1/4	5°	0.062	3/4	3	32410	32411	32449	32474	●
1/4	7°	0.062	1/2	3	32412	32413	32450	32475	●
1/4	10°	0.047	1/2	3	32414	32415	32451	32476	●
3/8	1°	0.093	1-3/4	3-1/2	32416	32417	32452	32477	●
3/8	1°30'	0.093	1-3/4	3-1/2	32418	32419	32453	32478	●
3/8	2°	0.093	1-3/4	3-1/2	32420	32421	32454	32479	●
3/8	3°	0.078	1-3/4	3-1/2	32422	32423	32455	32480	●
3/8	5°	0.062	1-1/2	3-1/2	32424	32425	32456	32481	●
3/8	7°	0.062	1	3-1/2	32426	32427	32457	32482	●
3/8	10°	0.062	3/4	3-1/2	32428	32429	32458	32483	●
1/2	1°	0.125	2	4	32430	32431	32459	32484	●
1/2	2°	0.125	2	4	32434	32435	32460	32485	●
1/2	3°	0.125	2	4	32436	32437	32461	32486	●
1/2	5°	0.125	1-1/4	4	32438	32439	32462	32487	●
1/2	7°	0.093	1-1/4	4	32440	32441	32463	32488	●
1/2	10°	0.062	1	4	32442	32443	32464	32489	●

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

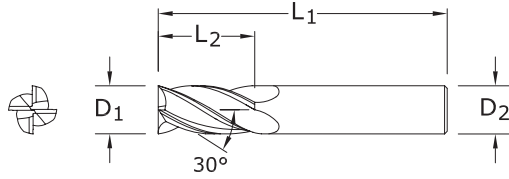
● U.S. Stock Standard  
 ■ NOT STOCKED—  
 Call for Delivery



# 4 Flute Square End Stub



**16**  
FRACTIONAL SERIES



**TOLERANCES (inch)**

$D_1 = +0.0000/-0.0020$

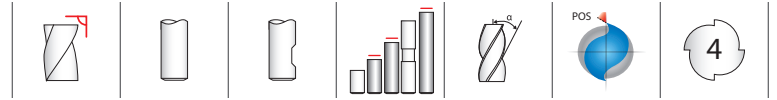
$D_2 = h_6$

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

CUTTING DIAMETER $D_1$	inch			EDP NO.				STOCK
	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/16	1/8	1-1/2	1/8	31601	31650	31238	31251	●
3/32	3/16	1-1/2	1/8	31603	31651	31239	31252	●
1/8	1/4	1-1/2	1/8	31605	31652	31240	31253	●
5/32	5/16	2	3/16	31607	31653	31241	31254	●
3/16	3/8	2	3/16	31609	31654	31242	31255	●
7/32	7/16	2	1/4	31611	31655	31243	31256	●
1/4	1/2	2	1/4	31613	31656	31244	31257	●
5/16	1/2	2	5/16	31615	31657	31245	31258	●
3/8	5/8	2	3/8	31617	31658	31246	31259	●
7/16	5/8	2-1/2	7/16	31619	31659	31247	31260	●
1/2	5/8	2-1/2	1/2	31621	31660	31248	31261	●
5/8	3/4	3	5/8	31623	31661	31249	31262	●
3/4	1	3	3/4	31625	31662	31250	31263	●

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

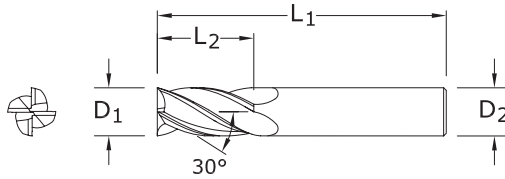
# FRACTIONAL 4 Flute End Mills



### TOLERANCES (inch)

$D_1 = -0.0010/-0.0020$

$D_2 = h_6$



## 1·1L·1EL

FRACTIONAL SERIES

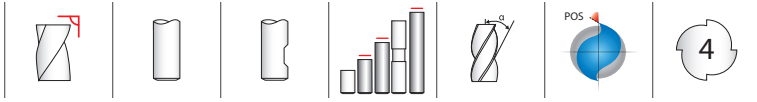
inch				EDP NO.							STOCK	SERIES
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	UNCOATED W/ FLAT	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT	Di-NAMITE (Diamond)		
1/64	1/32	1-1/2	1/8	30101	—	39101	39001	30191	—	—	●	1
1/32	5/64	1-1/2	1/8	30103	—	39103	39003	30192	—	—	●	1
3/64	7/64	1-1/2	1/8	30105	—	39105	39005	30193	—	—	●	1
1/16	3/16	1-1/2	1/8	30107	—	39107	39007	30194	—	91268	●	1
5/64	3/16	1-1/2	1/8	30109	—	39109	39009	30195	—	—	●	1
3/32	9/32	1-1/2	1/8	30111	—	39111	39011	30196	—	—	●	1
7/64	3/8	1-1/2	1/8	30113	—	39113	39013	30197	—	—	●	1
1/8	3/8	1-1/2	1/8	30177	—	39177	39077	30029	—	—	●	1
*1/8	1/2	1-1/2	1/8	30115	—	39115	39015	30198	—	91272	●	1
1/8	3/4	2-1/4	1/8	33141	—	31727	31737	31747	—	—	●	1L
1/8	1	3	1/8	33143	—	31860	31870	31880	—	—	●	1EL
9/64	1/2	2	3/16	30117	—	39117	39017	30199	—	—	●	1
5/32	1/2	2	3/16	30119	—	39119	39019	30000	—	—	●	1
11/64	5/8	2	3/16	30121	—	39121	39021	30001	—	—	●	1
*3/16	5/8	2	3/16	30123	—	39123	39023	30002	—	91276	●	1
3/16	3/4	2-1/2	3/16	33101	—	31728	31738	31748	—	—	●	1L
3/16	1-1/8	3	3/16	33121	—	31861	31871	31881	—	—	●	1EL
13/64	5/8	2-1/2	1/4	30125	—	39125	39025	30003	—	—	●	1
7/32	5/8	2-1/2	1/4	30127	—	39127	39027	30004	—	—	●	1
15/64	3/4	2-1/2	1/4	30129	—	39129	39029	30005	—	—	●	1
*1/4	3/4	2-1/2	1/4	30131	—	39131	39031	30006	—	91280	●	1
1/4	1-1/8	3	1/4	33103	—	31729	31739	31749	—	—	●	1L
1/4	1-1/2	4	1/4	33123	—	31862	31872	31882	—	—	●	1EL
17/64	3/4	2-1/2	5/16	30133	—	39133	39033	30007	—	—	●	1
9/32	3/4	2-1/2	5/16	30135	—	39135	39035	30008	—	—	●	1
19/64	13/16	2-1/2	5/16	30137	—	39137	39037	30009	—	—	●	1
*5/16	13/16	2-1/2	5/16	30139	—	39139	39039	30010	—	91284	●	1
5/16	1-1/8	3	5/16	33105	—	31730	31740	31763	—	—	●	1L
5/16	1-5/8	4	5/16	33125	—	31863	31873	31883	—	—	●	1EL
21/64	1	2-1/2	3/8	30141	—	39141	39041	30011	—	—	●	1

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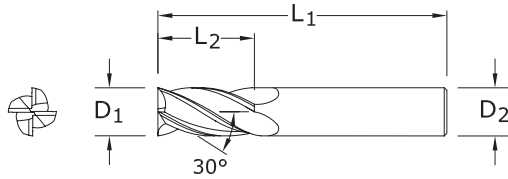
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

● U.S. Stock Standard  
 ■ NOT STOCKED—  
 Call for Delivery

# 4 Flute End Mills



**1·1L·1EL**  
FRACTIONAL SERIES



**TOLERANCES (inch)**

D<sub>1</sub> = +0.0000/-0.0020  
D<sub>2</sub> = h<sub>6</sub>

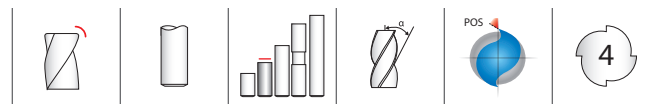
CONTINUED

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	EDP NO.								STOCK	SERIES
				UNCOATED	UNCOATED W/ FLAT	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT	Di-NAMITE (Diamond)			
11/32	1	2-1/2	3/8	30143	—	39143	39043	30012	—	—	●	1	
23/64	1	2-1/2	3/8	30145	—	39145	39045	30013	—	—	●	1	
*3/8	1	2-1/2	3/8	30147	30179	39147	39047	30014	30379	91288	●	1	
3/8	1-1/8	3	3/8	33107	—	31731	31741	31764	—	—	●	1L	
3/8	1-3/4	4	3/8	33127	—	31864	31874	31884	—	—	●	1EL	
25/64	1	2-3/4	7/16	30149	—	39149	39049	30015	—	—	●	1	
13/32	1	2-3/4	7/16	30151	—	39151	39051	30016	—	—	●	1	
27/64	1	2-3/4	7/16	30153	—	39153	39053	30017	—	—	●	1	
7/16	1	2-3/4	7/16	30155	—	39155	39055	30018	—	—	●	1	
7/16	2	4-1/2	7/16	33109	—	31732	31742	31765	—	—	●	1L	
7/16	3	6	7/16	33129	—	31865	31875	31885	—	—	●	1EL	
29/64	1	3	1/2	30157	—	39157	39057	30019	—	—	●	1	
15/32	1	3	1/2	30159	—	39159	39059	30020	—	—	●	1	
31/64	1	3	1/2	30161	—	39161	39061	30021	—	—	●	1	
1/2	1	3	1/2	30163	30180	39163	39063	30022	30380	91292	●	1	
1/2	2	4-1/2	1/2	33111	—	31733	31743	31766	—	—	●	1L	
1/2	3	6	1/2	33131	—	31866	31876	31886	—	—	●	1EL	
9/16	1-1/8	3-1/2	9/16	30165	—	39165	39065	30023	—	—	●	1	
5/8	1-1/4	3-1/2	5/8	30167	30181	39167	39067	30024	30381	—	●	1	
5/8	2-1/4	5	5/8	33113	—	31734	31744	31767	—	—	●	1L	
5/8	3	6	5/8	33133	—	31867	31877	31887	—	—	●	1EL	
11/16	1-3/8	4	3/4	30169	—	39169	39069	30025	—	—	●	1	
3/4	1-1/2	4	3/4	30171	30182	39171	39071	30026	30382	—	●	1	
3/4	2-1/4	5	3/4	33115	—	31735	31745	31768	—	—	●	1L	
3/4	3	6	3/4	33135	—	31868	31878	31888	—	—	●	1EL	
7/8	1-1/2	4	7/8	30173	—	39173	39073	30027	—	—	●	1	
1	1-1/2	4	1	30175	30183	39175	39075	30028	30383	—	●	1	
1	2-1/4	5	1	33117	—	31736	31746	31769	—	—	●	1L	
1	3	6	1	33137	—	31869	31879	31889	—	—	●	1EL	
*Series 1 Set				30189	—	39189	39089	30030	—	—	●	1	

# FRACTIONAL 4 Flute Corner Radius

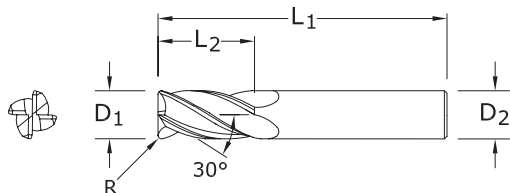


### TOLERANCES (inch)

$D_1 = -0.0010/-0.0020$

$D_2 = h_6$

$R = +0.0000/-0.0020$



**1CR**  
FRACTIONAL SERIES

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIA. $D_2$	CORNER RADIUS $R$	EDP NO.				STOCK
					UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/8*	1/2	1-1/2	1/8	.015	38001	38002	38115	38157	●
1/8*	1/2	1-1/2	1/8	.020	38003	38004	38116	38158	●
3/16*	5/8	2	3/16	.015	38009	38010	38117	38159	●
3/16*	5/8	2	3/16	.020	38011	38012	38118	38160	●
3/16*	5/8	2	3/16	.030	38013	38014	38119	38161	●
1/4*	3/4	2-1/2	1/4	.015	38019	38020	38120	38162	●
1/4*	3/4	2-1/2	1/4	.020	38021	38022	38121	38163	●
1/4*	3/4	2-1/2	1/4	.030	38023	38024	38122	38164	●
1/4*	3/4	2-1/2	1/4	.045	38025	38026	38123	38165	●
5/16*	13/16	2-1/2	5/16	.015	38031	38032	38124	38166	●
5/16*	13/16	2-1/2	5/16	.020	38033	38034	38125	38167	●
5/16*	13/16	2-1/2	5/16	.030	38035	38036	38126	38168	●
5/16*	13/16	2-1/2	5/16	.045	38037	38038	38127	38169	●
3/8	1	2-1/2	3/8	.015	38045	38046	38128	38170	●
3/8	1	2-1/2	3/8	.020	38047	38048	38129	38171	●
3/8	1	2-1/2	3/8	.030	38049	38050	38130	38172	●
3/8	1	2-1/2	3/8	.045	38051	38052	38131	38173	●
1/2	1	3	1/2	.015	38059	38060	38132	38174	●
1/2	1	3	1/2	.020	38061	38062	38133	38175	●
1/2	1	3	1/2	.030	38063	38064	38134	38176	●
1/2	1	3	1/2	.045	38065	38066	38135	38177	●
1/2	1	3	1/2	.060	38067	38068	38136	38178	●
5/8	1-1/4	3-1/2	5/8	.015	38073	38074	38137	38179	●
5/8	1-1/4	3-1/2	5/8	.020	38075	38076	38138	38180	●
5/8	1-1/4	3-1/2	5/8	.030	38077	38078	38139	38181	●
5/8	1-1/4	3-1/2	5/8	.045	38079	38080	38140	38182	●
5/8	1-1/4	3-1/2	5/8	.060	38081	38082	38141	38183	●
5/8	1-1/4	3-1/2	5/8	.090	38083	38084	38142	38184	●
3/4	1-1/2	4	3/4	.015	38087	38088	38143	38185	●
3/4	1-1/2	4	3/4	.020	38089	38090	38144	38186	●

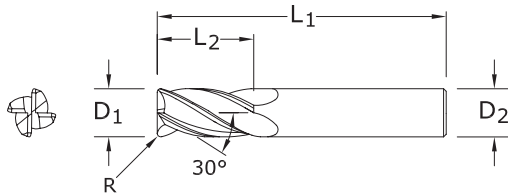
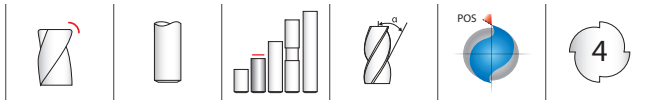
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

● U.S. Stock Standard  
 ■ NOT STOCKED—  
 Call for Delivery

\*Without Flat

continued on next page

# 4 Flute Corner Radius



**TOLERANCES (inch)**

$D_1 = -0.0010/-0.0020$

$D_2 = h_6$

$R = +0.0000/-0.0020$

**1CR**  
FRACTIONAL SERIES

CONTINUED

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			EDP NO.				STOCK
		OVERALL LENGTH $L_1$	SHANK DIA. $D_2$	CORNER RADIUS $R$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
3/4	1-1/2	4	3/4	.030	38091	38092	38145	38187	●
3/4	1-1/2	4	3/4	.045	38093	38094	38146	38188	●
3/4	1-1/2	4	3/4	.060	38095	38096	38147	38189	●
3/4	1-1/2	4	3/4	.090	38097	38098	38148	38190	●
3/4	1-1/2	4	3/4	.125	38099	38100	38149	38191	●
1	1-1/2	4	1	.015	38101	38102	38150	38192	●
1	1-1/2	4	1	.020	38103	38104	38151	38193	●
1	1-1/2	4	1	.030	38105	38106	38152	38194	●
1	1-1/2	4	1	.045	38107	38108	38153	38195	●
1	1-1/2	4	1	.060	38109	38110	38154	38196	●
1	1-1/2	4	1	.090	38111	38112	38155	38197	●
1	1-1/2	4	1	.125	38113	38114	38156	38198	●

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

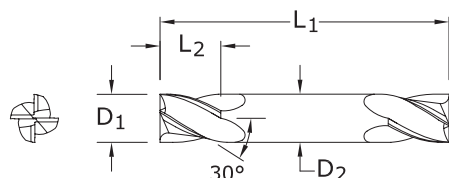
# 4 Flute Double End Mills



**TOLERANCES (inch)**

D<sub>1</sub> = +0.0000/-0.0020

D<sub>2</sub> = h<sub>6</sub>



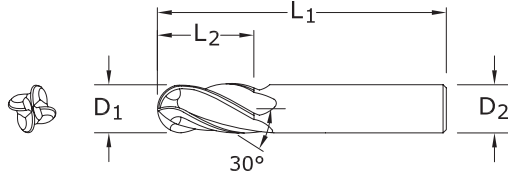
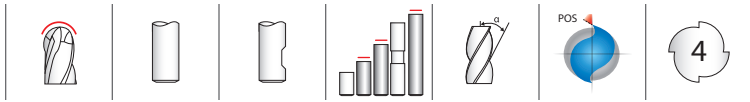
**14**  
FRACTIONAL SERIES

inch				EDP NO.				STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/32	1/16	1-1/2	1/8	31401	31441	39601	31170	●
3/64	3/32	1-1/2	1/8	31403	31443	39603	31171	●
1/16	1/8	1-1/2	1/8	31405	31445	39605	31172	●
5/64	1/8	1-1/2	1/8	31407	31447	39607	31173	●
3/32	3/16	1-1/2	1/8	31409	31449	39609	31174	●
7/64	3/16	1-1/2	1/8	31411	31451	39611	31175	●
*1/8	1/4	1-1/2	1/8	31413	31453	39613	31176	●
9/64	5/16	2	3/16	31415	31455	39615	31177	●
5/32	5/16	2	3/16	31417	31457	39617	31178	●
11/64	5/16	2	3/16	31419	31459	39619	31179	●
*3/16	3/8	2	3/16	31421	31461	39621	31180	●
13/64	1/2	2-1/2	1/4	31423	31463	39623	31181	●
7/32	1/2	2-1/2	1/4	31425	31465	39625	31182	●
15/64	1/2	2-1/2	1/4	31427	31467	39627	31183	●
*1/4	1/2	2-1/2	1/4	31429	31469	39629	31184	●
9/32	1/2	2-1/2	5/16	31431	31471	39631	31185	●
5/16	1/2	2-1/2	5/16	31433	31473	39633	31186	●
*3/8	9/16	2-1/2	3/8	31435	31475	39635	31187	●
7/16	9/16	2-3/4	7/16	31437	31477	39637	31188	●
*1/2	5/8	3	1/2	31439	31479	39639	31189	●
*Series 14 Set				31489	31481	39641	31190	●

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

● U.S. Stock Standard  
 ■ NOT STOCKED—  
 Call for Delivery

# 4 Flute Ball End



**1B•1LB•1ELB**  
FRACTIONAL SERIES

**TOLERANCES (inch)**

D<sub>1</sub> = +0.0000/-0.0020

D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

inch				EDP NO.							STOCK	SERIES
CUTTING DIA. D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIA. D <sub>2</sub>	UNCOATED	UNCOATED W/FLAT	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT	Di-NAMITE (Diamond)		
1/64	1/32	1-1/2	1/8	30102	—	39102	39002	30031	—	—	●	1B
1/32	5/64	1-1/2	1/8	30104	—	39104	39004	30032	—	—	●	1B
3/64	7/64	1-1/2	1/8	30106	—	39106	39006	30033	—	—	●	1B
1/16	3/16	1-1/2	1/8	30108	—	39108	39008	30034	—	91269	●	1B
5/64	3/16	1-1/2	1/8	30110	—	39110	39010	30035	—	—	●	1B
3/32	9/32	1-1/2	1/8	30112	—	39112	39012	30036	—	—	●	1B
7/64	3/8	1-1/2	1/8	30114	—	39114	39014	30037	—	—	●	1B
*1/8	3/8	1-1/2	1/8	30069	—	39178	39078	—	—	—	●	1B
1/8	1/2	1-1/2	1/8	30116	—	39116	39016	30038	—	91273	●	1B
1/8	3/4	2-1/4	1/8	33142	—	31770	31780	31790	—	—	●	1LB
1/8	1	3	1/8	33144	—	31900	31918	31928	—	—	●	1ELB
9/64	1/2	2	3/16	30118	—	39118	39018	30039	—	—	●	1B
5/32	1/2	2	3/16	30120	—	39120	39020	30040	—	—	●	1B
11/64	5/8	2	3/16	30122	—	39122	39022	30041	—	—	●	1B
*3/16	5/8	2	3/16	30124	—	39124	39024	30042	—	—	●	1B
3/16	3/4	2-1/2	3/16	33102	—	31771	31781	31791	—	91277	●	1LB
3/16	1-1/8	3	3/16	33122	—	31902	31919	31929	—	—	●	1ELB
13/64	5/8	2-1/2	1/4	30126	—	39126	39026	30043	—	—	●	1B
7/32	5/8	2-1/2	1/4	30128	—	39128	39028	30044	—	—	●	1B
15/64	3/4	2-1/2	1/4	30130	—	39130	39030	30045	—	—	●	1B
*1/4	3/4	2-1/2	1/4	30132	—	39132	39032	30046	—	91281	●	1B
1/4	1-1/8	3	1/4	33104	—	31772	31782	31792	—	—	●	1LB
1/4	1-1/2	4	1/4	33124	—	31904	31920	31930	—	—	●	1ELB
17/64	3/4	2-1/2	5/16	30134	—	39134	39034	30047	—	—	●	1B
9/32	3/4	2-1/2	5/16	30136	—	39136	39036	30048	—	—	●	1B
19/64	13/16	2-1/2	5/16	30138	—	39138	39038	30049	—	—	●	1B
*5/16	13/16	2-1/2	5/16	30140	—	39140	39040	30050	—	91285	●	1B
5/16	1-1/8	3	5/16	33106	—	31773	31783	31793	—	—	●	1LB
5/16	1-5/8	4	5/16	33126	—	31906	31921	31931	—	—	●	1ELB
21/64	1	2-1/2	3/8	30142	—	39142	39042	30051	—	—	●	1B
11/32	1	2-1/2	3/8	30144	—	39144	39044	30052	—	—	●	1B
23/64	1	2-1/2	3/8	30146	—	39146	39046	30053	—	—	●	1B

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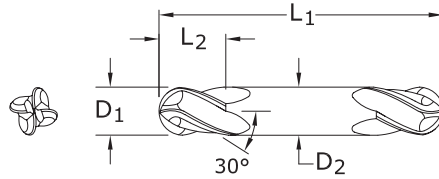
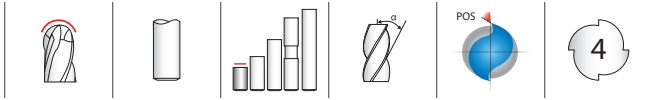
**1B•1LB•1ELB**  
FRACTIONAL SERIES

inch				EDP NO.							STOCK	SERIES
CUTTING DIA. D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIA. D <sub>2</sub>	UNCOATED	UNCOATED W/FLAT	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT	Di-NAMITE (Diamond)		
*3/8	1	2-1/2	3/8	30148	30184	39148	39048	30054	30384	91289	●	1B
3/8	1-1/8	3	3/8	33108	—	31774	31784	31794	—	—	●	1LB
3/8	1-3/4	4	3/8	33128	—	31908	31922	31932	—	—	●	1ELB
25/64	1	2-3/4	7/16	30150	—	39150	39050	30055	—	—	●	1B
13/32	1	2-3/4	7/16	30152	—	39152	39052	30056	—	—	●	1B
27/64	1	2-3/4	7/16	30154	—	39154	39054	30057	—	—	●	1B
7/16	1	2-3/4	7/16	30156	—	39156	39056	30058	—	—	●	1B
7/16	2	4-1/2	7/16	33110	—	31775	31785	31795	—	—	●	1LB
7/16	3	6	7/16	33130	—	31910	31923	31933	—	—	●	1ELB
29/64	1	3	1/2	30158	—	39158	39058	30059	—	—	●	1B
15/32	1	3	1/2	30160	—	39160	39060	30060	—	—	●	1B
31/64	1	3	1/2	30162	—	39162	39062	30061	—	—	●	1B
*1/2	1	3	1/2	30164	30185	39164	39064	30062	30385	91293	●	1B
1/2	2	4-1/2	1/2	33112	—	31776	31786	31796	—	—	●	1LB
1/2	3	6	1/2	33132	—	31912	31924	31934	—	—	●	1ELB
9/16	1-1/8	3-1/2	9/16	30166	—	39166	39066	30063	—	—	●	1B
5/8	1-1/4	3-1/2	5/8	30168	30186	39168	39068	30064	30386	—	●	1B
5/8	2-1/4	5	5/8	33114	—	31777	31787	31797	—	—	●	1LB
5/8	3	6	5/8	33134	—	31914	31925	31935	—	—	●	1ELB
11/16	1-3/8	4	3/4	30170	—	39170	39070	30065	—	—	●	1B
3/4	1-1/2	4	3/4	30172	30187	39172	39072	30066	30387	—	●	1B
3/4	2-1/4	5	3/4	33116	—	31778	31788	31798	—	—	●	1LB
3/4	3	6	3/4	33136	—	31916	31926	31936	—	—	●	1ELB
7/8	1-1/2	4	7/8	30174	—	39174	39074	30067	—	—	●	1B
1	1-1/2	4	1	30176	30188	39176	39076	30068	30388	—	●	1B
1	2-1/4	5	1	33118	—	31779	31789	31799	—	—	●	1LB
1	3	6	1	33138	—	31917	31927	31937	—	—	●	1ELB
*Series 1B Set				30190	—	39190	39090	30070	—	—	●	1B

CONTINUED



# 4 Flute Double End Ball End



**TOLERANCES (inch)**

D<sub>1</sub> = +0.0000/-0.0020  
D<sub>2</sub> = h<sub>6</sub>

## 14B

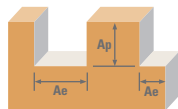
FRACTIONAL SERIES

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

inch				EDP NO.				STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/32	1/16	1-1/2	1/8	31402	31442	39602	31218	●
3/64	3/32	1-1/2	1/8	31404	31444	39604	31219	●
1/16	1/8	1-1/2	1/8	31406	31446	39606	31220	●
5/64	1/8	1-1/2	1/8	31408	31448	39608	31221	●
3/32	3/16	1-1/2	1/8	31410	31450	39610	31222	●
7/64	3/16	1-1/2	1/8	31412	31452	39612	31223	●
*1/8	1/4	1-1/2	1/8	31414	31454	39614	31224	●
9/64	5/16	2	3/16	31416	31456	39616	31225	●
5/32	5/16	2	3/16	31418	31458	39618	31226	●
11/64	5/16	2	3/16	31420	31460	39620	31227	●
*3/16	3/8	2	3/16	31422	31462	39622	31228	●
13/64	1/2	2-1/2	1/4	31424	31464	39624	31229	●
7/32	1/2	2-1/2	1/4	31426	31466	39626	31230	●
15/64	1/2	2-1/2	1/4	31428	31468	39628	31231	●
*1/4	1/2	2-1/2	1/4	31430	31470	39630	31232	●
9/32	1/2	2-1/2	5/16	31432	31472	39632	31233	●
*5/16	1/2	2-1/2	5/16	31434	31474	39634	31234	●
*3/8	9/16	2-1/2	3/8	31436	31476	39636	31235	●
7/16	9/16	2-3/4	7/16	31438	31478	39638	31236	●
*1/2	5/8	3	1/2	31440	31480	39640	31237	●
*Series 14B Set				31490	31482	39642	31217	●

# 2 Flute: Square & Ball End 4 Flute: Square & Ball End



Material	Profile	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)						
					1/8	1/4	5/16	3/8	1/2		
Diamond 1, 1B, 3, 3B Fractional	Profile	≤ 0.25	≤ 1.5	720	RPM	22003	11002	8801	7334	5501	
					Fz	0.0009	0.0023	0.0036	0.0043	0.0058	
					Feed 2 flutes (ipm)	38.3	50.6	63.4	63.1	63.8	
					Feed 3 flutes (ipm)	76.6	101.2	126.7	126.2	127.6	
					(576-864)						
	GRAPHITE Ultrafine, Superfine	Slot	≤ 1	≤ 1	580	RPM	17725	8862	7090	5908	4431
						Fz	0.0075	0.0020	0.0031	0.0038	0.0050
						Feed 2 flutes (ipm)	265.9	35.4	44.0	44.9	44.3
						Feed 3 flutes (ipm)	531.7	70.9	87.9	89.8	88.6
						(464-696)					
COMPOSITES FRP, CFRP, GRP	Profile	≤ 0.25	≤ 1.5	385	RPM	11766	5883	4706	3922	2941	
					Fz	0.0005	0.0014	0.0022	0.0026	0.0035	
					Feed 2 flutes (ipm)	12.2	16.5	20.7	20.4	20.6	
					Feed 3 flutes (ipm)	24.5	32.9	41.4	40.8	41.2	
					(308-462)						
	COMPOSITES FRP, CFRP, GRP	Slot	≤ 1	≤ 1	350	RPM	10696	5348	4278	3565	2674
						Fz	0.0005	0.0012	0.0019	0.0023	0.0030
						Feed 2 flutes (ipm)	9.6	12.8	16.3	16.4	16.0
						Feed 3 flutes (ipm)	19.3	25.7	32.5	32.8	32.1
						(280-420)					
PLASTICS Polycarbonate, PVC, Polypropylene	Profile	≤ 0.25	≤ 1.5	1200	RPM	36672	18336	14669	12224	9168	
					Fz	0.0009	0.0023	0.0036	0.0043	0.0058	
					Feed 2 flutes (ipm)	63.8	84.3	105.6	105.1	106.3	
					Feed 3 flutes (ipm)	127.6	168.7	211.2	210.3	212.7	
					(960-1440)						
	PLASTICS Polycarbonate, PVC, Polypropylene	Slot	≤ 1	≤ 1	960	RPM	29338	14669	11735	9779	7334
						Fz	0.0008	0.0020	0.0031	0.0038	0.0050
						Feed 2 flutes (ipm)	44.0	58.7	72.8	74.3	73.3
						Feed 3 flutes (ipm)	88.0	117.4	145.5	148.6	146.7
						(768-1152)					

rpm = (Vc x 3.82) / D<sub>1</sub>  
 ipm = Fz x number of flutes x rpm  
 finish cuts typically require reduced feed and cut depths (.02 x D maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

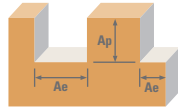
FRACTIONAL

2 Flute: Square, Double, Stub, Long, Ball, Corner Radius

3 Flute: Square, Ball, Tapered

4 Flute: Square, Double, Stub, Ball, Corner Radius

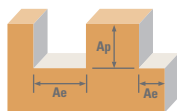
Tapered: Square, Radius



Series	Hardness	Flutes	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)									
						1/64	1/32	1/16	1/8	1/4	3/8	1/2	3/4	1	
<b>P</b> <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc		2 ≤ 0.50 ≤ 1.5 3 ≤ 0.25 ≤ 1.5 4 ≤ 0.25 ≤ 1.5	460 (368-552)	RPM	112461	56230	28115	14058	7029	4686	3514	2343	1757	
					Fz	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028	
					Feed (ipm)	6.7	6.7	7.3	8.4	11.2	14.1	14.1	11.2	9.8	
			2 1 ≤ 1 3 1 ≤ 0.5 4 1 ≤ 0.4	335 (268-402)	RPM	81901	40950	20475	10238	5119	3413	2559	1706	1280	
					Fz	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028	
					Feed (ipm)	4.9	4.9	5.3	6.1	8.2	10.2	10.2	8.2	7.2	
	<b>P</b> <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc		2 ≤ 0.50 ≤ 1.5 3 ≤ 0.25 ≤ 1.5 4 ≤ 0.25 ≤ 1.5	335 (268-402)	RPM	81901	40950	20475	10238	5119	3413	2559	1706	1280
						Fz	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
						Feed (ipm)	3.3	4.1	3.7	4.1	6.1	7.5	7.7	6.1	5.4
				2 1 ≤ 1 3 1 ≤ 0.5 4 1 ≤ 0.4	245 (196-294)	RPM	59898	29949	14974	7487	3744	2496	1872	1248	936
						Fz	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
						Feed (ipm)	2.4	3.0	2.7	3.0	4.5	5.5	5.6	4.5	3.9
<b>H</b> <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 250 Bhn or ≤ 24 HRc		2 ≤ 0.50 ≤ 1.5 3 ≤ 0.25 ≤ 1.5 4 ≤ 0.25 ≤ 1.5	315 (252-378)	RPM	77011	38506	19253	9626	4813	3209	2407	1604	1203
						Fz	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
						Feed (ipm)	3.1	3.9	3.5	3.9	5.8	7.1	7.2	5.8	5.1
				2 1 ≤ 1 3 1 ≤ 0.5 4 1 ≤ 0.4	230 (184-276)	RPM	56230	28115	14058	7029	3514	2343	1757	1171	879
						Fz	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
						Feed (ipm)	2.2	2.8	2.5	2.8	4.2	5.2	5.3	4.2	3.7
	<b>K</b> <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc		2 ≤ 0.50 ≤ 1.5 3 ≤ 0.25 ≤ 1.5 4 ≤ 0.25 ≤ 1.5	335 (268-402)	RPM	81901	40950	20475	10238	5119	3413	2559	1706	1280
						Fz	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028
						Feed (ipm)	4.9	4.9	5.3	6.1	8.2	10.2	10.2	8.2	7.2
				2 1 ≤ 1 3 1 ≤ 0.5 4 1 ≤ 0.4	245 (196-294)	RPM	59898	29949	14974	7487	3744	2496	1872	1248	936
						Fz	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028
						Feed (ipm)	3.6	3.6	3.9	4.5	6.0	7.5	7.5	6.0	5.2
<b>M</b> <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F, 440F		≤ 275 Bhn or ≤ 28 HRc		2 ≤ 0.50 ≤ 1.5 3 ≤ 0.25 ≤ 1.5 4 ≤ 0.25 ≤ 1.5	370 (296-444)	RPM	90458	45229	22614	11307	5654	3769	2827	1885	1413
						Fz	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
						Feed (ipm)	3.6	4.5	4.1	4.5	6.8	8.3	8.5	6.8	5.9
				2 1 ≤ 1 3 1 ≤ 0.5 4 1 ≤ 0.4	270 (216-324)	RPM	66010	33005	16502	8251	4126	2750	2063	1375	1031
						Fz	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
						Feed (ipm)	2.6	3.3	3.0	3.3	5.0	6.1	6.2	5.0	4.3
	<b>M</b> <b>STAINLESS STEELS</b> (DIFFICULT) 304, 304L, 316, 316L, 17-4 PH, 15-5, 13-4, Custom 450	≤ 275 Bhn or ≤ 28 HRc		2 ≤ 0.50 ≤ 1.5 3 ≤ 0.25 ≤ 1.5 4 ≤ 0.25 ≤ 1.5	255 (204-306)	RPM	62342	31171	15586	7793	3896	2598	1948	1299	974
						Fz	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017
						Feed (ipm)	2.5	2.5	2.5	2.6	3.9	4.7	4.7	3.6	3.3
				2 1 ≤ 1 3 1 ≤ 0.5 4 1 ≤ 0.4	185 (148-222)	RPM	45229	22614	11307	5654	2827	1885	1413	942	707
						Fz	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017
						Feed (ipm)	1.8	1.8	1.8	1.9	2.8	3.4	3.4	2.6	2.4

continued on next page

2 Flute: Square, Double, Stub, Long, Ball, Corner Radius  
 3 Flute: Square, Ball, Tapered  
 4 Flute: Square, Double, Stub, Ball, Corner Radius  
 Tapered: Square, Radius



Series  
 1, 3, 5, 14, 15, 16,  
 17, 23, 24, 59  
 Fractional

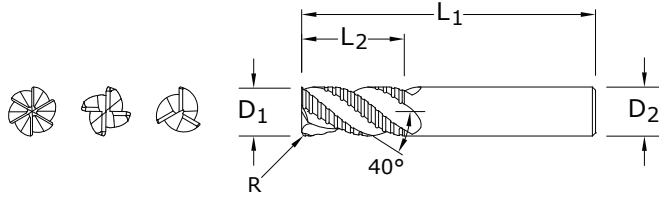
Diameter (D<sub>1</sub>)  
 (inch)

Series	Hardness	Flutes	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)											
						1/64	1/32	1/16	1/8	1/4	3/8	1/2	3/4	1			
S SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, 718, Incoloy 800, Monel 400, Rene, Waspalloy	≤ 300 Bhn or ≤ 32 HRc	Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	65	RPM	15891	7946	3973	1986	993	662	497	331	248		
						Fz	0.00002	0.00003	0.00006	0.0002	0.0004	0.0008	0.0010	0.0012	0.0014		
						Feed (ipm)	0.6	0.5	0.5	0.7	0.7	1.1	1.0	0.8	0.7		
		Slot	2 1 ≤ 1	3 1 ≤ 0.5	4 1 ≤ 0.4	45	RPM	11002	5501	2750	1375	688	458	344	229	172	
							Fz	0.00002	0.00003	0.00006	0.0002	0.0004	0.0008	0.0010	0.0012	0.0014	
							Feed (ipm)	0.4	0.3	0.3	0.5	0.5	0.7	1.1	1.0	0.8	0.7
	TITANIUM ALLOYS Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti10Al2Fe3Al, Ti5Al53Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti152Cr3Sn3Al	≤ 350 Bhn or ≤ 38 HRc	Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	180	RPM	44006	22003	11002	5501	2750	1834	1375	917	688	
							Fz	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017	
							Feed (ipm)	2.6	2.6	2.6	3.3	4.1	5.0	5.0	3.9	3.5	
			Slot	2 1 ≤ 1	3 1 ≤ 0.5	4 1 ≤ 0.4	130	RPM	31782	15891	7946	3973	1986	1324	993	662	497
								Fz	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017
								Feed (ipm)	1.3	1.3	1.3	1.6	2.0	2.4	2.4	1.9	1.7
N ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075	≤ 150 Bhn or ≤ 7 HRc	Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	880	RPM	215142	107571	53786	26893	13446	8964	6723	4482	3362		
						Fz	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056		
						Feed (ipm)	25.8	28.0	26.9	32.3	43.0	53.8	53.8	43.0	37.6		
		Slot	2 1 ≤ 1	3 1 ≤ 0.5	640	RPM	156467	78234	39117	19558	9779	6519	4890	3260	2445		
						Fz	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056		
						Feed (ipm)	18.8	20.3	19.6	23.5	31.3	39.1	39.1	31.3	27.4		
	COPPER ALLOYS Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	485	RPM	118573	59286	29643	14822	7411	4941	3705	2470	1853	
							Fz	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028	
							Feed (ipm)	7.1	7.1	7.7	8.9	11.9	14.8	14.8	11.9	10.4	
			Slot	2 1 ≤ 1	3 1 ≤ 0.5	350	RPM	85568	42784	21392	10696	5348	3565	2674	1783	1337	
							Fz	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028	
							Feed (ipm)	5.1	5.1	5.6	6.4	8.6	10.7	10.7	8.6	7.5	
N PLASTICS Polycarbonate, PVC, Polypropylene	≤ 140 Bhn or ≤ 3 HRc	Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	880	RPM	215142	107571	53786	26893	13446	8964	6723	4482	3362		
						Fz	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056		
						Feed (ipm)	25.8	28.0	26.9	32.3	43.0	53.8	53.8	43.0	37.6		
		Slot	2 1 ≤ 1	3 1 ≤ 0.5	640	RPM	156467	78234	39117	19558	9779	6519	4890	3260	2445		
						Fz	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056		
						Feed (ipm)	18.8	20.3	19.6	23.5	31.3	39.1	39.1	31.3	27.4		
	GRAPHITE	≤ 140 Bhn or ≤ 3 HRc	Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	660	RPM	161357	80678	40339	20170	10085	6723	5042	3362	2521	
							Fz	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056	
							Feed (ipm)	19.4	21.0	20.2	24.2	32.3	40.3	40.3	32.3	28.2	
			Slot	2 1 ≤ 1	3 1 ≤ 0.5	480	RPM	117350	58675	29338	14669	7334	4890	3667	2445	1834	
							Fz	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056	
							Feed (ipm)	14.1	15.3	14.7	17.6	23.5	29.3	29.3	23.5	20.5	

Bhn (Brinell)      HRc (Rockwell C)  
 rpm = (Vc x 3.82) / D<sub>1</sub>  
 ipm = Fz x number of flutes x rpm  
 reduce speed and feed for materials harder than listed  
 for tapered end mills, base the speed on the largest diameter contacting  
 the workpiece and the feed on the smallest diameter

limit cut depths of long and extra long flute mills to .05 x D<sub>1</sub> when slotting  
 or profiling  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information  
 (www.kyocera-sgstool.com)

# Single End Roughers



**62**  
FRACTIONAL SERIES

**TOLERANCES (inch)**

$D_1 = +0.0000/-0.0040$

$D_2 = h_6$

$R = +0.0050/-0.0050$

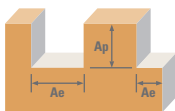
inch						EDP NO.			STOCK
CUTTING DIA. $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIA. $D_2$	CORNER RADIUS $R$	NO. OF FLUTES	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/4*	3/4	2-1/2	1/4	.045	3	36207	36206	36210	●
5/16*	3/4	2-1/2	5/16	.045	3	36209	36208	36211	●
3/8	7/8	2-1/2	3/8	.060	3	36213	36212	36214	●
1/2	1	3	1/2	.060	4	36217	36216	36218	●
5/8	1-1/4	3-1/2	5/8	.060	4	36221	36220	36222	●
3/4	1-5/8	4	3/4	.060	4	36225	36224	36226	●
1	1-3/4	4	1	.060	6	36229	36228	36230	●









\*Without Flat

- STAINLESS STEELS
- HIGH TEMP ALLOYS
- TITANIUM

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# Single End Roughers



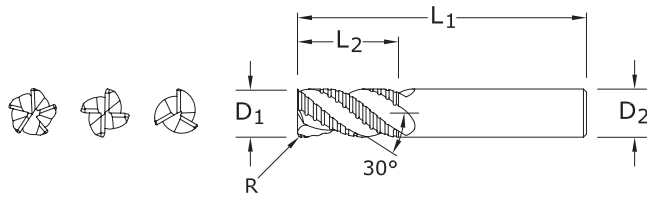
Series 62	Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)						
						1/4	3/8	1/2	3/4	1		
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	405	RPM	6188	4126	3094	2063	1547
						(324-486)	Fz	0.0006	0.0011	0.0015	0.0019	0.0021
						Feed (ipm)	11.1	13.6	18.6	15.7	19.5	
			Slot 	1	≤ 1	325	RPM	4966	3311	2483	1655	1242
						(260-390)	Fz	0.0006	0.0011	0.0015	0.0019	0.0021
						Feed (ipm)	8.9	10.9	14.9	12.6	15.6	
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L, 17-4PH, 15-5PH, 13-4PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	280	RPM	4278	2852	2139	1426	1070
						(224-336)	Fz	0.0005	0.0009	0.0012	0.0015	0.0017
						Feed (ipm)	6.4	7.7	10.3	8.6	10.9	
			Slot 	1	≤ 1	225	RPM	3438	2292	1719	1146	860
						(180-270)	Fz	0.0005	0.0009	0.0012	0.0015	0.0017
						Feed (ipm)	5.2	6.2	8.3	6.9	8.8	
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspalloy	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.5	≤ 1.5	70	RPM	1070	713	535	357	267
						(56-84)	Fz	0.0004	0.0008	0.0010	0.0013	0.0014
						Feed (ipm)	1.3	1.7	2.1	1.9	2.2	
			Slot 	1	≤ 1	56	RPM	856	570	428	285	214
						(45-67)	Fz	0.0004	0.0008	0.0010	0.0013	0.0014
						Feed (ipm)	1.0	1.4	1.7	1.5	1.8	
	TITANIUM ALLOYS Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti10Al2Fe3Al, Ti5Al3Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti152 Cr3Sn3Al	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.5	≤ 1.5	155	RPM	2368	1579	1184	789	592
						(124-186)	Fz	0.0005	0.0009	0.0012	0.0015	0.0017
						Feed (ipm)	3.6	4.3	5.7	4.7	6.0	
			Slot 	1	≤ 1	195	RPM	2980	1986	1490	993	745
						(156-234)	Fz	0.0005	0.0009	0.0012	0.0015	0.0017
						Feed (ipm)	4.5	5.4	7.2	6.0	7.6	

Bhn (Brinell)    HRc (Rockwell C)  
 rpm = (Vc x 3.82) / D<sub>1</sub>  
 ipm = Fz x number of flutes x rpm  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# Single End Roughers



## 61 FRACTIONAL SERIES



**TOLERANCES (inch)**

$D_1 = +0.0000/-0.0040$

$D_2 = h_6$

$R = +0.0050/-0.0050$

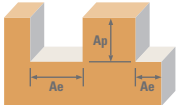
inch						EDP NO.			STOCK
CUTTING DIA. $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIA. $D_2$	CORNER RADIUS $R$	NO. OF FLUTES	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/4*	3/4	2-1/2	1/4	.045	3	36107	36106	36110	●
5/16*	3/4	2-1/2	5/16	.045	3	36109	36108	36111	●
3/8	7/8	2-1/2	3/8	.060	3	36113	36112	36114	●
1/2	1	3	1/2	.060	4	36117	36116	36118	●
5/8	1-1/4	3-1/2	5/8	.060	4	36121	36120	36222	●
3/4	1-5/8	4	3/4	.060	4	36125	36124	36126	●
1	1-3/4	4	1	.060	5	36129	36128	36130	●









\*Without Flat

- STEELS
- CAST IRON
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# Single End Roughers

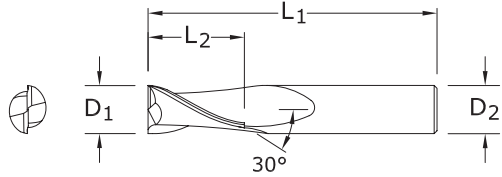
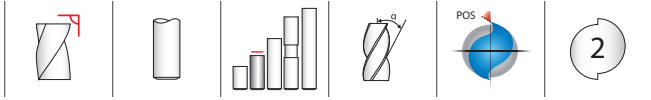


Series 61	Fractional	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)						
						1/4	3/8	1/2	3/4	1		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	Profile 	≤ 0.5	≤ 1.5	500	RPM	7640	5093	3820	2547	1910
						(400-600)	Fz	0.0006	0.0011	0.0014	0.0017	0.0020
							Feed (ipm)	13.8	16.8	21.4	17.3	19.1
			Slot 	1	≤ 1	400	RPM	6112	4075	3056	2037	1528
						(320-480)	Fz	0.0006	0.0011	0.0014	0.0017	0.0020
							Feed (ipm)	11.0	13.4	17.1	13.9	15.3
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HR	Profile 	≤ 0.5	≤ 1.5	365	RPM	5577	3718	2789	1859	1394
						(292-438)	Fz	0.0004	0.0008	0.0011	0.0013	0.0015
							Feed (ipm)	6.7	8.9	12.3	9.7	10.5
			Slot 	1	≤ 1	295	RPM	4508	3005	2254	1503	1127
						(236-354)	Fz	0.0004	0.0008	0.0011	0.0013	0.0015
							Feed (ipm)	5.4	7.2	9.9	7.8	8.5
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250 Bhn or ≤ 24 HRc	Profile 	≤ 0.5	≤ 1.5	345	RPM	5272	3514	2636	1757	1318
						(276-414)	Fz	0.0006	0.0009	0.0015	0.0018	0.0021
							Feed (ipm)	9.5	9.5	15.8	12.7	13.8
			Slot 	1	≤ 1	275	RPM	4202	2801	2101	1401	1051
						(220-330)	Fz	0.0006	0.0009	0.0015	0.0018	0.0021
							Feed (ipm)	7.6	7.6	12.6	10.1	11.0
K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile 	≤ 0.5	≤ 1.5	365	RPM	5577	3718	2789	1859	1394
						(292-438)	Fz	0.0008	0.0015	0.0020	0.0024	0.0028
							Feed (ipm)	13.4	16.7	22.3	17.8	19.5
			Slot 	1	≤ 1	295	RPM	4508	3005	2254	1503	1127
						(236-354)	Fz	0.0008	0.0015	0.0020	0.0024	0.0028
							Feed (ipm)	10.8	13.5	18.0	14.4	15.8

Bhn (Brinell)      HRc (Rockwell C)  
 rpm = (Vc x 3.82) / D<sub>1</sub>  
 ipm = Fz x number of flutes x rpm  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



# 2 Flute High Shear End Mills



**52**  
FRACTIONAL SERIES

**TOLERANCES (inch)**

$D_1 = +0.0000/-0.0020$

$D_2 = h_6$

NON-FERROUS

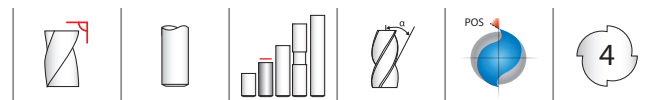
PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.		STOCK
				UNCOATED	Ti-NAMITE-C (TiCN)	
1/16	3/16	1-1/2	1/8	35273	35300	●
3/32	3/8	1-1/2	1/8	35275	35301	●
1/8	7/16	1-1/2	1/8	35277	35302	●
5/32	9/16	2	3/16	35278	35303	●
3/16	9/16	2	3/16	35279	35304	●
7/32	5/8	2-1/2	1/4	35280	35305	●
1/4	3/4	2-1/2	1/4	35281	35306	●
9/32	3/4	2-1/2	5/16	35282	35307	●
5/16	13/16	2-1/2	5/16	35283	35308	●
3/8	7/8	2-1/2	3/8	35285	35309	●
7/16	1	2-3/4	7/16	35287	35310	●
1/2	1	3	1/2	35289	35311	●
9/16	1-1/8	3-1/2	9/16	35291	35312	●
5/8	1-1/4	3-1/2	5/8	35293	35313	●
3/4	1-1/2	4	3/4	35295	35314	●
1	1-1/2	4	1	35297	35315	●

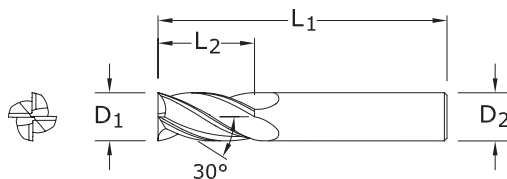
# 4 Flute High Shear End Mills



**TOLERANCES (inch)**

D1 = +0.0000/-0.0020

D2 = h<sub>6</sub>



**54**  
FRACTIONAL SERIES

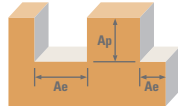
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	EDP NO.		STOCK
				UNCOATED	Ti-NAMITE-C (TiCN)	
1/16	3/16	1-1/2	1/8	35473	35500	●
3/32	3/8	1-1/2	1/8	35475	35501	●
1/8	7/16	1-1/2	1/8	35477	35502	●
5/32	9/16	2	3/16	35478	35503	●
3/16	9/16	2	3/16	35479	35504	●
7/32	5/8	2-1/2	1/4	35480	35505	●
1/4	3/4	2-1/2	1/4	35481	35506	●
9/32	3/4	2-1/2	5/16	35482	35507	●
5/16	13/16	2-1/2	5/16	35483	35508	●
3/8	7/8	2-1/2	3/8	35485	35509	●
7/16	1	2-3/4	7/16	35487	35510	●
1/2	1	3	1/2	35489	35511	●
9/16	1-1/8	3-1/2	9/16	35491	35512	●
5/8	1-1/4	3-1/2	5/8	35493	35513	●
3/4	1-1/2	4	3/4	35495	35514	●
1	1-1/2	4	1	35497	35515	●

- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

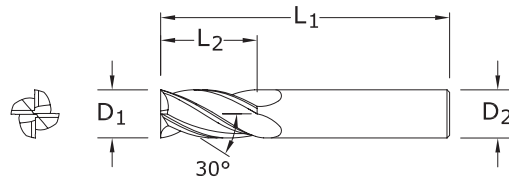
# 2 Flute: High Shear End Mills

## 4 Flute: High Shear End Mills



Series 52, 54 Fractional	Hardness	Flutes	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)							
						1/8	1/4	3/8	1/2	3/4	1		
ALUMINUM ALLOYS 2024, 5052, 5086, 6061, 6063, 7075	≤ 150 Bhn or ≤ 7 HRc	Profile	2	≤ 0.3	≤ 1.5	1360	RPM	41562	20781	13854	10390	6927	5195
						(1088-1632)	Fz	0.00069	0.0018	0.0034	0.0046	0.0055	0.0064
						Feed (ipm)	57.4	74.8	94.2	95.6	76.2	66.5	
		4	≤ 0.3	≤ 1.5	1090	RPM	33310	16655	11103	8328	5552	4164	
					(872-1308)	Fz	0.00063	0.0017	0.0032	0.0042	0.0050	0.0059	
					Feed (ipm)	42.0	56.6	71.1	70.0	55.5	49.1		
	Slot	2	1	≤ 1	410	RPM	12530	6265	4177	3132	2088	1566	
					(328-492)	Fz	0.00063	0.0017	0.0032	0.0042	0.0050	0.0059	
					Feed (ipm)	15.8	21.3	26.7	26.3	20.9	18.5		
		4	1	≤ 0.25	590	RPM	18030	9015	6010	4508	3005	2254	
					(472-708)	Fz	0.00039	0.0010	0.0020	0.0026	0.0031	0.0037	
					Feed (ipm)	14.1	18.0	24.0	23.4	18.6	16.7		
COPPER ALLOYS Aluminum Bronze, Muntz Brass, Naval, Brass, Red Brass	≤ 140 Bhn or ≤ 3 HRc	Profile	2	≤ 0.3	≤ 1.5	475	RPM	14516	7258	4839	3629	2419	1815
						(380-570)	Fz	0.00036	0.0010	0.0018	0.0024	0.0029	0.0034
						Feed (ipm)	10.5	14.5	17.4	17.4	14.0	12.3	
		4	1	≤ 0.25	235	RPM	7182	3591	2394	1795	1197	898	
					(188-282)	Fz	0.00039	0.0010	0.0020	0.0026	0.0031	0.0037	
					Feed (ipm)	5.6	7.2	9.6	9.3	7.4	6.6		
	Slot	2	1	≤ 1	190	RPM	5806	2903	1935	1452	968	726	
					(152-228)	Fz	0.00036	0.0010	0.0018	0.0024	0.0029	0.0034	
					Feed (ipm)	4.2	5.8	7.0	7.0	5.6	4.9		
		4	1	≤ 0.25	1600	RPM	48896	24448	16299	12224	8149	6112	
					(1280-1920)	Fz	0.00110	0.0030	0.0056	0.0074	0.0089	0.0100	
					Feed (ipm)	107.6	146.7	182.5	180.9	145.1	122.2		
PLASTICS ABS, Polycarbonate, PVC, Polypropylene	≤ 200 Bhn or ≤ 23 HRc	Profile	2	≤ 0.3	≤ 1.5	1280	RPM	39117	19558	13039	9779	6519	4890
						(1024-1536)	Fz	0.00100	0.0027	0.0051	0.0068	0.0082	0.0095
						Feed (ipm)	78.2	105.6	133.0	133.0	106.9	92.9	
		4	1	≤ 0.25	720	RPM	22003	11002	7334	5501	3667	2750	
					(576-864)	Fz	0.00082	0.0022	0.0041	0.0055	0.0065	0.0076	
					Feed (ipm)	36.1	48.4	60.1	60.5	47.7	41.8		
	Slot	2	1	≤ 1	575	RPM	17572	8786	5857	4393	2929	2197	
					(460-690)	Fz	0.00075	0.0020	0.0037	0.0050	0.0060	0.0070	
					Feed (ipm)	26.4	35.1	43.3	43.9	35.1	30.8		
		4	1	≤ 0.25	720	RPM	22003	11002	7334	5501	3667	2750	
					(576-864)	Fz	0.00082	0.0022	0.0041	0.0055	0.0065	0.0076	
					Feed (ipm)	36.1	48.4	60.1	60.5	47.7	41.8		
PLASTICS Fiberglass, Glass Filled	Profile	2	≤ 0.3	≤ 1.5	720	RPM	22003	11002	7334	5501	3667	2750	
					(576-864)	Fz	0.00082	0.0022	0.0041	0.0055	0.0065	0.0076	
					Feed (ipm)	36.1	48.4	60.1	60.5	47.7	41.8		
	4	≤ 0.3	≤ 1.5	575	RPM	17572	8786	5857	4393	2929	2197		
				(460-690)	Fz	0.00075	0.0020	0.0037	0.0050	0.0060	0.0070		
				Feed (ipm)	26.4	35.1	43.3	43.9	35.1	30.8			
4	1	≤ 0.25	720	RPM	22003	11002	7334	5501	3667	2750			
			(576-864)	Fz	0.00082	0.0022	0.0041	0.0055	0.0065	0.0076			
			Feed (ipm)	36.1	48.4	60.1	60.5	47.7	41.8				

Bhn (Brinell)    HRc (Rockwell C)    HRb (Rockwell B)  
 rpm = (Vc x 3.82) / D<sub>1</sub>  
 ipm = Fz x number of flutes x rpm  
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information (www.kyocera-sgstool.com)



CUTTING DIAMETER $D_1$	SINGLE END LENGTH OF CUT $L_2$	DOUBLE END LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$
1/8	1/2	1/4	1-1/2	1/8
3/16	5/8	3/8	2	3/16
1/4	3/4	1/2	2-1/2	1/4
5/16	13/16	1/2	2-1/2	5/16
3/8	1	9/16	2-1/2	3/8
1/2	1	5/8	3	1/2

## Square End

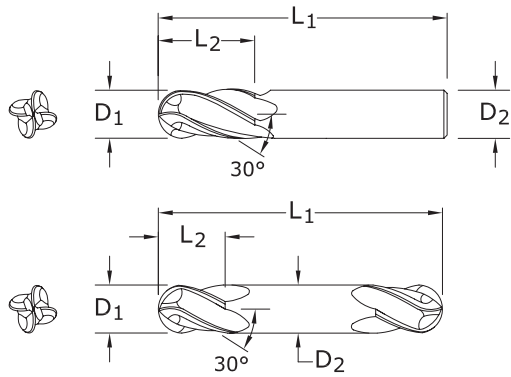
FRACTIONAL SERIES

DESCRIPTION	EDP NO.				STOCK
	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
Series 1 – 4 Flute, Single End	30189	39189	39089	30030	●
Series 3 – 2 Flute, Single End	30389	39389	39589	30470	●
Series 5 – 3 Flute, Single End	30589	39789	30810	30850	●
Series 14 – 4 Flute, Double End	31489	31481	39641	31190	●
Series 15 – 2 Flute, Double End	31589	31581	39691	31336	●



- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# End Mills Sets



CUTTING DIAMETER D <sub>1</sub>	SINGLE END LENGTH OF CUT L <sub>2</sub>	DOUBLE END LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>
1/8	1/2	1/4	1-1/2	1/8
3/16	5/8	3/8	2	3/16
1/4	3/4	1/2	2-1/2	1/4
5/16	13/16	1/2	2-1/2	5/16
3/8	1	9/16	2-1/2	3/8
1/2	1	5/8	3	1/2

## Ball End

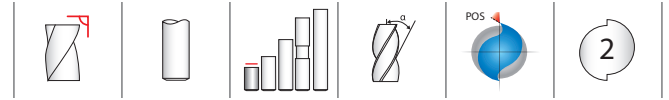
FRACTIONAL SERIES



- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

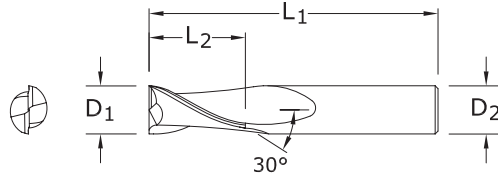
DESCRIPTION	EDP NO.				STOCK
	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
Series 1B – 4 Flute, Single End	30190	39109	39090	30070	●
Series 3B – 2 Flute, Single End	30390	39390	39590	30600	●
Series 5B – 3 Flute, Single End	30590	30900	30944	31169	●
Series 14B – 4 Flute, Double End	31490	31482	39642	31217	●
Series 15B – 2 Flute, Double End	31590	31582	39692	31357	●

# 2 Flute Square End Stub



**TOLERANCES (mm)**

$D_1 = +0,000/-0,050$   
 $D_2 = h_6$



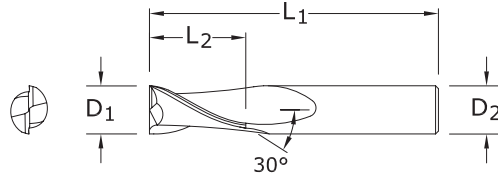
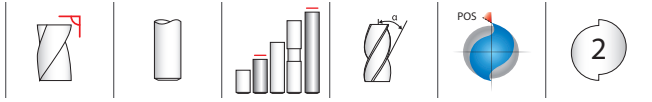
**17M**  
 METRIC SERIES

mm				EDP NO.				STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1,0	2,0	38,0	3,0	41705	49262	49283	49304	●
1,5	3,0	38,0	3,0	41709	49263	49284	49305	●
2,0	4,0	38,0	3,0	41713	49264	49285	49306	●
2,5	5,0	38,0	3,0	41717	49265	49286	49307	●
3,0	6,0	38,0	3,0	41721	49266	49287	49308	●
3,5	7,0	50,0	4,0	41725	49267	49288	49309	●
4,0	8,0	50,0	4,0	41729	49268	49289	49310	●
4,5	9,5	50,0	4,5	41733	49269	49290	49311	●
5,0	10,0	50,0	5,0	41737	49270	49291	49312	●
6,0	12,0	50,0	6,0	41741	49271	49292	49313	●
7,0	12,0	50,0	8,0	41745	49272	49293	49314	●
8,0	12,0	50,0	8,0	41749	49273	49294	49315	●
9,0	14,0	50,0	9,0	41753	49274	49295	49316	●
10,0	16,0	50,0	10,0	41757	49275	49296	49317	●
11,0	19,0	63,0	12,0	41761	49276	49297	49318	●
12,0	19,0	63,0	12,0	41765	49277	49298	49319	●

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

● U.S. Stock Standard  
 ■ NOT STOCKED—  
 Call for Delivery

# 2 Flute Square End



**3M•3XLM**  
METRIC SERIES

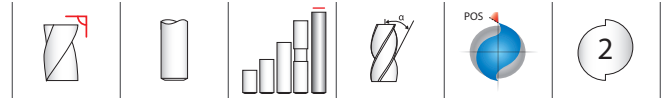
**TOLERANCES (mm)**  
D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

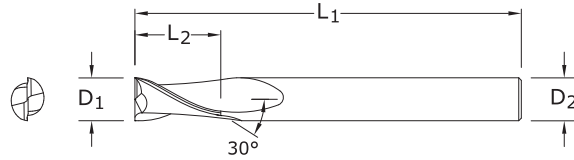
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	EDP NO.				STOCK	SERIES
				UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)		
1,0	4,0	38,0	3,0	40305	48628	48650	48671	●	3M
1,5	4,5	38,0	3,0	40309	48629	48651	48672	●	3M
2,0	6,3	38,0	3,0	40313	48630	48652	48673	●	3M
2,5	9,5	38,0	3,0	40317	48631	48653	48674	●	3M
3,0	12,0	38,0	3,0	40321	48632	48654	48675	●	3M
3,0	25,0	75,0	3,0	43301	49427	49440	49453	●	3XLM
3,5	12,0	50,0	4,0	40325	48633	48655	48676	●	3M
4,0	14,0	50,0	4,0	40329	48634	48656	48677	●	3M
4,0	25,0	75,0	4,0	43303	49428	49441	49454	●	3XLM
4,5	16,0	50,0	6,0	40333	48635	48657	48678	●	3M
5,0	16,0	50,0	6,0	40337	48636	48658	48679	●	3M
5,0	25,0	75,0	5,0	43307	49430	49443	49456	●	3XLM
6,0	19,0	50,0	6,0	40341	48637	48659	48680	●	3M
6,0	25,0	75,0	6,0	43305	49429	49442	49455	●	3XLM
7,0	19,0	63,0	8,0	40345	48638	48660	48681	●	3M
8,0	20,0	63,0	8,0	40349	48639	48661	48682	●	3M
8,0	25,0	75,0	8,0	43315	49431	49444	49457	●	3XLM
9,0	22,0	75,0	10,0	40353	48640	48662	48683	●	3M
10,0	22,0	75,0	10,0	40357	48641	48663	48684	●	3M
10,0	38,0	100,0	10,0	43325	49432	49445	49458	●	3XLM
11,0	25,0	75,0	12,0	40361	48642	48664	48685	●	3M
12,0	25,0	75,0	12,0	40365	48643	48665	48686	●	3M
12,0	50,0	100,0	12,0	43335	49433	49446	49459	●	3XLM
12,0	75,0	150,0	12,0	43345	49434	49447	49460	●	3XLM
14,0	32,0	89,0	14,0	40369	48644	48666	48687	●	3M
14,0	75,0	150,0	14,0	43355	49435	49448	49461	●	3XLM
16,0	32,0	89,0	16,0	40373	48645	48667	48688	●	3M
16,0	75,0	150,0	16,0	43365	49436	49449	49462	●	3XLM
18,0	38,0	100,0	18,0	40377	48646	48668	48689	●	3M
18,0	75,0	150,0	18,0	43375	49437	49450	49463	●	3XLM
20,0	38,0	100,0	20,0	40381	48647	48669	48690	●	3M
20,0	75,0	150,0	20,0	43385	49438	49451	49464	●	3XLM
25,0	38,0	100,0	25,0	40385	48648	48670	48691	●	3M
25,0	75,0	150,0	25,0	43395	49439	49452	49465	●	3XLM

# 2 Flute Square End Long Reach



**TOLERANCES (mm)**

$D_1 = +0,000/-0,050$   
 $D_2 = h_6$



**59M**  
 METRIC SERIES

mm				EDP NO.				STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
3,0	9,0	60,0	6,0	43910	43920	43930	43950	●
4,0	12,0	70,0	6,0	43911	43921	43931	43951	●
6,0	15,0	80,0	6,0	43912	43922	43932	43952	●
8,0	20,0	89,0	8,0	43913	43923	43933	43953	●
10,0	25,0	100,0	10,0	43914	43924	43934	43954	●
12,0	30,0	110,0	12,0	43915	43925	43935	43955	●
14,0	35,0	120,0	16,0	43916	43926	43936	43956	●
16,0	40,0	120,0	16,0	43917	43927	43937	43957	●
18,0	40,0	130,0	20,0	43918	43928	43938	43958	●
20,0	45,0	130,0	20,0	43919	43929	43939	43959	●

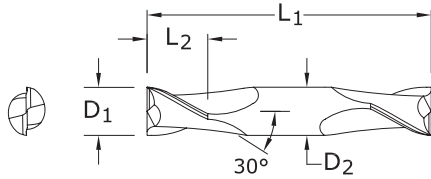
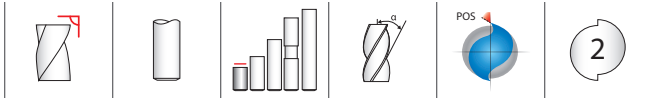
Neck Option Available

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



# 2 Flute Double End Mills



**15M**  
METRIC SERIES

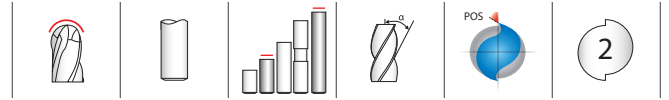
**TOLERANCES (mm)**  
D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

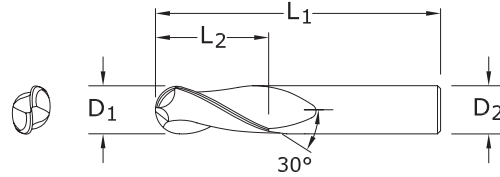
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	EDP NO.				STOCK
				UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1,0	2,0	38,0	3,0	41505	49010	49031	49052	●
1,5	3,0	38,0	3,0	41509	49011	49032	49053	●
2,0	4,0	38,0	3,0	41513	49012	49033	49054	●
2,5	5,0	38,0	3,0	41517	49013	49034	49055	●
3,0	6,0	38,0	3,0	41521	49014	49035	49056	●
3,5	7,0	50,0	4,0	41525	49015	49036	49057	●
4,0	8,0	50,0	4,0	41529	49016	49037	49058	●
4,5	9,5	63,0	4,5	41533	49017	49038	49059	●
5,0	10,0	63,0	5,0	41537	49018	49039	49060	●
6,0	12,0	63,0	6,0	41541	49019	49040	49061	●
7,0	12,0	63,0	8,0	41545	49020	49041	49062	●
8,0	12,0	63,0	8,0	41549	49021	49042	49063	●
9,0	14,0	75,0	9,0	41553	49022	49043	49064	●
10,0	14,0	75,0	10,0	41557	49023	49044	49065	●
11,0	14,0	75,0	12,0	41561	49024	49045	49066	●
12,0	16,0	75,0	12,0	41565	49025	49046	49067	●

# 2 Flute Ball End



**TOLERANCES (mm)**

D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>



## 3MB•3XLMB

METRIC SERIES

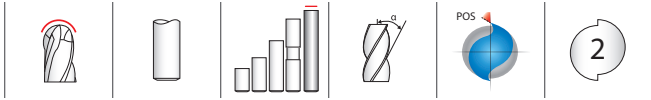
mm				EDP NO.				STOCK	SERIES
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)		
1,0	4,0	38,0	3,0	40306	48692	48714	48735	●	3MB
1,5	4,5	38,0	3,0	40310	48693	48715	48736	●	3MB
2,0	6,3	38,0	3,0	40314	48694	48716	48737	●	3MB
2,5	9,5	38,0	3,0	40318	48695	48717	48738	●	3MB
3,0	12,0	38,0	3,0	40322	48696	48718	48739	●	3MB
3,0	25,0	75,0	3,0	43302	49544	49557	49570	●	3XLMB
3,5	12,0	50,0	4,0	40326	48697	48719	48740	●	3MB
4,0	14,0	50,0	4,0	40330	48698	48720	48741	●	3MB
4,0	25,0	75,0	4,0	43304	49545	49558	49571	●	3XLMB
4,5	16,0	50,0	6,0	40334	48699	48721	48742	●	3MB
5,0	16,0	50,0	6,0	40338	48700	48722	48743	●	3MB
5,0	25,0	75,0	5,0	43308	49547	49560	49573	●	3XLMB
6,0	19,0	50,0	6,0	40342	48701	48723	48744	●	3MB
6,0	25,0	75,0	6,0	43306	49546	49559	49572	●	3XLMB
7,0	19,0	63,0	8,0	40346	48702	48724	48745	●	3MB
8,0	20,0	63,0	8,0	40350	48703	48725	48746	●	3MB
8,0	25,0	75,0	8,0	43316	49548	49561	49574	●	3XLMB
9,0	22,0	75,0	10,0	40354	48704	48726	48747	●	3MB
10,0	22,0	75,0	10,0	40358	48705	48727	48748	●	3MB
10,0	38,0	100,0	10,0	43326	49549	49562	49575	●	3XLMB
11,0	25,0	75,0	12,0	40362	48706	48728	48749	●	3MB
12,0	25,0	75,0	12,0	40366	48707	48729	48750	●	3MB
12,0	50,0	100,0	12,0	43336	49550	49563	49576	●	3XLMB
12,0	75,0	150,0	12,0	43346	49551	49564	49577	●	3XLMB
14,0	32,0	89,0	14,0	40370	48708	48730	48751	●	3MB
14,0	75,0	150,0	14,0	43356	49552	49565	49578	●	3XLMB
16,0	32,0	89,0	16,0	40374	48709	48731	48752	●	3MB
16,0	75,0	150,0	16,0	43366	49553	49566	49579	●	3XLMB
18,0	38,0	100,0	18,0	40378	48710	48732	48753	●	3MB
18,0	75,0	150,0	18,0	43376	49554	49567	49580	●	3XLMB
20,0	38,0	100,0	20,0	40382	48711	48733	48754	●	3MB
20,0	75,0	150,0	20,0	43386	49555	49568	49581	●	3XLMB
25,0	38,0	100,0	25,0	40386	48712	48734	48755	●	3MB
25,0	75,0	150,0	25,0	43396	49556	49569	49582	●	3XLMB

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

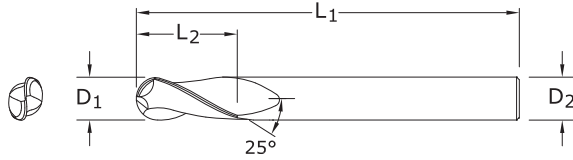
● U.S. Stock Standard  
 ■ NOT STOCKED—  
 Call for Delivery

METRIC

# 2 Flute Ball End Long Reach



**59MB**  
METRIC SERIES



**TOLERANCES (mm)**

$D_1 = +0,000/-0,050$

$D_2 = h_6$

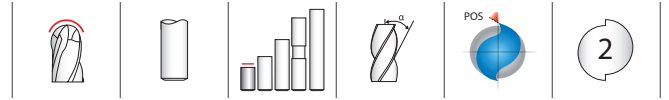
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

mm				EDP NO.				STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
3,0	9,0	60,0	6,0	43900	49622	49632	49642	●
4,0	12,0	70,0	6,0	43901	49623	49633	49643	●
6,0	15,0	80,0	6,0	43902	49624	49634	49644	●
8,0	20,0	89,0	8,0	43903	49625	49635	49645	●
10,0	25,0	100,0	10,0	43904	49626	49636	49646	●
12,0	30,0	110,0	12,0	43905	49627	49637	49647	●
14,0	35,0	120,0	16,0	43906	49628	49638	49648	●
16,0	40,0	120,0	16,0	43907	49629	49639	49649	●
18,0	40,0	130,0	20,0	43908	49630	49640	49650	●
20,0	45,0	130,0	20,0	43909	49631	49641	49651	●

Neck Option Available

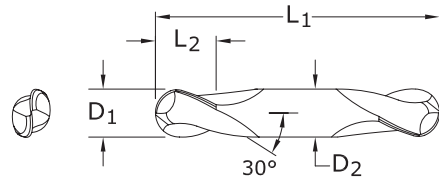
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# 2 Flute Double End Ball End



**TOLERANCES (mm)**

D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>



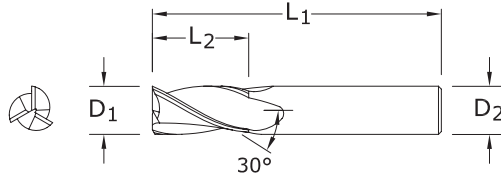
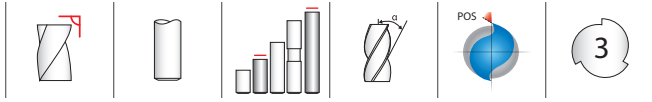
**15MB**  
METRIC SERIES

mm				EDP NO.				STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1,0	2,0	38,0	3,0	41506	49073	49094	49115	●
1,5	3,0	38,0	3,0	41510	49074	49095	49116	●
2,0	4,0	38,0	3,0	41514	49075	49096	49117	●
2,5	5,0	38,0	3,0	41518	49076	49097	49118	●
3,0	6,0	38,0	3,0	41522	49077	49098	49119	●
3,5	7,0	50,0	4,0	41526	49078	49099	49120	●
4,0	8,0	50,0	4,0	41530	49079	49100	49121	●
4,5	9,5	63,0	4,5	41534	49080	49101	49122	●
5,0	10,0	63,0	5,0	41538	49081	49102	49123	●
6,0	12,0	63,0	6,0	41542	49082	49103	49124	●
7,0	12,0	63,0	8,0	41546	49083	49104	49125	●
8,0	12,0	63,0	8,0	41550	49084	49105	49126	●
9,0	14,0	75,0	9,0	41554	49085	49106	49127	●
10,0	14,0	75,0	10,0	41558	49086	49107	49128	●
11,0	14,0	75,0	12,0	41562	49087	49108	49129	●
12,0	16,0	75,0	12,0	41566	49088	49109	49130	●

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

● U.S. Stock Standard  
■ NOT STOCKED—  
Call for Delivery

# 3 Flute Square End



**5M•5XLM**  
METRIC SERIES

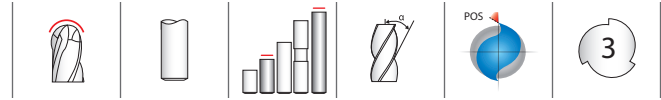
**TOLERANCES (mm)**  
D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

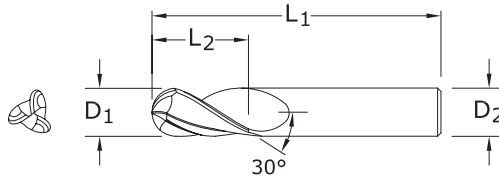
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	EDP NO.				STOCK	SERIES
				UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)		
1,0	4,0	38,0	3,0	40505	48756	48778	48799	●	5M
1,5	4,5	38,0	3,0	40509	48757	48779	48800	●	5M
2,0	6,3	38,0	3,0	40513	48758	48780	48801	●	5M
2,5	9,5	38,0	3,0	40517	48759	48781	48802	●	5M
3,0	12,0	38,0	3,0	40521	48760	48782	48803	●	5M
3,0	25,0	75,0	3,0	43501	49466	49479	49492	●	5XLM
3,5	12,0	50,0	4,0	40525	48761	48783	48804	●	5M
4,0	14,0	50,0	4,0	40529	48762	48784	48805	●	5M
4,0	25,0	75,0	4,0	43503	49467	49480	49493	●	5XLM
4,5	16,0	50,0	6,0	40533	48763	48785	48806	●	5M
5,0	16,0	50,0	6,0	40537	48764	48786	48807	●	5M
5,0	25,0	75,0	5,0	43507	49469	49482	49495	●	5XLM
6,0	19,0	50,0	6,0	40541	48765	48787	48808	●	5M
6,0	25,0	75,0	6,0	43505	49468	49481	49494	●	5XLM
7,0	19,0	63,0	8,0	40545	48766	48788	48809	●	5M
8,0	20,0	63,0	8,0	40549	48767	48789	48810	●	5M
8,0	25,0	75,0	8,0	43515	49470	49483	49496	●	5XLM
9,0	22,0	75,0	10,0	40553	48768	48790	48811	●	5M
10,0	22,0	75,0	10,0	40557	48769	48791	48812	●	5M
10,0	38,0	100,0	10,0	43525	49471	49484	49497	●	5XLM
11,0	25,0	75,0	12,0	40561	48770	48792	48813	●	5M
12,0	25,0	75,0	12,0	40565	48771	48793	48814	●	5M
12,0	50,0	100,0	12,0	43535	49472	49485	49498	●	5XLM
12,0	75,0	150,0	12,0	43545	49473	49486	49499	●	5XLM
14,0	32,0	89,0	14,0	40569	48772	48794	48815	●	5M
14,0	75,0	150,0	14,0	43555	49474	49487	49500	●	5XLM
16,0	32,0	89,0	16,0	40573	48773	48795	48816	●	5M
16,0	75,0	150,0	16,0	43565	49475	49488	49501	●	5XLM
18,0	38,0	100,0	18,0	40577	48774	48796	48817	●	5M
18,0	75,0	150,0	18,0	43575	49476	49489	49502	●	5XLM
20,0	38,0	100,0	20,0	40581	48775	48797	48818	●	5M
20,0	75,0	150,0	20,0	43585	49477	49490	49503	●	5XLM
25,0	38,0	100,0	25,0	40585	48776	48798	48819	●	5M
25,0	75,0	150,0	25,0	43595	49478	49491	49504	●	5XLM

# 3 Flute Ball End



**TOLERANCES (mm)**

D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>



## 5MB • 5XLMB

METRIC SERIES

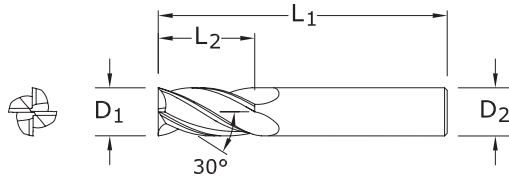
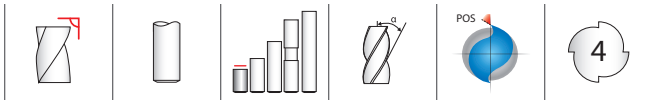
mm				EDP NO.				STOCK	SERIES
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)		
1,0	4,0	38,0	3,0	40506	48820	48842	48863	●	5MB
1,5	4,5	38,0	3,0	40510	48821	48843	48864	●	5MB
2,0	6,3	38,0	3,0	40514	48822	48844	48865	●	5MB
2,5	9,5	38,0	3,0	40518	48823	48845	48866	●	5MB
3,0	12,0	38,0	3,0	40522	48824	48846	48867	●	5MB
3,0	25,0	75,0	3,0	43502	49583	49596	49609	●	5XLMB
3,5	12,0	50,0	4,0	40526	48825	48847	48868	●	5MB
4,0	14,0	50,0	4,0	40530	48826	48848	48869	●	5MB
4,0	25,0	75,0	4,0	43504	49584	49597	49610	●	5XLMB
4,5	16,0	50,0	6,0	40534	48827	48849	48870	●	5MB
5,0	16,0	50,0	6,0	40538	48828	48850	48871	●	5MB
5,0	25,0	75,0	5,0	43508	49586	49599	49612	●	5XLMB
6,0	19,0	50,0	6,0	40542	48829	48851	48872	●	5MB
6,0	25,0	75,0	6,0	43506	49585	49598	49611	●	5XLMB
7,0	19,0	63,0	8,0	40546	48830	48852	48873	●	5MB
8,0	20,0	63,0	8,0	40550	48831	48853	48874	●	5MB
8,0	25,0	75,0	8,0	43516	49587	49600	49613	●	5XLMB
9,0	22,0	75,0	10,0	40554	48832	48854	48875	●	5MB
10,0	22,0	75,0	10,0	40558	48833	48855	48876	●	5MB
10,0	38,0	100,0	10,0	43526	49588	49601	49614	●	5XLMB
11,0	25,0	75,0	12,0	40562	48834	48856	48877	●	5MB
12,0	25,0	75,0	12,0	40566	48835	48857	48878	●	5MB
12,0	50,0	100,0	12,0	43536	49589	49602	49615	●	5XLMB
12,0	75,0	150,0	12,0	43546	49590	49603	49616	●	5XLMB
14,0	32,0	89,0	14,0	40570	48836	48858	48879	●	5MB
14,0	75,0	150,0	14,0	43556	49591	49604	49617	●	5XLMB
16,0	32,0	89,0	16,0	40574	48837	48859	48880	●	5MB
16,0	75,0	150,0	16,0	43566	49592	49605	49618	●	5XLMB
18,0	38,0	100,0	18,0	40578	48838	48860	48881	●	5MB
18,0	75,0	150,0	18,0	43576	49593	49606	49619	●	5XLMB
20,0	38,0	100,0	20,0	40582	48839	48861	48882	●	5MB
20,0	75,0	150,0	20,0	43586	49594	49607	49620	●	5XLMB
25,0	38,0	100,0	25,0	40586	48840	48862	48883	●	5MB
25,0	75,0	150,0	25,0	43596	49595	49608	49621	●	5XLMB

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

● U.S. Stock Standard  
■ NOT STOCKED—  
Call for Delivery

METRIC

# 4 Flute Square End Stub



**16M**  
METRIC SERIES

**TOLERANCES (mm)**

D<sub>1</sub> = +0,000/-0,050

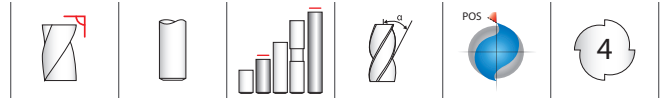
D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

mm				EDP NO.				STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	UNCOATED EDP NO.	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1,0	2,0	38,0	3,0	41605	49136	49157	49178	●
1,5	3,0	38,0	3,0	41609	49137	49158	49179	●
2,0	4,0	38,0	3,0	41613	49138	49159	49180	●
2,5	5,0	38,0	3,0	41617	49139	49160	49181	●
3,0	6,0	38,0	3,0	41621	49140	49161	49182	●
3,5	7,0	50,0	4,0	41625	49141	49162	49183	●
4,0	8,0	50,0	4,0	41629	49142	49163	49184	●
4,5	9,5	50,0	4,5	41633	49143	49164	49185	●
5,0	10,0	50,0	5,0	41637	49144	49165	49186	●
6,0	12,0	50,0	6,0	41641	49145	49166	49187	●
7,0	12,0	50,0	8,0	41645	49146	49167	49188	●
8,0	12,0	50,0	8,0	41649	49147	49168	49189	●
9,0	14,0	50,0	9,0	41653	49148	49169	49190	●
10,0	16,0	50,0	10,0	41657	49149	49170	49191	●
11,0	19,0	63,0	12,0	41661	49150	49171	49192	●
12,0	19,0	63,0	12,0	40165	49151	49172	49193	●

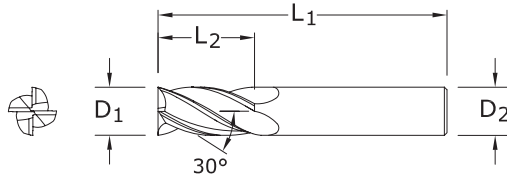
# METRIC 4 Flute End Mills



## TOLERANCES (mm)

$D_1 = +0,000/-0,050$

$D_2 = h_6$



## 1M • 1XLM METRIC SERIES

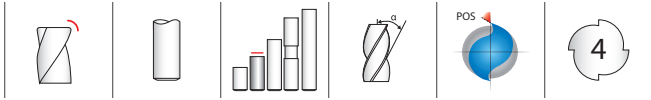
mm				EDP NO.				STOCK	SERIES
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED EDP NO.	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)		
1,0	4,0	38,0	3,0	40105	48500	48522	48543	●	1M
1,5	4,5	38,0	3,0	40109	48501	48523	48544	●	1M
2,0	6,3	38,0	3,0	40113	48502	48524	48545	●	1M
2,5	9,5	38,0	3,0	40117	48503	48525	48546	●	1M
3,0	12,0	38,0	3,0	40121	48504	48526	48547	●	1M
3,0	25,0	75,0	3,0	43101	49388	49401	49414	●	1XLM
3,5	12,0	50,0	4,0	40125	48505	48527	48548	●	1M
4,0	14,0	50,0	4,0	40129	48506	48528	48549	●	1M
4,0	25,0	75,0	4,0	43103	49389	49402	49415	●	1XLM
4,5	16,0	50,0	6,0	40133	48507	48529	48550	●	1M
5,0	16,0	50,0	6,0	40137	48508	48530	48551	●	1M
5,0	25,0	75,0	5,0	43107	49391	49404	49417	●	1XLM
6,0	19,0	50,0	6,0	40141	48509	48531	48552	●	1M
6,0	25,0	75,0	6,0	43105	49390	49403	49416	●	1XLM
7,0	19,0	63,0	8,0	40145	48510	48532	48553	●	1M
8,0	20,0	63,0	8,0	40149	48511	48533	48554	●	1M
8,0	25,0	75,0	8,0	43115	49392	49405	49418	●	1XLM
9,0	22,0	75,0	10,0	40153	48512	48534	48555	●	1M
10,0	22,0	75,0	10,0	40157	48513	48535	48556	●	1M
10,0	38,0	100,0	10,0	43125	49393	49406	49419	●	1XLM
11,0	25,0	75,0	12,0	40161	48514	48536	48557	●	1M
12,0	25,0	75,0	12,0	41665	48515	48537	48558	●	1M
12,0	50,0	100,0	12,0	43135	49394	49407	49420	●	1XLM
12,0	75,0	150,0	12,0	43145	49395	49408	49421	●	1XLM
14,0	32,0	89,0	14,0	40169	48516	48538	48559	●	1M
14,0	75,0	150,0	14,0	43155	49396	49409	49422	●	1XLM
16,0	32,0	89,0	16,0	40173	48517	48539	48560	●	1M
16,0	75,0	150,0	16,0	43165	49397	49410	49423	●	1XLM
18,0	38,0	100,0	18,0	40177	48518	48540	48561	●	1M
18,0	75,0	150,0	18,0	43175	49398	49411	49424	●	1XLM
20,0	38,0	100,0	20,0	40181	48519	48541	48562	●	1M
20,0	75,0	150,0	20,0	43185	49399	49412	49425	●	1XLM
25,0	38,0	100,0	25,0	40185	48520	48542	48563	●	1M
25,0	75,0	150,0	25,0	43195	49400	49413	49426	●	1XLM

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

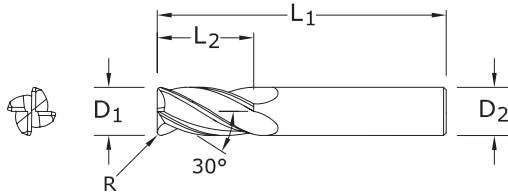
- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



# 4 Flute Corner Radius



**1MCR**  
METRIC SERIES



**TOLERANCES (mm)**

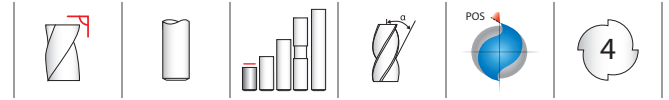
$D_1 = +0,000/-0,050$   
 $D_2 = h_6$   
 $R = +0,000/-0,050$

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

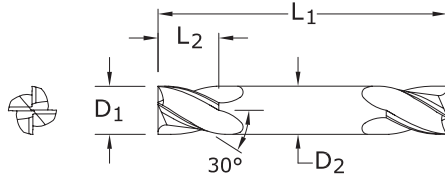
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	mm			SHANK DIAMETER $D_2$	EDP NO.	STOCK
		OVERALL LENGTH $L_1$	CORNER RADIUS $R$	Ti-NAMITE-A (AITiN)			
4,0	14,0	50,0	0,25	4,0	40000	●	
4,0	14,0	50,0	0,50	4,0	40001	●	
4,0	14,0	50,0	1,00	4,0	40003	●	
5,0	16,0	50,0	0,25	6,0	40004	●	
5,0	16,0	50,0	0,50	6,0	40005	●	
5,0	16,0	50,0	1,00	6,0	40007	●	
6,0	19,0	50,0	0,25	6,0	40009	●	
6,0	19,0	50,0	0,50	6,0	40010	●	
6,0	19,0	50,0	0,75	6,0	40011	●	
6,0	19,0	50,0	1,00	6,0	40012	●	
8,0	20,0	63,0	0,50	8,0	40015	●	
8,0	20,0	63,0	0,75	8,0	40016	●	
8,0	20,0	63,0	1,00	8,0	40017	●	
8,0	20,0	63,0	1,50	8,0	40019	●	
8,0	20,0	63,0	2,00	8,0	40020	●	
10,0	22,0	75,0	0,50	10,0	40021	●	
10,0	22,0	75,0	1,00	10,0	40023	●	
10,0	22,0	75,0	1,50	10,0	40024	●	
10,0	22,0	75,0	2,00	10,0	40025	●	
12,0	25,0	75,0	0,50	12,0	40028	●	
12,0	25,0	75,0	1,00	12,0	40030	●	
12,0	25,0	75,0	1,50	12,0	40031	●	
12,0	25,0	75,0	2,00	12,0	40032	●	
16,0	32,0	89,0	0,50	16,0	40035	●	
16,0	32,0	89,0	1,00	16,0	40037	●	
16,0	32,0	89,0	1,50	16,0	40038	●	
16,0	32,0	89,0	2,00	16,0	40039	●	

# 4 Flute Double End Mills



**TOLERANCES (mm)**

$D_1 = +0,000/-0,050$   
 $D_2 = h_6$



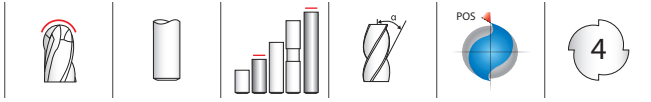
**14M**  
 METRIC SERIES

mm				EDP NO.				STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1,0	2,0	38,0	3,0	41405	48884	48905	48926	●
1,5	3,0	38,0	3,0	41409	48885	48906	48927	●
2,0	4,0	38,0	3,0	41413	48886	48907	48928	●
2,5	5,0	38,0	3,0	41417	48887	48908	48929	●
3,0	6,0	38,0	3,0	41421	48888	48909	48930	●
3,5	7,0	50,0	4,0	41425	48889	48910	48931	●
4,0	8,0	50,0	4,0	41429	48890	48911	48932	●
4,5	9,5	63,0	4,5	41433	48891	48912	48933	●
5,0	10,0	63,0	5,0	41437	48892	48913	48934	●
6,0	12,0	63,0	6,0	41441	48893	48914	48935	●
7,0	12,0	63,0	8,0	41445	48894	48915	48936	●
8,0	12,0	63,0	8,0	41449	48895	48916	48937	●
9,0	14,0	75,0	9,0	41453	48896	48917	48938	●
10,0	14,0	75,0	10,0	41457	48897	48918	48939	●
11,0	14,0	75,0	12,0	41461	48898	48919	48940	●
12,0	16,0	75,0	12,0	41465	48899	48920	48941	●

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

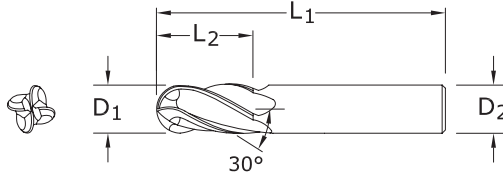
● U.S. Stock Standard  
 ■ NOT STOCKED—  
 Call for Delivery

# 4 Flute Ball End



## 1MB•1XLMB

METRIC SERIES



**TOLERANCES (mm)**

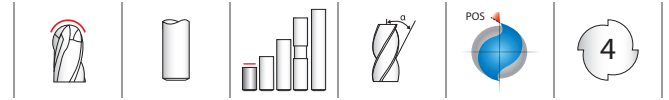
D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

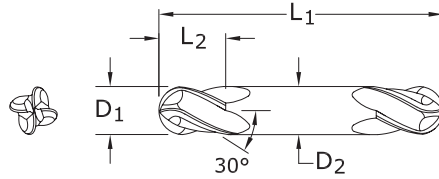
mm				EDP NO.				STOCK	SERIES
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	UNCOATED EDP NO.	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)		
1,0	4,0	38,0	3,0	40106	48564	48586	48607	●	1MB
1,5	4,5	38,0	3,0	40110	48565	48587	48608	●	1MB
2,0	6,3	38,0	3,0	40114	48566	48588	48609	●	1MB
2,5	9,5	38,0	3,0	40118	48567	48589	48610	●	1MB
3,0	12,0	38,0	3,0	40122	48568	48590	48611	●	1MB
3,0	25,0	75,0	3,0	43102	49505	49518	49531	●	1XLMB
3,5	12,0	50,0	4,0	40126	48569	48591	48612	●	1MB
4,0	14,0	50,0	4,0	40130	48570	48592	48613	●	1MB
4,0	25,0	75,0	4,0	43104	49506	49519	49532	●	1XLMB
4,5	16,0	50,0	6,0	40134	48571	48593	48614	●	1MB
5,0	16,0	50,0	6,0	40138	48572	48594	48615	●	1MB
5,0	25,0	75,0	5,0	43108	49508	49521	49534	●	1XLMB
6,0	19,0	50,0	6,0	40142	48573	48595	48616	●	1MB
6,0	25,0	75,0	6,0	43106	49507	49520	49533	●	1XLMB
7,0	19,0	63,0	8,0	40146	48574	48596	48617	●	1MB
8,0	20,0	63,0	8,0	40150	48575	48597	48618	●	1MB
8,0	25,0	75,0	8,0	43116	49509	49522	49535	●	1XLMB
9,0	22,0	75,0	10,0	40154	48576	48598	48619	●	1MB
10,0	22,0	75,0	10,0	40158	48577	48599	48620	●	1MB
10,0	38,0	100,0	10,0	43126	49510	49523	49536	●	1XLMB
11,0	25,0	75,0	12,0	40162	48578	48600	48621	●	1MB
12,0	25,0	75,0	12,0	40166	48579	48601	48622	●	1MB
12,0	50,0	100,0	12,0	43136	49511	49524	49537	●	1XLMB
12,0	75,0	150,0	12,0	43146	49512	49525	49538	●	1XLMB
14,0	32,0	89,0	14,0	40170	48580	48602	48623	●	1MB
14,0	75,0	150,0	14,0	43156	49513	49526	49539	●	1XLMB
16,0	32,0	89,0	16,0	40174	48581	48603	48624	●	1MB
16,0	75,0	150,0	16,0	43166	49514	49527	49540	●	1XLMB
18,0	38,0	100,0	18,0	40178	48582	48604	48625	●	1MB
18,0	75,0	150,0	18,0	43176	49515	49528	49541	●	1XLMB
20,0	38,0	100,0	20,0	40182	48583	48605	48626	●	1MB
20,0	75,0	150,0	20,0	43186	49516	49529	49542	●	1XLMB
25,0	38,0	100,0	25,0	40186	48584	48606	48627	●	1MB
25,0	75,0	150,0	25,0	43196	49517	49530	49543	●	1XLMB

# 4 Flute Double End Ball End



**TOLERANCES (mm)**

$D_1 = +0,000/-0,050$   
 $D_2 = h_6$



**14MB**  
 METRIC SERIES

mm				EDP NO.				STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1,0	2,0	38,0	3,0	41406	48947	48968	48989	●
1,5	3,0	38,0	3,0	41410	48948	48969	48990	●
2,0	4,0	38,0	3,0	41414	48949	48970	48991	●
2,5	5,0	38,0	3,0	41418	48950	48971	48992	●
3,0	6,0	38,0	3,0	41422	48951	48972	48993	●
3,5	7,0	50,0	4,0	41426	48952	48973	48994	●
4,0	8,0	50,0	4,0	41430	48953	48974	48995	●
4,5	9,5	63,0	4,5	41434	48954	48975	48996	●
5,0	10,0	63,0	5,0	41438	48955	48976	48997	●
6,0	12,0	63,0	6,0	41442	48956	48977	48998	●
7,0	12,0	63,0	8,0	41446	48957	48978	48999	●
8,0	12,0	63,0	8,0	41450	48958	48979	49000	●
9,0	14,0	75,0	9,0	41454	48959	48980	49001	●
10,0	14,0	75,0	10,0	41458	48960	48981	49002	●
11,0	14,0	75,0	12,0	41462	48961	48982	49003	●
12,0	16,0	75,0	12,0	41466	48962	48983	49004	●

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

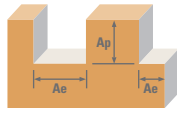
● U.S. Stock Standard  
 ■ NOT STOCKED—  
 Call for Delivery

METRIC

2 Flute: Square, Double, Stub, Long Reach, Ball

3 Flute: Square, Long Reach, Ball

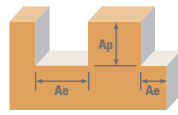
4 Flute: Square, Double, Stub, Long Reach, Ball, Corner Radius



Series	Hardness	Flutes	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	V <sub>c</sub> (m/min)	Diameter (D <sub>1</sub> ) (mm)											
						0.4	0.75	1.5	3	6	10	12	20	25			
<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	140	RPM	111483	59458	29729	14864	7432	4459	3716	2230	1784		
						Fz	0.0008	0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070		
						Feed (mm/min)	178	178	184	208	282	357	357	285	250		
							268	268	276	312	424	535	535	428	375		
							357	357	369	416	565	713	713	571	499		
						Slot	2 1 ≤ 1	3 1 ≤ 0.5	4 1 ≤ 0.4	102	RPM	81189	43301	21650	10825	5413	3248
		Fz	0.0008	0.0015	0.0031						0.007	0.019	0.040	0.048	0.064	0.070	
		Feed (mm/min)	130	130	134						152	206	260	260	208	182	
			195	195	201						227	309	390	390	312	273	
			260	260	268						303	411	520	520	416	364	
		<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	Profile	2 ≤ 0.50 ≤ 1.5						3 ≤ 0.25 ≤ 1.5	102	RPM	81189	43301	21650	10825
						Fz	0.0005	0.0012	0.0022	0.006			0.014	0.029	0.036	0.048	0.052
Feed (mm/min)	81					104	95	130	152	188			195	156	135		
	122					156	143	195	227	283			292	234	203		
	162					208	191	260	303	377			390	312	270		
Slot	2 1 ≤ 1					3 1 ≤ 0.5	4 1 ≤ 0.4	75	RPM	59377			31668	15834	7917	3958	2375
				Fz	0.0005				0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052	
				Feed (mm/min)	59				76	70	95	111	138	143	114	99	
					119				152	139	190	222	276	285	228	198	
					119				152	139	190	222	276	285	228	198	
				<b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250 Bhn or ≤ 24 HRc				Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	96	RPM	76342	40715	20358	10179
Fz	0.0005					0.0012	0.0022	0.006					0.014	0.029	0.036	0.048	0.052
Feed (mm/min)	76	98	90			122	143	177					183	147	127		
	115	147	134			183	214	266					275	220	191		
	153	195	179			244	285	354					366	293	254		
Slot	2 1 ≤ 1	3 1 ≤ 0.5	4 1 ≤ 0.4			70	RPM	55741					29729	14864	7432	3716	2230
							Fz	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052	
							Feed (mm/min)	56	71	65	89	104	129	134	107	93	
								84	107	98	134	156	194	201	161	139	
								111	143	131	178	208	259	268	214	186	
							<b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	102	RPM	81189	43301	21650	10825
Fz	0.0008	0.0015	0.0031			0.007							0.019	0.040	0.048	0.064	0.070
Feed (mm/min)	130	130	134	152	206	260							260	208	182		
	195	195	201	227	309	390							390	312	273		
	260	260	268	303	411	520							520	416	364		
Slot	2 1 ≤ 1	3 1 ≤ 0.5	4 1 ≤ 0.4	75	RPM	59377							31668	15834	7917	3958	2375
					Fz	0.0008			0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070	
					Feed (mm/min)	95			95	98	111	150	190	190	152	133	
						143			143	147	166	226	285	285	228	200	
						190			190	196	222	301	380	380	304	266	
					<b>STAINLESS STEELS (FREE MACHINING)</b> 303, 416, 420F, 430F 440F	≤ 275 Bhn or ≤ 28 HRc			Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	113	RPM	89671	47825	23912	11956
Fz	0.0005	0.0012	0.0022	0.006									0.014	0.029	0.036	0.048	0.052
Feed (mm/min)	90	115	105	143			167	208					215	172	149		
	135	172	158	215			251	312					323	258	224		
	179	230	210	287			335	416					430	344	298		
Slot	2 1 ≤ 1	3 1 ≤ 0.5	4 1 ≤ 0.4	82			RPM	65436					34899	17449	8725	4362	2617
							Fz	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052	
							Feed (mm/min)	65	84	77	105	122	152	157	126	109	
								98	126	115	157	183	228	236	188	163	
								131	168	154	209	244	304	314	251	218	
							<b>STAINLESS STEELS (DIFFICULT)</b> 304, 304L, 316, 316L, 17-4 PH, 15-5, 13-4, Custom 450	≤ 275 Bhn or ≤ 28 HRc	Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	78	RPM	61800	32960	16480	8240
Fz	0.0005	0.0010	0.0019	0.004									0.012	0.024	0.029	0.037	0.042
Feed (mm/min)	62	66	63	66	99	119							119	91	83		
	93	99	94	99	148	178							179	137	125		
	124	132	125	132	198	237							239	183	166		
Slot	2 1 ≤ 1	3 1 ≤ 0.5	4 1 ≤ 0.4	56	RPM	44836							23912	11956	5978	2989	1793
					Fz	0.0005			0.0010	0.0019	0.004	0.012	0.024	0.029	0.037	0.042	
					Feed (mm/min)	45			48	45	48	72	86	87	66	60	
						67			72	68	72	108	129	130	100	90	
						90			96	91	96	143	172	173	133	121	

continued on next page

# 2 Flute: Square, Double, Stub, Long Reach, Ball 3 Flute: Square, Long Reach, Ball 4 Flute: Square, Double, Stub, Long Reach, Ball, Corner Radius



Series  
1M, 3M, 5M,  
14M, 15M, 16M,  
17M, 59M  
Metric

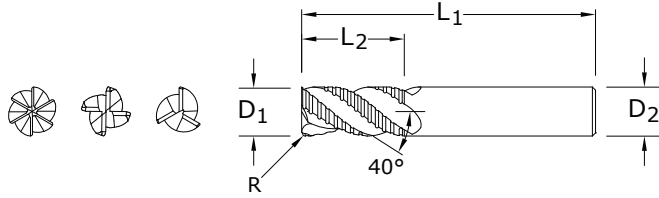
Series	Hardness	Flutes	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)										
						0.4	0.75	1.5	3	6	10	12	20	25		
<b>SUPER ALLOYS</b> (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, 718, Incoloy 800, Monel 400, Rene, Waspalloy	≤ 300 Bhn or ≤ 32 HRC	Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	20	RPM	15753	8402	4201	2100	1050	630	525	315	252	
						Fz	0.0005	0.0007	0.0014	0.004	0.010	0.021	0.024	0.032	0.035	
						Feed (mm/min)	16	12	12	17	21	26	25	20	18	
							24	18	18	25	32	40	38	30	26	
							32	24	24	34	42	53	50	40	35	
							32	24	24	34	42	53	50	40	35	
		Slot	2 1 ≤ 1	3 1 ≤ 0.5	4 1 ≤ 0.4	14	RPM	10906	5816	2908	1454	727	436	364	218	174
							Fz	0.0005	0.0007	0.0014	0.004	0.010	0.021	0.024	0.032	0.035
							Feed (mm/min)	11	8	8	12	15	18	17	14	12
								16	12	12	17	22	27	26	21	18
								22	16	16	23	29	37	35	28	24
								22	16	16	23	29	37	35	28	24
<b>TITANIUM ALLOYS</b> Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti10Al2Fe3Al, Ti5Al3Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti152 Cr3Sn3Al	≤ 350 Bhn or ≤ 38 HRC	Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	55	RPM	43624	23266	11633	5816	2908	1745	1454	872	698	
						Fz	0.0005	0.0010	0.0019	0.004	0.012	0.024	0.029	0.037	0.042	
						Feed (mm/min)	44	47	44	47	70	84	84	65	59	
							65	70	66	70	105	126	127	97	88	
							87	93	88	93	140	168	169	129	117	
							87	93	88	93	140	168	169	129	117	
		Slot	2 1 ≤ 1	3 1 ≤ 0.5	4 1 ≤ 0.4	40	RPM	31506	16803	8402	4201	2100	1260	1050	630	504
							Fz	0.0005	0.0010	0.0019	0.004	0.012	0.024	0.029	0.037	0.042
							Feed (mm/min)	32	34	32	34	50	60	61	47	42
								47	50	48	50	76	91	91	70	64
								63	67	64	67	101	121	122	93	85
								63	67	64	67	101	121	122	93	85
<b>ALUMINUM ALLOYS</b> 2017, 2024, 356, 6061, 7075	≤ 150 Bhn or ≤ 7 HRC	Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	268	RPM	213272	113745	56872	28436	14218	8531	7109	4265	3412	
						Fz	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140	
						Feed (mm/min)	640	728	682	796	1081	1365	1365	1092	955	
							960	1092	1024	1194	1621	2047	2047	1638	1433	
							1280	1456	1365	1592	2161	2730	2730	2184	1911	
							1280	1456	1365	1592	2161	2730	2730	2184	1911	
		Slot	2 1 ≤ 1	3 1 ≤ 0.5	4 1 ≤ 0.4	195	RPM	155107	82724	41362	20681	10340	6204	5170	3102	2482
							Fz	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140
							Feed (mm/min)	465	529	496	579	786	993	993	794	695
								698	794	745	869	1179	1489	1489	1191	1042
								931	1059	993	1158	1572	1985	1985	1588	1390
								931	1059	993	1158	1572	1985	1985	1588	1390
<b>COPPER ALLOYS</b> Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRC	Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	148	RPM	117542	62689	31344	15672	7836	4702	3918	2351	1881	
						Fz	0.0008	0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070	
						Feed (mm/min)	188	188	194	219	298	376	376	301	263	
							282	282	292	329	447	564	564	451	395	
							376	376	389	439	596	752	752	602	527	
							376	376	389	439	596	752	752	602	527	
		Slot	2 1 ≤ 1	3 1 ≤ 0.5	4 1 ≤ 0.4	148	RPM	84824	45239	22620	11310	5655	3393	2827	1696	1357
							Fz	0.0008	0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070
							Feed (mm/min)	136	136	140	158	215	271	271	217	190
								204	204	210	238	322	407	407	326	285
								271	271	280	317	430	543	543	434	380
								271	271	280	317	430	543	543	434	380
<b>PLASTICS</b> Polycarbonate, PVC, Polypropylene		Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	268	RPM	213272	113745	56872	28436	14218	8531	7109	4265	3412	
						Fz	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140	
						Feed (mm/min)	640	728	682	796	1081	1365	1365	1092	955	
							960	1092	1024	1194	1621	2047	2047	1638	1433	
							1280	1456	1365	1592	2161	2730	2730	2184	1911	
							1280	1456	1365	1592	2161	2730	2730	2184	1911	
		Slot	2 1 ≤ 1	3 1 ≤ 0.5	4 1 ≤ 0.4	195	RPM	155107	82724	41362	20681	10340	6204	5170	3102	2482
							Fz	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140
							Feed (mm/min)	465	529	496	579	786	993	993	794	695
								698	794	745	869	1179	1489	1489	1191	1042
								931	1059	993	1158	1572	1985	1985	1588	1390
								931	1059	993	1158	1572	1985	1985	1588	1390
<b>GRAPHITE</b>		Profile	2 ≤ 0.50 ≤ 1.5	3 ≤ 0.25 ≤ 1.5	201	RPM	159954	85309	42654	21327	10664	6398	5332	3199	2559	
						Fz	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140	
						Feed (mm/min)	480	546	512	597	810	1024	1024	819	717	
							720	819	768	896	1216	1536	1536	1228	1075	
							960	1092	1024	1194	1621	2047	2047	1638	1433	
							960	1092	1024	1194	1621	2047	2047	1638	1433	
		Slot	2 1 ≤ 1	3 1 ≤ 0.5	4 1 ≤ 0.4	146	RPM	116330	62043	31021	15511	7755	4653	3878	2327	1861
							Fz	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140
							Feed (mm/min)	349	397	372	434	589	745	745	596	521
								523	596	558	651	884	1117	1117	893	782
								698	794	745	869	1179	1489	1489	1191	1042
								698	794	745	869	1179	1489	1489	1191	1042

Bhn (Brinell)    HRC (Rockwell C)  
rpm = (Vc x 1000) / (D<sub>1</sub> x 3.14)  
mm/min = Fz x number of flutes x rpm  
reduce speed and feed for materials harder than listed

limit cut depths of long and extra long flute mills to .05 x D<sub>1</sub> when slotting or profiling  
reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
refer to the SGS Tool Wizard for complete technical information  
(www.kyocera-sgstool.com)

METRIC

# Single End Roughers



**62M**  
METRIC SERIES

**TOLERANCES h10 (mm)**

$D_1 = +0,000 / -0,100$

$D_2 = h_6$

$R = +0,127 / -0,127$

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	mm			EDP NO.			STOCK
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	NO. OF FLUTES	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
6,0	19,0	63,0	6,0	3	46207	46206	46210	●
8,0	19,0	63,0	8,0	3	46209	46208	46211	●
10,0	22,0	72,0	10,0	3	46213	46212	46214	●
12,0	26,0	83,0	12,0	4	46217	46216	46218	●
16,0	32,0	92,0	16,0	4	46221	46220	46222	●
20,0	38,0	104,0	20,0	4	46229	46228	46232	●
25,0	44,0	104,0	25,0	6	46231	46230	46233	●

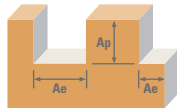
STAINLESS STEELS





HIGH TEMP ALLOYS

TITANIUM

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# Single End Roughers



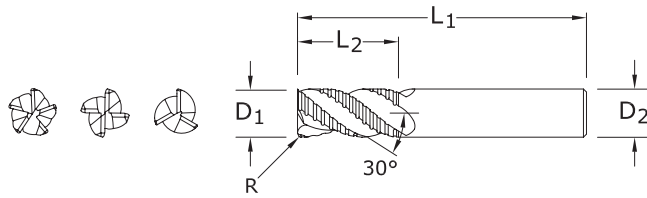
Series 62M Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)							
					6	10	12	20	25			
M	STAINLESS STEELS (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	123	RPM	6544	3926	3272	1963	1570
						(99-148)	Fz	0.014	0.029	0.036	0.051	0.053
							Feed (mm/min)	283	345	471	398	495
						99	RPM	5251	3151	2626	1575	1260
						(79-119)	Fz	0.014	0.029	0.036	0.051	0.053
							Feed (mm/min)	227	277	378	319	397
	STAINLESS STEELS (DIFFICULT) 304, 304L, 316, 316L, 17-4PH, 15-5PH, 13-4PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	Profile 	≤ 0.5	≤ 1.5	85	RPM	4524	2714	2262	1357	1086
						(68-102)	Fz	0.012	0.024	0.029	0.040	0.043
							Feed (mm/min)	163	195	261	217	277
						69	RPM	3635	2181	1818	1091	872
						(55-82)	Fz	0.012	0.024	0.029	0.040	0.043
							Feed (mm/min)	131	157	209	174	222
S	SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspalloy	≤ 300 Bhn or ≤ 32 HRc	Profile 	≤ 0.5	≤ 1.5	21	RPM	1131	679	565	339	271
						(17-26)	Fz	0.010	0.021	0.024	0.035	0.035
							Feed (mm/min)	33	43	54	47	57
						17	RPM	905	543	452	271	217
						(14-20)	Fz	0.010	0.021	0.024	0.035	0.035
							Feed (mm/min)	26	35	43	38	46
	TITANIUM ALLOYS Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti10Al2Fe3Al, Ti5Al53Mo3Cr, Ti7Al4Mo, Ti3Al8V6Cr4Zr4Mo, Ti6Al6V6Sn, Ti152 Cr3Sn3Al	≤ 350 Bhn or ≤ 38 HRc	Profile 	≤ 0.5	≤ 1.5	47	RPM	2504	1503	1252	751	601
						(38-57)	Fz	0.012	0.024	0.029	0.040	0.043
							Feed (mm/min)	90	108	144	120	153
						59	RPM	3151	1890	1575	945	756
						(48-71)	Fz	0.012	0.024	0.029	0.040	0.043
							Feed (mm/min)	113	136	181	151	193

Bhn (Brinell)      HRc (Rockwell C)  
 rpm = (Vc x 1000) / (D<sub>1</sub> x 3.14)  
 mm/min = Fz x number of flutes x rpm  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



METRIC

# Single End Roughers



**61M**  
METRIC SERIES

**TOLERANCES h10 (mm)**

$D_1 = +0,000 / -0,100$

$D_2 = h_6$

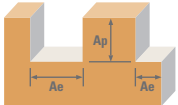
$R = +0,127 / -0,127$

mm						EDP NO.			STOCK
CUTTING DIA. $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIA. $D_2$	CORNER RADIUS $R$	NO. OF FLUTES	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
6,0	19,0	63,0	6,0	1,14	3	46107	46106	46110	●
8,0	19,0	63,0	8,0	1,14	3	46109	46108	46111	●
10,0	22,0	72,0	10,0	1,52	3	46113	46112	46114	●
12,0	26,0	83,0	12,0	1,52	4	46117	46116	46118	●
16,0	32,0	92,0	16,0	1,52	4	46121	46120	46122	●
20,0	38,0	104,0	20,0	1,52	4	46129	46128	46132	●
25,0	44,0	104,0	25,0	1,52	5	46131	46130	46133	●

- STEELS
- CAST IRON
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# Single End Roughers

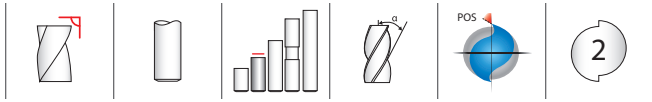


Series 61M Metric	Hardness	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)						
					6	10	12	20	25		
P	CARBON STEELS 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	Profile ≤ 0.5	≤ 1.5	152	RPM	8078	4847	4039	2424	1939
					(122-183)	Fz	0.014	0.029	0.034	0.045	0.050
						Feed (mm/min)	339	422	549	436	485
					122	RPM	6463	3878	3231	1939	1551
					(98-146)	Fz	0.014	0.029	0.034	0.045	0.050
						Feed (mm/min)	271	337	439	349	388
	ALLOY STEELS 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HR	Profile ≤ 0.5	≤ 1.5	111	RPM	5897	3538	2949	1769	1415
					(89-134)	Fz	0.010	0.021	0.026	0.035	0.038
						Feed (mm/min)	177	223	307	248	269
					90	RPM	4766	2860	2383	1430	1144
					(72-108)	Fz	0.010	0.021	0.026	0.035	0.038
						Feed (mm/min)	143	180	248	200	217
H	TOOL STEELS A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250 Bhn or ≤ 24 HRc	Profile ≤ 0.5	≤ 1.5	105	RPM	5574	3344	2787	1672	1338
					(84-126)	Fz	0.014	0.024	0.036	0.048	0.053
						Feed (mm/min)	234	241	401	321	355
					84	RPM	4443	2666	2222	1333	1066
					(67-101)	Fz	0.014	0.024	0.036	0.048	0.053
						Feed (mm/min)	187	192	320	256	283
K	CAST IRONS Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	Profile ≤ 0.5	≤ 1.5	111	RPM	5897	3538	2949	1769	1415
					(89-134)	Fz	0.019	0.040	0.048	0.064	0.070
						Feed (mm/min)	336	425	566	453	495
					90	RPM	4766	2860	2383	1430	1144
					(72-108)	Fz	0.019	0.040	0.048	0.064	0.070
						Feed (mm/min)	272	343	458	366	400

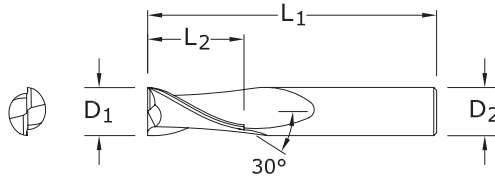
Bhn (Brinell)    HRc (Rockwell C)  
 rpm = (Vc x 1000) / (D<sub>1</sub> x 3.14)  
 mm/min = Fz x number of flutes x rpm  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

METRIC

# 2 Flute High Shear End Mills



**52M**  
METRIC SERIES



**TOLERANCES (mm)**

$D_1 = +0,000/-0,050$

$D_2 = h_6$

NON-FERROUS

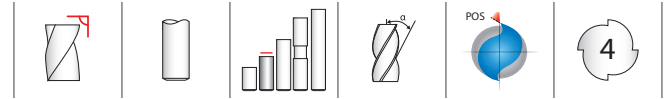
PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

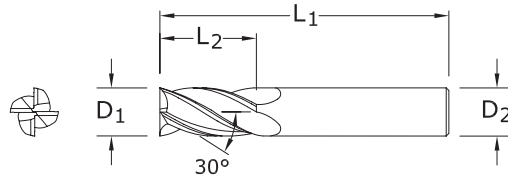
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.		STOCK
				UNCOATED	Ti-NAMITE-C (TiCN)	
3,0	7,0	38,0	3,0	45277	49829	●
3,5	7,0	57,0	6,0	45279	49830	●
4,0	8,0	57,0	6,0	45281	49831	●
4,5	8,0	57,0	6,0	45283	49832	●
5,0	10,0	57,0	6,0	45285	49833	●
6,0	10,0	57,0	6,0	45287	49834	●
8,0	16,0	63,0	8,0	45289	49835	●
10,0	19,0	72,0	10,0	45291	49836	●
12,0	22,0	83,0	12,0	45293	49837	●
14,0	22,0	83,0	14,0	45295	49838	●
16,0	26,0	92,0	16,0	45297	49839	●
20,0	32,0	104,0	20,0	45299	49840	●

# 4 Flute High Shear End Mills



**TOLERANCES (mm)**

$D_1 = +0,000/-0,050$   
 $D_2 = h_6$



**54M**  
 METRIC SERIES

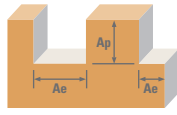
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.		STOCK
				UNCOATED	Ti-NAMITE-C (TiCN)	
3,0	8,0	38,0	3,0	45477	45478	●
3,5	10,0	57,0	6,0	45479	45480	●
4,0	11,0	57,0	6,0	45481	45482	●
4,5	11,0	57,0	6,0	45483	45484	●
5,0	13,0	57,0	6,0	45485	45486	●
6,0	13,0	57,0	6,0	45487	45488	●
8,0	19,0	63,0	8,0	45489	45490	●
10,0	22,0	72,0	10,0	45491	45492	●
12,0	26,0	83,0	12,0	45493	45494	●
14,0	26,0	83,0	14,0	45495	45496	●
16,0	32,0	92,0	16,0	45497	45498	●
20,0	38,0	104,0	20,0	45499	45500	●

- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# 2 Flute: High Shear End Mills

## 4 Flute: High Shear End Mills

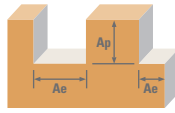


Series 52M, 54M Metric	Hardness	Flutes	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	V <sub>c</sub> (m/min)	Diameter (D <sub>1</sub> ) (mm)							
						3	6	10	12	20	25		
<b>ALUMINUM ALLOYS</b> 2024, 5052, 5086, 6061, 6063, 7075	≤ 150 Bhn or ≤ 7 HRc	Profile 	2	≤ 0.3	≤ 1.5	415	RPM	43947	21973	13184	10987	6592	5274
						(332-497)	Fz	0.0166	0.043	0.091	0.110	0.147	0.160
							Feed (mm/min)	1459	1890	2399	2417	1938	1688
		4	≤ 0.3	≤ 1.5	332	RPM	35222	17611	10567	8806	5283	4227	
						Fz	0.0151	0.041	0.085	0.101	0.133	0.148	
					Feed (mm/min)	1064	1444	1796	1779	1405	1251		
	Slot 	2	1	≤ 1	(266-399)	RPM	16480	8240	4944	4120	2472	1978	
						Fz	0.0166	0.043	0.091	0.110	0.147	0.160	
					Feed (mm/min)	547	709	900	906	727	633		
		4	1	≤ 0.25	125	RPM	13249	6624	3975	3312	1987	1590	
						Fz	0.0151	0.041	0.085	0.101	0.133	0.148	
					Feed (mm/min)	400	543	676	669	529	471		
<b>ALUMINUM DIE CAST ALLOYS (HIGH SILICON)</b> A-390, A-392, B-390	≤ 125 Bhn or ≤ 77 HRb	Profile 	2	≤ 0.3	≤ 1.5	155	RPM	16480	8240	4944	4120	2472	1978
						(124-187)	Fz	0.0166	0.043	0.091	0.110	0.147	0.160
							Feed (mm/min)	547	709	900	906	727	633
		4	≤ 0.3	≤ 1.5	125	RPM	13249	6624	3975	3312	1987	1590	
						Fz	0.0151	0.041	0.085	0.101	0.133	0.148	
					Feed (mm/min)	400	543	676	669	529	471		
	Slot 	2	1	≤ 1	(100-150)	RPM	19065	9533	5720	4766	2860	2288	
						Fz	0.0094	0.024	0.053	0.062	0.083	0.093	
					Feed (mm/min)	358	458	606	591	475	426		
		4	≤ 0.3	≤ 1.5	145	RPM	15349	7675	4605	3837	2302	1842	
						Fz	0.0086	0.024	0.048	0.058	0.077	0.085	
					Feed (mm/min)	264	368	442	445	355	313		
Slot 	2	1	≤ 1	(116-174)	RPM	7594	3797	2278	1898	1139	911		
					Fz	0.0094	0.024	0.053	0.062	0.083	0.093		
				Feed (mm/min)	143	182	241	235	189	169			
	4	≤ 0.3	≤ 1.5	58	RPM	6140	3070	1842	1535	921	737		
					Fz	0.0086	0.024	0.048	0.058	0.077	0.085		
				Feed (mm/min)	106	147	177	178	142	125			
Slot 	2	1	≤ 1	(46-69)	RPM	7594	3797	2278	1898	1139	911		
					Fz	0.0094	0.024	0.053	0.062	0.083	0.093		
				Feed (mm/min)	286	365	483	471	378	339			
	4	1	≤ 0.25	58	RPM	6140	3070	1842	1535	921	737		
					Fz	0.0086	0.024	0.048	0.058	0.077	0.085		
				Feed (mm/min)	106	147	177	178	142	125			
Slot 	2	1	≤ 1	(46-69)	RPM	6140	3070	1842	1535	921	737		
					Fz	0.0086	0.024	0.048	0.058	0.077	0.085		
				Feed (mm/min)	106	147	177	178	142	125			
	4	1	≤ 0.25	58	RPM	6140	3070	1842	1535	921	737		
					Fz	0.0086	0.024	0.048	0.058	0.077	0.085		
				Feed (mm/min)	106	147	177	178	142	125			

continued on next page

# 2 Flute: High Shear End Mills

## 4 Flute: High Shear End Mills



Series 52M, 54M Metric	Hardness	Flutes	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)							
						3	6	10	12	20	25		
<b>PLASTICS</b> ABS, Polycarbonate, PVC, Polypropylene	Profile	2	≤ 0.3	≤ 1.5	488	RPM	51702	25851	15511	12926	7755	6204	
					Fz	0.0264	0.072	0.149	0.178	0.237	0.250		
		4	≤ 0.3	≤ 1.5	(390-585)	Feed (mm/min)	2730	3723	4622	4601	3676	3102	
					5460	7445	9244	9203	7352	6204			
		Slot	2	1	≤ 1	390	RPM	41362	20681	12409	10340	6204	4963
						Fz	0.0240	0.065	0.136	0.163	0.210	0.238	
	4		1	≤ 0.25	(312-468)	Feed (mm/min)	1985	2689	3375	3371	2606	2363	
					3971	5377	6750	6742	5212	4725			
	<b>PLASTICS</b> Fiberglass, Glass Filled	Profile	2	≤ 0.3	≤ 1.5	219	RPM	23266	11633	6980	5816	3490	2792
						Fz	0.0197	0.053	0.109	0.132	0.173	0.190	
4			≤ 0.3	≤ 1.5	(176-263)	Feed (mm/min)	917	1233	1522	1536	1208	1061	
					1833	2466	3043	3071	2415	2122			
Slot			2	1	≤ 1	175	RPM	18580	9290	5574	4645	2787	2230
						Fz	0.0180	0.048	0.101	0.120	0.160	0.175	
		4	1	≤ 0.25	(140-210)	Feed (mm/min)	669	892	1126	1115	892	780	
					1338	1784	2252	2230	1784	1561			

Bhn (Brinell)    HRc (Rockwell C)    HRb (Rockwell B)  
 rpm = (Vc x 1000) / (D<sub>1</sub> x 3.14)  
 mm/min = Fz x number of flutes x rpm  
 reduce speed and feed for materials harder than listed  
 reduce feed and Ae when finish milling (.02 x D<sub>1</sub> maximum)  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

## High Performance Drills



## Hole Making

HIGH PERFORMANCE DRILLS	SERIES	DESCRIPTION	PAGE
Hi-PerCarb	135 (3xD)	2 Flute External Coolant Double Margin 3xD	231
	135 (5xD)	2 Flute External Coolant Double Margin 5xD	240
Ice-Carb	140 (5xD)	2 Flute Internal Coolant 5xD	250
	140 (8xD)	2 Flute Internal Coolant 8xD	258
CFRP 8 Facet	120	2 Flute External Coolant Double Margin CFRP	266

*Speed & Feed Recommendations listed after each series*

## Taladrado

TALADROS DE ALTO RENDIMIENTO	SERIE	DESCRIPCIÓN	PÁGINA
Hi-PerCarb	135 (3xD)	2 filos, refrigerante externo, doble margen, 3xD	231
	135 (5xD)	2 filos, refrigerante externo, doble margen, 5xD	240
Ice-Carb	140 (5xD)	2 filos, refrigerante interno, 5xD	250
	140 (8xD)	2 filos, refrigerante interno, 8xD	258
De 8 caras CFRP	120	2 filos, refrigerante externo, doble margen, CFRP	266

*Recomendaciones de velocidades y avances mostradas tras cada serie*

## Outils de perçage

FORETS HAUTE PERFORMANCE	SÉRIES	DESCRIPTION	PAGE
Hi-PerCarb	135 (3xD)	2 dents refroidissement externe à double listel 3xD	231
	135 (5xD)	2 dents refroidissement externe à double listel 5xD	240
Ice-Carb	140 (5xD)	2 dents refroidissement interne 5xD	250
	140 (8xD)	2 dents refroidissement interne 8xD	258
CFRP à 8 facettes	120	2 dents refroidissement externe à double listel CFRP	266

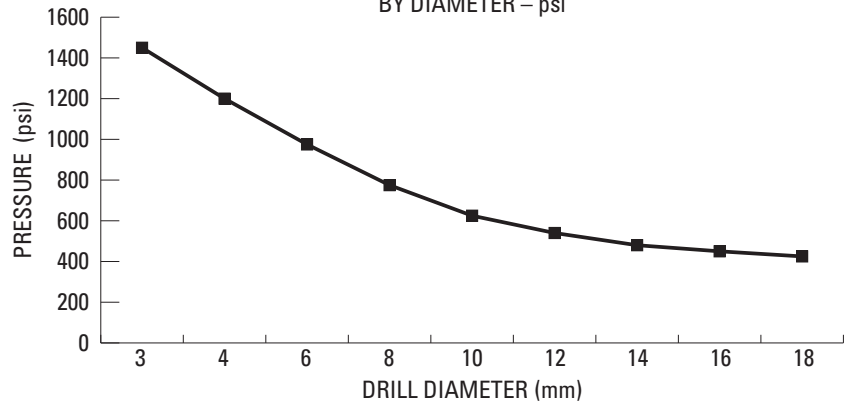
*Recommandations de vitesse et avance indiquées après chaque série*



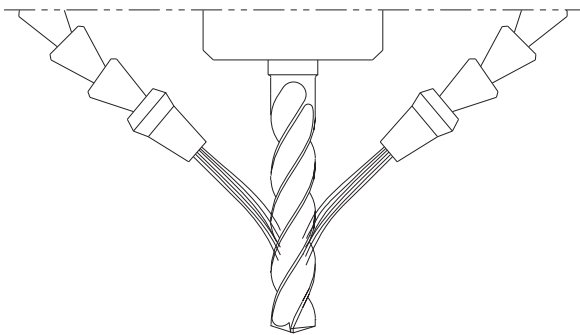
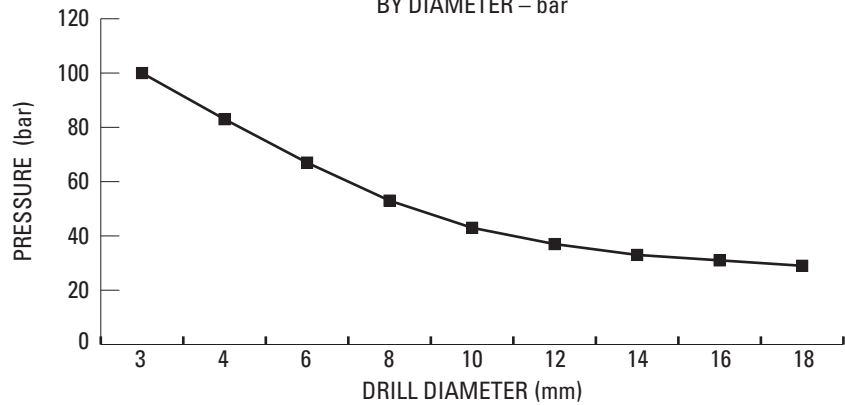
# 🇺🇸 Drilling Operations Coolant Recommendations

- Coolant works to mobilize chips away from the cut zone, reduce the heat created during the cutting process and minimize friction.
- It is important to optimize the coolant pressure and position in order to gain the full benefits coolant offers the cutting process.
- Proper coolant application promotes greater operating parameters, greater material removal rates, improved surface finishes, predictable tool life, reduced power consumption and reduced cycle times.
- Pressure is important, but more importantly is consistency of the pressure and application onto the tool; intermittent cooling of carbide leads to thermal stressing of the material and the formation of “microcracks.”
- Proper cleanliness and filtration of coolants is important in order for the coolant to maintain its beneficial properties, and also to avoid a reduction in coolant pressure or the possibility of clogging the coolant channels in coolant through drills.

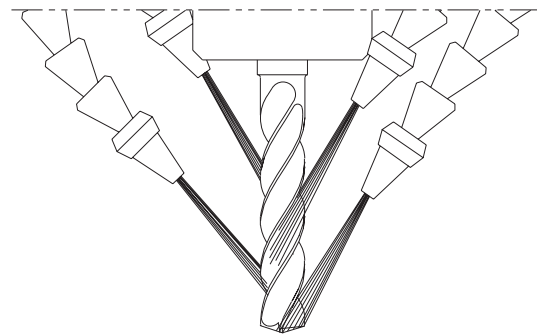
RECOMMENDED COOLANT PRESSURE  
BY DIAMETER – psi



RECOMMENDED COOLANT PRESSURE  
BY DIAMETER – bar



LARGE TIP – LOW VELOCITY  
NO COVERAGE AT MAXIMUM DEPTH



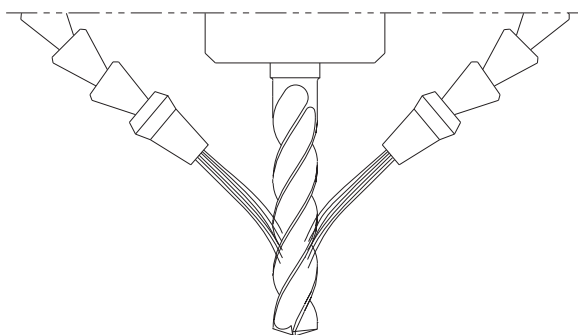
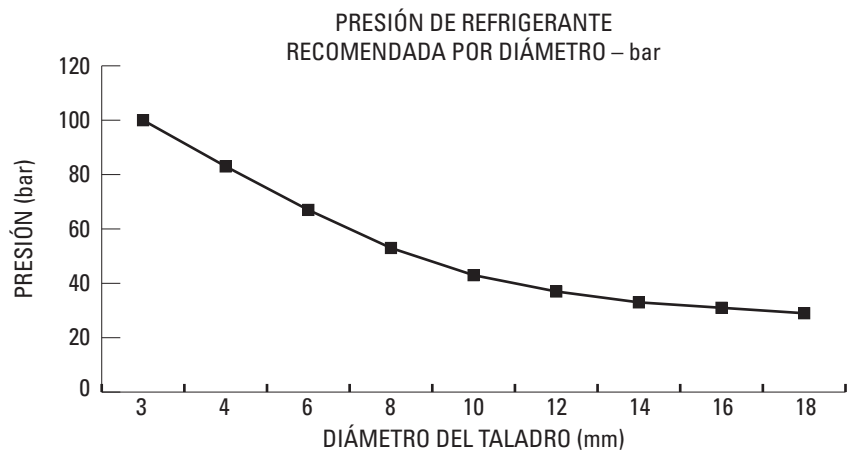
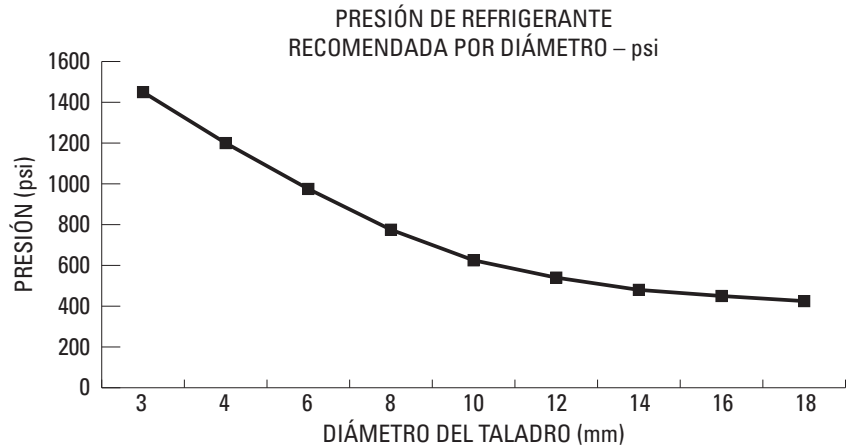
SMALL TIP – HIGH VELOCITY  
COMPLETE COVERAGE

- Reducing the nozzle size helps maximize the cooling benefits of the unique double margin design on the Hi-PerCarb drill by increasing velocity. Aim the nozzles in line with the secondary flute located between the two margins as well as the flute for best results.

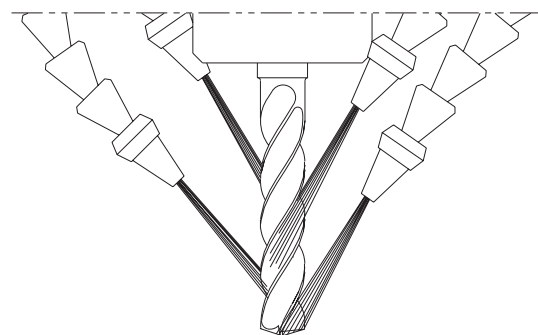
# Operaciones de taladrado

## Refrigerantes recomendados

- El líquido refrigerante actúa movilizandoo las virtutas fuera de la zona de corte, disminuyendo el calor generado durante el proceso de corte y minimizando la fricción.
- Es importante optimizar la presión del refrigerante y la posición para poder obtener todos los beneficios del refrigerante durante el proceso de corte.
- Una aplicación apropiada del refrigerante fomenta mayores parámetros de operación, mayores índices de eliminación de material, acabados de superficie mejorados, una duración de la herramienta más predecible, bajo consumo de energía y un tiempo de ciclo reducido.
- La presión es importante pero lo es más la estabilidad de la presión y la aplicación en la herramienta; la refrigeración intermitente del carburo conlleva un estrés térmico del material y la formación de "microfisuras".
- La limpieza adecuada y la filtración de refrigerantes es importante para que el mismo mantenga sus propiedades beneficiosas, y también para evitar una reducción en la presión o la posibilidad de obstruir los canales del refrigerante del taladro.



PUNTA GRANDE – BAJA VELOCIDAD  
SIN ALCANCE A PROFUNDIDAD MÁXIMA



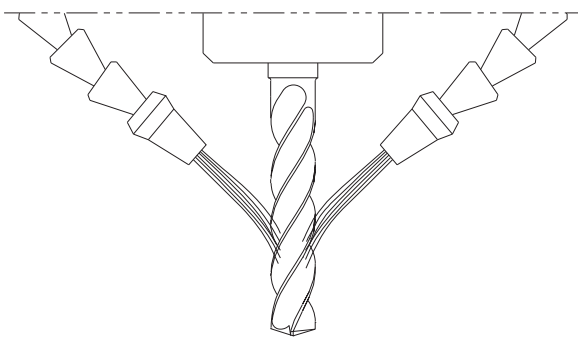
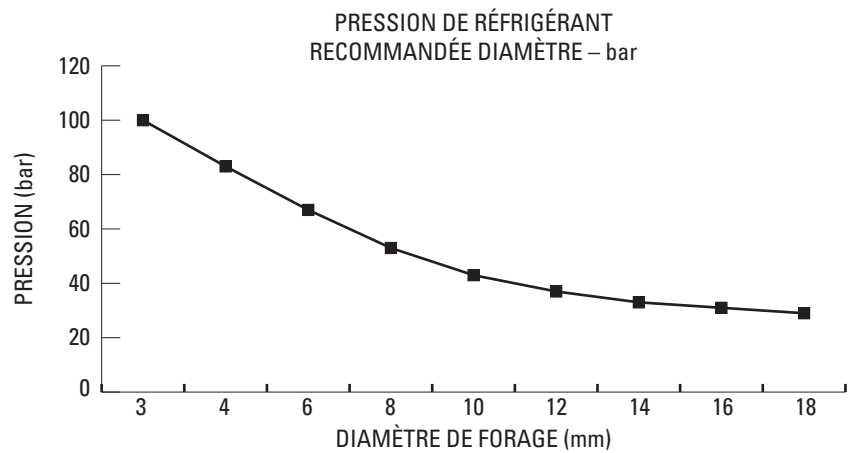
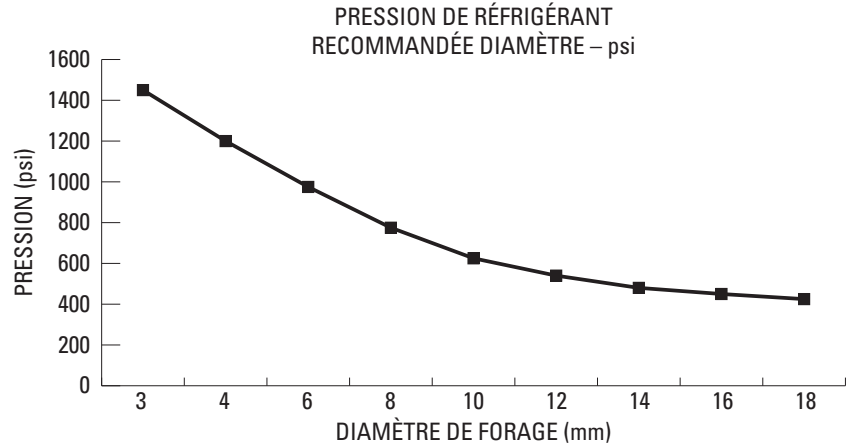
PUNTA PEQUEÑA – ALTA VELOCIDAD  
COMPLETO ALCANCE

- Reducir el tamaño de la boquilla ayuda a maximizar los beneficios de refrigeración del exclusivo diseño de doble margen del taladro Hi-PerCarb aumentando la velocidad. Coloque las boquillas en línea con el segundo filo que se encuentra entre los dos márgenes y también el filo para obtener mejores resultados.

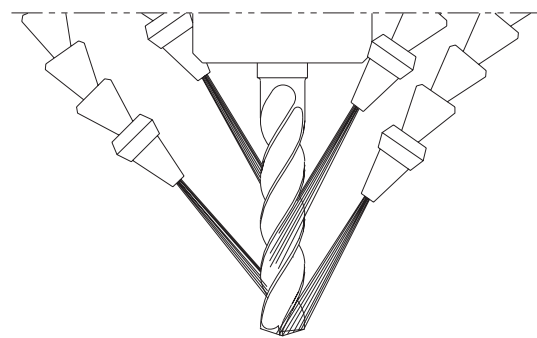
# Opérations de forage

## Recommandations en matière de refroidissement

- Le réfrigérant sert à éloigner les copeaux de la zone de coupe, à réduire la chaleur dégagée durant la coupe et à minimiser la friction.
- Il est important d'optimiser la pression et la position du réfrigérant pour en retirer les bénéfices maximums durant la coupe.
- L'application adéquate de réfrigérant se traduit par des paramètres opératoires supérieurs, des taux d'élimination supérieurs des matériaux, de plus belles finitions des surfaces, une durée de vie des outils prévisible, moins de consommation d'énergie et des temps de cycle réduits.
- La pression est importante, mais une pression régulière et l'application sur l'outil sont des facteurs encore plus importants ; le refroidissement intermittent du carbure se traduit par des contraintes thermiques pour le matériau et la formation de microfissures.
- La propreté et le filtrage adéquats des réfrigérants sont importants pour qu'ils conservent leur propriétés, mais aussi pour éviter la réduction de pression du réfrigérant ou le risque d'obturation des conduits à réfrigérant dans les perceuses à réfrigérant intégré.



POINTE LARGE – BASSE VITESSE  
PAS DE COUVERTURE À LA PROFONDEUR MAXIMUM



POINTE FINE – GRANDE VITESSE  
COUVERTURE COMPLÈTE

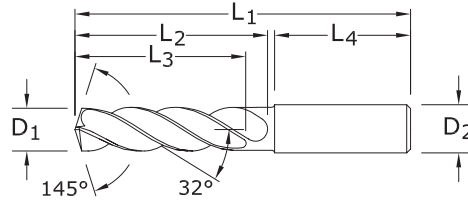
- La réduction de la taille de l'embout permet de maximiser les bienfaits du refroidissement du concept à double listel original de la perceuse Hi-PerCarb en augmentant la vitesse. Pour les meilleurs résultats, orientez les embouts dans l'axe de la goujure secondaire située entre les deux listels, de même que la goujure primaire.



3xD



2



**TOLERANCES (inch)**

≤.1181 DIAMETER

D<sub>1</sub> = +.00008/+0.00047

D<sub>2</sub> = h<sub>6</sub>

>.1181-.2362 DIAMETER

D<sub>1</sub> = +.00016/+0.00063

D<sub>2</sub> = h<sub>6</sub>

>.2362-.3937 DIAMETER

D<sub>1</sub> = +.00024/+0.00083

D<sub>2</sub> = h<sub>6</sub>

>.3937-.7087 DIAMETER

D<sub>1</sub> = +.00028/+0.00098

D<sub>2</sub> = h<sub>6</sub>

>.7087-1.1811 DIAMETER

D<sub>1</sub> = +.00031/+0.00114

D<sub>2</sub> = h<sub>6</sub>

**TOLERANCES (mm)**

≤3 DIAMETER

D<sub>1</sub> = +0,002/+0,012

D<sub>2</sub> = h<sub>6</sub>

>3-6 DIAMETER

D<sub>1</sub> = +0,004/+0,016

D<sub>2</sub> = h<sub>6</sub>

>6-10 DIAMETER

D<sub>1</sub> = +0,006/+0,021

D<sub>2</sub> = h<sub>6</sub>

>10-18 DIAMETER

D<sub>1</sub> = +0,007/+0,025

D<sub>2</sub> = h<sub>6</sub>

>18-30 DIAMETER

D<sub>1</sub> = +0,008/+0,029

D<sub>2</sub> = h<sub>6</sub>

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

NON-FERROUS

HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AITIN)	STOCK
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.	
1/64	0.0156	0.40		1/8	1-1/2	1/8	5/64	1	51752*	●
1/32	0.0312	0.79		1/8	1-1/2	1/4	3/16	1	51269*	●
3/64	0.0469	1.19	1/16-64	1/8	1-1/2	3/8	5/16	1	51270*	●
1,25 mm	0.0492			3,0	38,0	9,5	8,0	25,0	64500*	●
1,45 mm	0.0571			3,0	38,0	9,5	8,0	25,0	64501*	●
#53	0.0595	1.51		1/8	1-1/2	3/8	5/16	1	64502*	●
1/16	0.0625	1.59	5/64-60	1/8	2	7/16	3/8	1-1/4	51271*	●
1,6 mm	0.0630			3,0	50,0	11,0	9,0	32,0	64503*	●
1,75 mm	0.0689			3,0	50,0	11,0	9,0	32,0	64504*	●
#50	0.0700	1.78		1/8	2	7/16	3/8	1-1/4	64505*	●
5/64	0.0781	1.98		1/8	2	1/2	7/16	1-1/4	51272*	●
#47	0.0785	1.99		1/8	2	1/2	7/16	1-1/4	64506*	●
2,05 mm	0.0807			3,0	50,0	12,0	11,0	32,0	64507*	●
#46	0.0810	2.06		1/8	2	1/2	7/16	1-1/4	64508*	●
#43	0.0890	2.26		1/8	2	1/2	7/16	1-1/4	64509*	●
#42	0.0935	2.37		1/8	2	1/2	7/16	1-1/4	64510*	●
3/32	0.0938	2.38	1/8-32	1/8	2	1/2	7/16	1-1/4	51273	●
#40	0.0980	2.49		1/8	2	9/16	1/2	1-1/4	51274	●
2,5 mm	0.0984			3,0	50,0	14,0	12,0	32,0	64511	●
#39	0.0995	2.53		1/8	2	9/16	1/2	1-1/4	51753	●
#38	0.1015	2.58	5-40	1/8	2	9/16	1/2	1-1/4	51754	●
#37	0.1040	2.64	5-44	1/8	2	9/16	1/2	1-1/4	51755	●
#36	0.1065	2.71	6-32	1/8	2	9/16	1/2	1-1/4	51756	●
7/64	0.1094	2.78		1/8	2	5/8	9/16	1-1/4	51275	●
#35	0.1100	2.79		1/8	2	5/8	9/16	1-1/4	51276	●
#34	0.1110	2.82		1/8	2	5/8	9/16	1-1/4	51277	●
#33	0.1130	2.87	6-40	1/8	2	5/8	9/16	1-1/4	51757	●
2,9 mm	0.1142			3,0	50,0	16,0	14,0	32,0	64512	●
#32	0.1160	2.95		1/8	2	5/8	9/16	1-1/4	51758	●
3,0 mm	0.1181			6,0	62,0	20,0	17,0	36,0	63155	●
#31	0.1200	3.05		1/8	2	5/8	9/16	1-1/4	51759	●
3,1 mm	0.1220			6,0	62,0	20,0	17,0	36,0	63741	●
1/8	0.1250	3.18		1/4	2-1/2	3/4	21/32	1-7/16	51330	●
3,2 mm	0.1260		M3,5 X 0,35	6,0	62,0	20,0	17,0	36,0	63156	●
#30	0.1285	3.26		1/4	2-1/2	3/4	21/32	1-7/16	51278	●
3,3 mm	0.1299		M4 X 0,7	6,0	62,0	20,0	17,0	36,0	63157	●
3,4 mm	0.1339			6,0	62,0	20,0	17,0	36,0	63158	●
#29	0.1360	3.45	8-32,8-36	1/4	2-1/2	3/4	21/32	1-7/16	51331	●
3,5 mm	0.1378		M4 X 0,5	6,0	62,0	20,0	17,0	36,0	63159	●
#28	0.1405	3.57	8-40	1/4	2-1/2	3/4	21/32	1-7/16	51760	●
9/64	0.1406	3.57		1/4	2-1/2	3/4	21/32	1-7/16	51332	●
3,6 mm	0.1417		M4 X 0,35	6,0	62,0	20,0	17,0	36,0	63160	●
#27	0.1440	3.66		1/4	2-1/2	3/4	21/32	1-7/16	51761	●
3,7 mm	0.1457		M4.5 X 0,75	6,0	62,0	20,0	17,0	36,0	63161	●

continued on next page

\*Single Margin

**135 3xD**  
FRACTIONAL & METRIC SERIES

- Double margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials ≤ 56 HRc (≤ 577 Bhn)

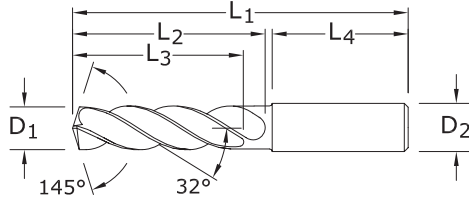
# Hi-PerCarb



3xD



2



## 135 3xD

FRACTIONAL & METRIC SERIES

- Double margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials  $\leq 56$  HRc ( $\leq 577$  Bhn)

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AITiN)	EDP NO.	STOCK
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>			
#26	0.1470	3.73	3/16-24	1/4	2-1/2	3/4	21/32	1-7/16	51762	●	
#25	0.1495	3.80	10-24	1/4	2-5/8	7/8	23/32	1-7/16	51333	●	
3,8 mm	0.1496			6,0	66,0	24,0	21,0	36,0	63472	●	
#24	0.1520	3.86	10-28	1/4	2-5/8	7/8	23/32	1-7/16	51763	●	
3,9 mm	0.1535			6,0	66,0	24,0	21,0	36,0	63743	●	
#23	0.1540	3.91		1/4	2-5/8	7/8	23/32	1-7/16	51764	●	
5/32	0.1562	3.97		1/4	2-5/8	7/8	23/32	1-7/16	51334	●	
#22	0.1570	3.99	10-30	1/4	2-5/8	7/8	23/32	1-7/16	51765	●	
4,0 mm	0.1575		M4,5 X 0,5	6,0	66,0	24,0	21,0	36,0	63162	●	
#21	0.1590	4.04	10-32	1/4	2-5/8	7/8	23/32	1-7/16	51335	●	
#20	0.1610	4.09	13/64-24	1/4	2-5/8	7/8	23/32	1-7/16	51279	●	
4,1 mm	0.1614			6,0	66,0	24,0	21,0	36,0	63744	●	
4,2 mm	0.1654		M5 / M5 X 0,75	6,0	66,0	24,0	21,0	36,0	63163	●	
#19	0.1660	4.22		1/4	2-5/8	7/8	23/32	1-7/16	51766	●	
4,3 mm	0.1693			6,0	66,0	24,0	21,0	36,0	63164	●	
#18	0.1695	4.31		1/4	2-5/8	7/8	23/32	1-7/16	51767	●	
11/64	0.1719	4.37		1/4	2-5/8	7/8	23/32	1-7/16	51336	●	
#17	0.1730	4.39		1/4	2-5/8	7/8	23/32	1-7/16	51768	●	
4,4 mm	0.1732			6,0	66,0	24,0	21,0	36,0	63745	●	
#16	0.1770	4.50	12-24	1/4	2-5/8	7/8	23/32	1-7/16	51769	●	
4,5 mm	0.1772		M5 X 0,5	6,0	66,0	24,0	21,0	36,0	63165	●	
#15	0.1800	4.57		1/4	2-5/8	7/8	23/32	1-7/16	51770	●	
4,6 mm	0.1811		12-28	6,0	66,0	24,0	21,0	36,0	63166	●	
#14	0.1820	4.62		1/4	2-5/8	7/8	23/32	1-7/16	51771	●	
#13	0.1850	4.70	12-32	1/4	2-5/8	7/8	23/32	1-7/16	51772	●	
4,7 mm	0.1850			6,0	66,0	24,0	21,0	36,0	63746	●	
3/16	0.1875	4.76		1/4	2-5/8	1	53/64	1-7/16	51337	●	
#12	0.1890	4.80	7/32-32	1/4	2-5/8	1	53/64	1-7/16	51773	●	
4,8 mm	0.1890			6,0	66,0	28,0	24,0	36,0	63167	●	
#11	0.1910	4.85		1/4	2-5/8	1	53/64	1-7/16	51774	●	
4,9 mm	0.1929			6,0	66,0	28,0	24,0	36,0	63747	●	
#10	0.1935	4.91	14-20	1/4	2-5/8	1	53/64	1-7/16	51775	●	
#9	0.1960	4.98		1/4	2-5/8	1	53/64	1-7/16	51776	●	
5,0 mm	0.1969		M6 X 1	6,0	66,0	28,0	24,0	36,0	63168	●	
#8	0.1990	5.05		1/4	2-5/8	1	53/64	1-7/16	51777	●	
5,1 mm	0.2008			6,0	66,0	28,0	24,0	36,0	63748	●	
#7	0.2010	5.11	1/4-20	1/4	2-5/8	1	53/64	1-7/16	51338	●	
13/64	0.2031	5.16		1/4	2-5/8	1	53/64	1-7/16	51339	●	
#6	0.2040	5.18		1/4	2-5/8	1	53/64	1-7/16	51778	●	
5,2 mm	0.2047		M6 X 0,75	6,0	66,0	28,0	24,0	36,0	63749	●	
#5	0.2055	5.22		1/4	2-5/8	1	53/64	1-7/16	51779	●	
5,25 mm	0.2067			6,0	66,0	28,0	24,0	36,0	63169	●	
5,3 mm	0.2087			6,0	66,0	28,0	24,0	36,0	63170	●	
#4	0.2090	5.31	1/4-24	1/4	2-5/8	1	53/64	1-7/16	51780	●	
5,4 mm	0.2126			6,0	66,0	28,0	24,0	36,0	63750	●	
#3	0.2130	5.41	1/4-28	1/4	2-5/8	1	53/64	1-7/16	51340	●	
5,5 mm	0.2165		M6 X 0,5	6,0	66,0	28,0	24,0	36,0	63171	●	

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### TOLERANCES (inch)

$\leq .1181$  DIAMETER

D<sub>1</sub> = +.0008/+0.0047

D<sub>2</sub> = h<sub>6</sub>

$>.1181-.2362$  DIAMETER

D<sub>1</sub> = +.00016/+0.00063

D<sub>2</sub> = h<sub>6</sub>

$>.2362-.3937$  DIAMETER

D<sub>1</sub> = +.00024/+0.00083

D<sub>2</sub> = h<sub>6</sub>

$>.3937-.7087$  DIAMETER

D<sub>1</sub> = +.00028/+0.00098

D<sub>2</sub> = h<sub>6</sub>

$>.7087-1.1811$  DIAMETER

D<sub>1</sub> = +.00031/+0.0114

D<sub>2</sub> = h<sub>6</sub>

### TOLERANCES (mm)

$\leq 3$  DIAMETER

D<sub>1</sub> = +0,002/+0,012

D<sub>2</sub> = h<sub>6</sub>

$>3-6$  DIAMETER

D<sub>1</sub> = +0,004/+0,016

D<sub>2</sub> = h<sub>6</sub>

$>6-10$  DIAMETER

D<sub>1</sub> = +0,006/+0,021

D<sub>2</sub> = h<sub>6</sub>

$>10-18$  DIAMETER

D<sub>1</sub> = +0,007/+0,025

D<sub>2</sub> = h<sub>6</sub>

$>18-30$  DIAMETER

D<sub>1</sub> = +0,008/+0,029

D<sub>2</sub> = h<sub>6</sub>

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

NON-FERROUS

HARDENED STEELS

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



# 135 3xD

FRACTIONAL & METRIC SERIES

CONTINUED

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AITiN)	EDP NO.	STOCK
7/32	0.2188	5.56	1/4-32	1/4	2-5/8	1	53/64	1-7/16	51341	●	
5,6 mm	0.2205			6,0	66,0	28,0	24,0	36,0	63751	●	
#2	0.2210	5.61		1/4	2-5/8	1	53/64	1-7/16	51781	●	
5,7 mm	0.2244			6,0	66,0	28,0	24,0	36,0	63752	●	
#1	0.2280	5.79		1/4	2-5/8	1	53/64	1-7/16	51782	●	
5,8 mm	0.2283			6,0	66,0	28,0	24,0	36,0	63172	●	
5,9 mm	0.2323			6,0	66,0	28,0	24,0	36,0	63753	●	
A	0.2340	5.94		1/4	2-5/8	1	53/64	1-7/16	51601	●	
15/64	0.2344	5.95		1/4	2-5/8	1	53/64	1-7/16	51342	●	
6,0	0.2362	6.00	M7 X 1	6,0	66,0	28,0	24,0	36,0	63173	●	
B	0.2380	6.05		1/4	3-1/8	1-5/16	1-3/64	1-7/16	51602	●	
6,1 mm	0.2402			8,0	79,0	34,0	28,0	36,0	63754	●	
C	0.2420	6.15		1/4	3-1/8	1-5/16	1-3/64	1-7/16	51603	●	
6,2 mm	0.2441			8,0	79,0	34,0	28,0	36,0	63755	●	
D	0.2460	6.25		1/4	3-1/8	1-5/16	1-3/64	1-7/16	51604	●	
6,25 mm	0.2461		M7 X 0,75	8,0	79,0	34,0	28,0	36,0	63174	●	
6,3 mm	0.2480			8,0	79,0	34,0	28,0	36,0	63756	●	
1/4	0.2500	6.35		1/4	3-1/8	1-5/16	1-3/64	1-7/16	51343	●	
E	0.2500	6.35		1/4	3-1/8	1-5/16	1-3/64	1-7/16	51605	●	
6,4 mm	0.2520			8,0	79,0	34,0	28,0	36,0	63175	●	
6,5 mm	0.2559			8,0	79,0	34,0	28,0	36,0	63213	●	
F	0.2570	6.53	5/16-18	5/16	3-1/8	1-5/16	1-3/64	1-7/16	51344	●	
6,6 mm	0.2598			8,0	79,0	34,0	28,0	36,0	63757	●	
G	0.2610	6.63		5/16	3-1/8	1-5/16	1-3/64	1-7/16	51606	●	
6,7 mm	0.2638			8,0	79,0	34,0	28,0	36,0	63758	●	
17/64	0.2656	6.75	5/16-20	5/16	3-1/8	1-5/16	1-3/64	1-7/16	51345	●	
H	0.2660	6.76		5/16	3-1/8	1-5/16	1-3/64	1-7/16	51607	●	
6,8 mm	0.2677		M8 X 1,25	8,0	79,0	34,0	28,0	36,0	63176	●	
6,9 mm	0.2717			8,0	79,0	34,0	28,0	36,0	63759	●	
I	0.2720	6.91	5/16-24	5/16	3-1/8	1-5/16	1-3/64	1-7/16	51346	●	
7,0 mm	0.2756		M8 X 1	8,0	79,0	34,0	28,0	36,0	63177	●	
J	0.2770	7.04		5/16	3-1/8	1-5/16	1-3/64	1-7/16	51608	●	
7,1 mm	0.2795			8,0	79,0	41,0	34,0	36,0	63760	●	
K	0.2810	7.14		5/16	3-1/8	1-9/16	1-3/16	1-7/16	51609	●	
9/32	0.2812	7.14	5/16-32	5/16	3-1/8	1-9/16	1-3/16	1-7/16	51347	●	
7,2 mm	0.2835			8,0	79,0	41,0	34,0	36,0	63761	●	
7,25 mm	0.2854		M8 X 0,75	8,0	79,0	41,0	34,0	36,0	63178	●	
7,3 mm	0.2874			8,0	79,0	41,0	34,0	36,0	63762	●	
L	0.2900	7.37		5/16	3-1/8	1-9/16	1-3/16	1-7/16	51610	●	
7,4 mm	0.2913			8,0	79,0	41,0	34,0	36,0	63763	●	
M	0.2950	7.49		5/16	3-1/8	1-9/16	1-3/16	1-7/16	51611	●	
7,5 mm	0.2953		M8 X 0,5	8,0	79,0	41,0	34,0	36,0	63179	●	
19/64	0.2969	7.54		5/16	3-1/8	1-9/16	1-3/16	1-7/16	51348	●	
7,6 mm	0.2992			8,0	79,0	41,0	34,0	36,0	63764	●	
N	0.3020	7.67		5/16	3-1/8	1-9/16	1-3/16	1-7/16	51612	●	
7,7 mm	0.3031			8,0	79,0	41,0	34,0	36,0	63765	●	
7,8 mm	0.3071		M9 X 1,25	8,0	79,0	41,0	34,0	36,0	63180	●	
7,9 mm	0.3110			8,0	79,0	41,0	34,0	36,0	63766	●	
5/16	0.3125	7.94	3/8-16	5/16	3-1/8	1-9/16	1-3/16	1-7/16	51349	●	
8,0 mm	0.3150		M9 x 1	8,0	79,0	41,0	34,0	36,0	63181	●	
O	0.3160	8.03		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51613	●	
8,1 mm	0.3189			10,0	89,0	47,0	40,0	40,0	63767	●	
8,2 mm	0.3228			10,0	89,0	47,0	40,0	40,0	63768	●	
P	0.3230	8.20		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51614	●	
8,3 mm	0.3268			10,0	89,0	47,0	40,0	40,0	63769	●	
21/64	0.3281	8.33	3/8-20	3/8	3-1/2	1-27/32	1-37/64	1-9/16	51350	●	
8,4 mm	0.3307			10,0	89,0	47,0	40,0	40,0	63182	●	
Q	0.3320	8.43	3/8-24	3/8	3-1/2	1-27/32	1-37/64	1-9/16	51351	●	
8,5 mm	0.3346		M10 X 1,5	10,0	89,0	47,0	40,0	40,0	63183	●	

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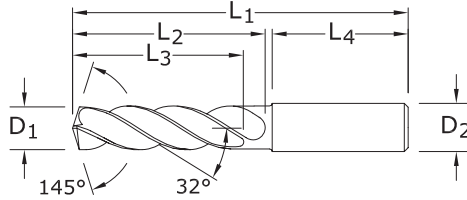
# Hi-PerCarb



3xD



2



## 135 3xD

FRACTIONAL & METRIC SERIES

- Double margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials  $\leq 56$  HRc ( $\leq 577$  Bhn)

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AITiN)	EDP NO.	STOCK
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>			
8,6 mm	0.3386			10,0	89,0	47,0	40,0	40,0	63770		●
R	0.3390	8.61		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51615		●
8,7 mm	0.3425			10,0	89,0	47,0	40,0	40,0	63771		●
11/32	0.3438	8.73	3/8-32	3/8	3-1/2	1-27/32	1-37/64	1-9/16	51352		●
8,8 mm	0.3465		M10 X 1,25	10,0	89,0	47,0	40,0	40,0	63184		●
S	0.3480	8.84		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51616		●
8,9 mm	0.3504			10,0	89,0	47,0	40,0	40,0	63772		●
9,0 mm	0.3543		M10 X 1	10,0	89,0	47,0	40,0	40,0	63185		●
T	0.3580	9.09		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51617		●
9,1 mm	0.3583			10,0	89,0	47,0	40,0	40,0	63773		●
23/64	0.3594	9.13		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51353		●
9,2 mm	0.3622		M10 X 0,75	10,0	89,0	47,0	40,0	40,0	63774		●
9,25 mm	0.3642	9.25		10,0	89,0	47,0	40,0	40,0	63186		●
9,3 mm	0.3661			10,0	89,0	47,0	40,0	40,0	63775		●
U	0.3680	9.35	7/16-14	3/8	3-1/2	1-27/32	1-37/64	1-9/16	51354		●
9,4 mm	0.3701			10,0	89,0	47,0	40,0	40,0	63776		●
9,5 mm	0.3740		M10 X 0,5	10,0	89,0	47,0	40,0	40,0	63187		●
3/8	0.3750	9.53		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51355		●
V	0.3770	9.58		1/2	3-1/2	1-27/32	1-37/64	1-9/16	51618		●
9,6 mm	0.3780			10,0	89,0	47,0	40,0	40,0	63777		●
9,7 mm	0.3819			10,0	89,0	47,0	40,0	40,0	63778		●
9,8 mm	0.3858			10,0	89,0	47,0	40,0	40,0	63779		●
W	0.3860			1/2	3-1/2	1-27/32	1-37/64	1-9/16	51619		●
9,9 mm	0.3898			10,0	89,0	47,0	40,0	40,0	63780		●
25/64	0.3906	9.92	7/16-20	1/2	3-1/2	1-27/32	1-37/64	1-9/16	51356		●
10,0 mm	0.3937			10,0	89,0	47,0	40,0	40,0	63188		●
X	0.3970	10.08	7/16-24	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51620		●
10,1 mm	0.3976			12,0	102,0	55,0	45,0	45,0	63781		●
10,2 mm	0.4016		M12 X 1,75	12,0	102,0	55,0	45,0	45,0	63189		●
Y	0.4040	10.26	7/16-28	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51621		●
10,3 mm	0.4055			12,0	102,0	55,0	45,0	45,0	63782		●
13/32	0.4062	10.32		1/2	4-1/16	2-3/16	1-51/64	1-49/64	51357		●
10,4 mm	0.4094			12,0	102,0	55,0	45,0	45,0	63783		●
Z	0.4130	10.49		1/2	4-1/16	2-3/16	1-51/64	1-49/64	51622		●
10,5 mm	0.4134		M12 X 1,5	12,0	102,0	55,0	45,0	45,0	63190		●
10,6 mm	0.4173			12,0	102,0	55,0	45,0	45,0	63784		●
10,7 mm	0.4213			12,0	102,0	55,0	45,0	45,0	63785		●
27/64	0.4219	10.72	1/2-13	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51358		●
10,8 mm	0.4252		M12 X 1,25	12,0	102,0	55,0	45,0	45,0	63191		●
10,9 mm	0.4291			12,0	102,0	55,0	45,0	45,0	63786		●
11,0 mm	0.4331		M12 X 1	12,0	102,0	55,0	45,0	45,0	63192		●
11,1 mm	0.4370			12,0	102,0	55,0	45,0	45,0	63787		●
7/16	0.4375	11.11	1/4-18 NPT	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51359		●
11,2 mm	0.4409			12,0	102,0	55,0	45,0	45,0	63788		●
11,25 mm	0.4429			12,0	102,0	55,0	45,0	45,0	63193		●
11,3 mm	0.4449			12,0	102,0	55,0	45,0	45,0	63789		●

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### TOLERANCES (inch)

$\leq .1181$  DIAMETER

D<sub>1</sub> = +.0008/+0.0047

D<sub>2</sub> = h<sub>6</sub>

$>.1181-.2362$  DIAMETER

D<sub>1</sub> = +.00016/+0.00063

D<sub>2</sub> = h<sub>6</sub>

$>.2362-.3937$  DIAMETER

D<sub>1</sub> = +.00024/+0.00083

D<sub>2</sub> = h<sub>6</sub>

$>.3937-.7087$  DIAMETER

D<sub>1</sub> = +.00028/+0.00098

D<sub>2</sub> = h<sub>6</sub>

$>.7087-1.1811$  DIAMETER

D<sub>1</sub> = +.00031/+0.0114

D<sub>2</sub> = h<sub>6</sub>

### TOLERANCES (mm)

$\leq 3$  DIAMETER

D<sub>1</sub> = +0,002/+0,012

D<sub>2</sub> = h<sub>6</sub>

$>3-6$  DIAMETER

D<sub>1</sub> = +0,004/+0,016

D<sub>2</sub> = h<sub>6</sub>

$>6-10$  DIAMETER

D<sub>1</sub> = +0,006/+0,021

D<sub>2</sub> = h<sub>6</sub>

$>10-18$  DIAMETER

D<sub>1</sub> = +0,007/+0,025

D<sub>2</sub> = h<sub>6</sub>

$>18-30$  DIAMETER

D<sub>1</sub> = +0,008/+0,029

D<sub>2</sub> = h<sub>6</sub>

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

NON-FERROUS

HARDENED STEELS

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



# 135 3xD

FRACTIONAL & METRIC SERIES

CONTINUED

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AITiN)	STOCK
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.	
11,4 mm	0.4488			12,0	102,0	55,0	45,0	45,0	63790	●
11,5 mm	0.4528		M12 X 0,5	12,0	102,0	55,0	45,0	45,0	63194	●
29/64	0.4531	11.51	1/2-20	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51360	●
11,6 mm	0.4567			12,0	102,0	55,0	45,0	45,0	63791	●
11,7 mm	0.4606			12,0	102,0	55,0	45,0	45,0	63792	●
11,8 mm	0.4646			12,0	102,0	55,0	45,0	45,0	63793	●
11,9 mm	0.4685			12,0	102,0	55,0	45,0	45,0	63794	●
15/32	0.4688	11.91	1/2-28	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51361	●
12,0 mm	0.4724		M14 X 2	12,0	102,0	55,0	45,0	45,0	63195	●
31/64	0.4844	12.30	9/16-12	1/2	4-1/4	2-5/16	1-7/8	1-49/64	51362	●
12,5 mm	0.4921		M14 X 1,5	14,0	107,0	60,0	49,0	45,0	63196	●
1/2	0.5000	12.70		1/2	4-1/4	2-5/16	1-7/8	1-49/64	51363	●
12,8 mm	0.5039		M14 X 1,25	14,0	107,0	60,0	49,0	45,0	63197	●
13,0 mm	0.5118		M14 X 1	14,0	107,0	60,0	49,0	45,0	63198	●
33/64	0.5156	13.10	9/16-18	5/8	4-1/4	2-5/16	1-7/8	1-49/64	51364	●
17/32	0.5312	13.49	5/8-11	5/8	4-1/4	2-5/16	1-7/8	1-49/64	51365	●
13,5 mm	0.5315			14,0	107,0	60,0	49,0	45,0	63199	●
35/64	0.5469	13.89	5/8-12	5/8	4-1/4	2-5/16	1-7/8	1-49/64	51783	●
14,0 mm	0.5512		M16 X 2	14,0	107,0	60,0	49,0	45,0	63200	●
9/16	0.5625	14.29		5/8	4-9/16	2-1/2	2	1-57/64	51366	●
14,5 mm	0.5709		M16 X 1,5	16,0	115,0	65,0	51,0	48,0	63201	●
37/64	0.5781	14.68	5/8-18	5/8	4-9/16	2-1/2	2	1-57/64	51367	●
15,0 mm	0.5906		M16 X 1	16,0	115,0	65,0	51,0	48,0	63202	●
19/32	0.5938	15.08	11/16-11	5/8	4-9/16	2-1/2	2	1-57/64	51784	●
39/64	0.6094	15.48	11/16-12	5/8	4-9/16	2-1/2	2	1-57/64	51785	●
15,5 mm	0.6102		M18 X 2,5	16,0	115,0	65,0	51,0	48,0	63203	●
5/8	0.6250	15.88	11/16-16	5/8	4-9/16	2-1/2	2	1-57/64	51368	●
16,0 mm	0.6299			16,0	115,0	65,0	51,0	48,0	63204	●
41/64	0.6406	16.27	11/16-24	3/4	4-7/8	2-3/4	2-5/16	1-57/64	51786	●
16,5 mm	0.6496		M18 X 1,5	18,0	123,0	73,0	58,0	48,0	63205	●
21/32	0.6562	16.67	3/4-10	3/4	4-7/8	2-3/4	2-5/16	1-57/64	51369	●
17,0 mm	0.6693			18,0	123,0	73,0	58,0	48,0	63206	●
43/64	0.6719	17.07	3/4-12	3/4	4-7/8	2-3/4	2-5/16	1-57/64	51787	●
11/16	0.6875	17.46	3/4-16	3/4	4-7/8	2-3/4	2-5/16	1-57/64	51370	●
17,5 mm	0.6890		M20 X 2,5	18,0	123,0	73,0	58,0	48,0	63207	●
45/64	0.7031	17.86	3/4-20, 1/2-14 NPT	3/4	4-7/8	2-3/4	2-5/16	1-57/64	51788	●
18,0 mm	0.7087			18,0	123,0	73,0	58,0	48,0	63208	●
23/32	0.7188	18.26		3/4	4-7/8	2-3/4	2-5/16	1-57/64	51789	●
18,5 mm	0.7283		M20 X 1,5	20,0	131,0	79,0	63,0	50,0	63209	●
47/64	0.7344	18.65	13/16-12	3/4	4-7/8	2-3/4	2-5/16	1-57/64	51790	●
19,0 mm	0.7480			20,0	131,0	79,0	63,0	50,0	63210	●
3/4	0.7500	19.05	13/16-16	3/4	5-1/4	3-1/16	2-7/16	1-31/32	51371	●
49/64	0.7656	19.45	7/8-9	7/8	5-1/4	3-1/16	2-7/16	1-31/32	51372	●
19,5 mm	0.7677		M22 X 2,5	20,0	131,0	79,0	63,0	50,0	63211	●
25/32	0.7812	19.84		7/8	6	3-11/16	2-11/16	2-1/8	51791	●
20,0 mm	0.7874			20,0	131,0	79,0	63,0	50,0	63212	●
51/64	0.7969	20.24	7/8-12	7/8	6	3-11/16	2-11/16	2-1/8	51792	●
20,5 mm	0.8071			22,0	150,0	93,0	73,0	53,0	64513	●
13/16	0.8125	20.64	7/8-14	7/8	6	3-11/16	2-11/16	2-1/8	51373	●
21,0 mm	0.8268			22,0	150,0	93,0	73,0	53,0	64514	●
22,0 mm	0.8661			22,0	150,0	93,0	73,0	53,0	64515	●
7/8	0.8750	22.23	15/16-16, 1-8	7/8	6	3-11/16	2-11/16	2-1/8	51374	●
59/64	0.9219	23.42	1-12	1	6	3-11/16	2-11/16	2-1/8	51375	●



# FRACTIONAL Hi-PerCarb

Series 135 3D Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/32	1/8	1/4	3/8	1/2	5/8	7/8		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	385	RPM	47062	11766	5883	3922	2941	2353	1681	
		(308-462)	Fr	0.0010	0.0038	0.0076	0.0115	0.0153	0.0191	0.0268	
			Feed (ipm)	45.0	45.0	45.0	45.0	45.0	45.0	45.0	
	≤ 275 Bhn or ≤ 28 HRc	350	RPM	42784	10696	5348	3565	2674	2139	1528	
		(280-420)	Fr	0.0009	0.0036	0.0071	0.0107	0.0142	0.0178	0.0249	
			Feed (ipm)	38.0	38.0	38.0	38.0	38.0	38.0	38.0	
	≤ 425 Bhn or ≤ 45 HRc	200	RPM	24448	6112	3056	2037	1528	1222	873	
		(160-240)	Fr	0.0007	0.0029	0.0059	0.0088	0.0118	0.0147	0.0206	
			Feed (ipm)	18.0	18.0	18.0	18.0	18.0	18.0	18.0	
	<b>H</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	300	RPM	36672	9168	4584	3056	2292	1834	1310
			(240-360)	Fr	0.0007	0.0029	0.0059	0.0088	0.0118	0.0147	0.0206
				Feed (ipm)	27.0	27.0	27.0	27.0	27.0	27.0	27.0
≤ 375 Bhn or ≤ 40 HRc		185	RPM	22614	5654	2827	1885	1413	1131	808	
		(148-222)	Fr	0.0006	0.0026	0.0051	0.0077	0.0103	0.0128	0.0180	
			Feed (ipm)	14.5	14.5	14.5	14.5	14.5	14.5	14.5	
≤ 450 Bhn or ≤ 48 HRc		130	RPM	15891	3973	1986	1324	993	795	568	
		(104-156)	Fr	0.0004	0.0018	0.0035	0.0053	0.0070	0.0088	0.0123	
			Feed (ipm)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	
<b>K</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 200 Bhn or ≤ 13 HRc	130	RPM	15891	3973	1986	1324	993	795	568
			(104-156)	Fr	0.0007	0.0026	0.0053	0.0079	0.0106	0.0132	0.0185
				Feed (ipm)	10.5	10.5	10.5	10.5	10.5	10.5	10.5
	≤ 375 Bhn or ≤ 40 HRc	90	RPM	11002	2750	1375	917	688	550	393	
		(72-108)	Fr	0.0003	0.0012	0.0023	0.0035	0.0047	0.0058	0.0081	
			Feed (ipm)	3.2	3.2	3.2	3.2	3.2	3.2	3.2	
	≤ 475 Bhn or ≤ 50 HRc	75	RPM	9168	2292	1146	764	573	458	327	
		(60-90)	Fr	0.0002	0.0008	0.0016	0.0024	0.0031	0.0039	0.0055	
			Feed (ipm)	1.8	1.8	1.8	1.8	1.8	1.8	1.8	
	<b>M</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	320	RPM	39117	9779	4890	3260	2445	1956	1397
			(256-384)	Fr	0.0012	0.0046	0.0092	0.0138	0.0184	0.0230	0.0322
				Feed (ipm)	45.0	45.0	45.0	45.0	45.0	45.0	45.0
≤ 260 Bhn or ≤ 26 HRc		285	RPM	34838	8710	4355	2903	2177	1742	1244	
		(228-342)	Fr	0.0011	0.0046	0.0092	0.0138	0.0184	0.0230	0.0321	
			Feed (ipm)	40.0	40.0	40.0	40.0	40.0	40.0	40.0	
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F, 440F		≤ 185 Bhn or ≤ 9 HRc	275	RPM	33616	8404	4202	2801	2101	1681	1201
			(220-330)	Fr	0.0006	0.0026	0.0051	0.0077	0.0102	0.0128	0.0179
				Feed (ipm)	21.5	21.5	21.5	21.5	21.5	21.5	21.5
		≤ 275 Bhn or ≤ 28 HRc	170	RPM	20781	5195	2598	1732	1299	1039	742
			(136-204)	Fr	0.0005	0.0020	0.0040	0.0061	0.0081	0.0101	0.0141
				Feed (ipm)	10.5	10.5	10.5	10.5	10.5	10.5	10.5
	<b>M</b>  <b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	90	RPM	11002	2750	1375	917	688	550	393
			(72-108)	Fr	0.0005	0.0020	0.0040	0.0060	0.0080	0.0100	0.0140
				Feed (ipm)	5.5	5.5	5.5	5.5	5.5	5.5	5.5
		≤ 375 Bhn or ≤ 40 HRc	65	RPM	7946	1986	993	662	497	397	284
			(52-78)	Fr	0.0004	0.0018	0.0035	0.0053	0.0070	0.0088	0.0123
				Feed (ipm)	3.5	3.5	3.5	3.5	3.5	3.5	3.5

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Series 135 3D Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/32	1/8	1/4	3/8	1/2	5/8	7/8		
<b>S</b>  <b>SUPER ALLOYS</b> (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	≤ 300 Bhn or ≤ 32 HRc	55	RPM	6723	1681	840	560	420	336	240	
		(44-66)	Fr	0.0002	0.0008	0.0015	0.0023	0.0031	0.0039	0.0054	
			Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	1.3	
	≤ 400 Bhn or ≤ 43 HRc	30	RPM	3667	917	458	306	229	183	131	
		(24-36)	Fr	0.0002	0.0007	0.0013	0.0020	0.0026	0.0033	0.0046	
			Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
	<b>S</b>  <b>TITANIUM ALLOYS</b> Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	135	RPM	16502	4126	2063	1375	1031	825	589
			(108-162)	Fr	0.0004	0.0018	0.0035	0.0053	0.0071	0.0088	0.0124
				Feed (ipm)	7.3	7.3	7.3	7.3	7.3	7.3	7.3
		≤ 350 Bhn or ≤ 38 HRc	100	RPM	12224	3056	1528	1019	764	611	437
			(80-120)	Fr	0.0004	0.0016	0.0033	0.0049	0.0065	0.0082	0.0115
				Feed (ipm)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
≤ 440 Bhn or ≤ 47 HRc		55	RPM	6723	1681	840	560	420	336	240	
		(44-66)	Fr	0.0003	0.0012	0.0024	0.0036	0.0048	0.0059	0.0083	
			Feed (ipm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
<b>N</b>  <b>ALUMINUM ALLOYS</b> 2017, 2024, 356, 6061, 7075		≤ 80 Bhn or ≤ 47 HRb	700	RPM	85568	21392	10696	7131	5348	4278	3056
			(560-840)	Fr	0.0012	0.0049	0.0098	0.0147	0.0196	0.0245	0.0344
				Feed (ipm)	105.0	105.0	105.0	105.0	105.0	105.0	105.0
	≤ 150 Bhn or ≤ 7 HRc	600	RPM	73344	18336	9168	6112	4584	3667	2619	
		(480-720)	Fr	0.0012	0.0050	0.0099	0.0149	0.0199	0.0248	0.0347	
			Feed (ipm)	91.0	91.0	91.0	91.0	91.0	91.0	91.0	
	<b>N</b>  <b>COPPER ALLOYS</b> Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	500	RPM	61120	15280	7640	5093	3820	3056	2183
			(400-600)	Fr	0.0005	0.0020	0.0039	0.0059	0.0079	0.0098	0.0137
				Feed (ipm)	30.0	30.0	30.0	30.0	30.0	30.0	30.0
		≤ 200 Bhn or ≤ 23 HRc	400	RPM	48896	12224	6112	4075	3056	2445	1746
			(320-480)	Fr	0.0005	0.0020	0.0040	0.0060	0.0080	0.0100	0.0140
				Feed (ipm)	24.5	24.5	24.5	24.5	24.5	24.5	24.5

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fr \times rpm$   
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstoool.com](http://www.kyocera-sgstoool.com))

# Hi-PerCarb

Series 135 3D Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (inch)									
			1.5	3	6	8	10	12	16	20		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	117	RPM	24882	12441	6220	4665	3732	3110	2333	1866	
		(94-141)	Fr	0.047	0.094	0.189	0.252	0.315	0.378	0.504	0.630	
			Feed (mm/min)	1175	1175	1175	1175	1175	1175	1175	1175	1175
	≤ 275 Bhn or ≤ 28 HRc	107	RPM	22620	11310	5655	4241	3393	2827	2121	1696	
		(85-128)	Fr	0.043	0.086	0.172	0.229	0.286	0.343	0.457	0.572	
			Feed (mm/min)	970	970	970	970	970	970	970	970	970
	≤ 475 Bhn or ≤ 45 HRc	61	RPM	12926	6463	3231	2424	1939	1616	1212	969	
		(49-73)	Fr	0.036	0.071	0.142	0.190	0.237	0.285	0.380	0.475	
			Feed (mm/min)	460	460	460	460	460	460	460	460	460
	<b>H</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	91	RPM	19388	9694	4847	3635	2908	2424	1818	1454
			(73-110)	Fr	0.036	0.071	0.142	0.190	0.237	0.285	0.380	0.475
				Feed (mm/min)	690	690	690	690	690	690	690	690
≤ 375 Bhn or ≤ 40 HRc		56	RPM	11956	5978	2989	2242	1793	1495	1121	897	
		(45-68)	Fr	0.031	0.061	0.122	0.163	0.204	0.244	0.326	0.407	
			Feed (mm/min)	365	365	365	365	365	365	365	365	365
≤ 450 Bhn or ≤ 48 HRc		40	RPM	8402	4201	2100	1575	1260	1050	788	630	
		(32-48)	Fr	0.021	0.042	0.083	0.111	0.139	0.167	0.222	0.278	
			Feed (mm/min)	175	175	175	175	175	175	175	175	175
<b>K</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 200 Bhn or ≤ 13 HRc	40	RPM	8402	4201	2100	1575	1260	1050	788	630
			(32-48)	Fr	0.032	0.063	0.126	0.168	0.210	0.252	0.336	0.421
				Feed (mm/min)	265	265	265	265	265	265	265	265
	≤ 375 Bhn or ≤ 40 HRc	27	RPM	5816	2908	1454	1091	872	727	545	436	
		(22-33)	Fr	0.014	0.028	0.055	0.073	0.092	0.110	0.147	0.183	
			Feed (mm/min)	80	80	80	80	80	80	80	80	80
	≤ 475 Bhn or ≤ 50 HRc	23	RPM	4847	2424	1212	909	727	606	454	364	
		(18-27)	Fr	0.009	0.019	0.037	0.050	0.062	0.074	0.099	0.124	
			Feed (mm/min)	45	45	45	45	45	45	45	45	45
	<b>M</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	98	RPM	20681	10340	5170	3878	3102	2585	1939	1551
			(78-117)	Fr	0.055	0.110	0.220	0.293	0.366	0.439	0.585	0.732
				Feed (mm/min)	1135	1135	1135	1135	1135	1135	1135	1135
≤ 260 Bhn or ≤ 26 HRc		87	RPM	18419	9209	4605	3454	2763	2302	1727	1381	
		(69-104)	Fr	0.055	0.110	0.219	0.292	0.366	0.439	0.585	0.731	
			Feed (mm/min)	1010	1010	1010	1010	1010	1010	1010	1010	1010
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 185 Bhn or ≤ 9 HRc	84	RPM	17773	8886	4443	3332	2666	2222	1666	1333	
		(67-101)	Fr	0.031	0.061	0.123	0.164	0.204	0.245	0.327	0.409	
			Feed (mm/min)	545	545	545	545	545	545	545	545	545
	≤ 275 Bhn or ≤ 28 HRc	52	RPM	10987	5493	2747	2060	1648	1373	1030	824	
		(41-62)	Fr	0.024	0.047	0.095	0.126	0.158	0.189	0.252	0.316	
			Feed (mm/min)	260	260	260	260	260	260	260	260	260
	<b>M</b>  <b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	27	RPM	5816	2908	1454	1091	872	727	545	436
			(22-33)	Fr	0.023	0.046	0.093	0.124	0.155	0.186	0.248	0.309
				Feed (mm/min)	135	135	135	135	135	135	135	135
		≤ 375 Bhn or ≤ 40 HRc	20	RPM	4201	2100	1050	788	630	525	394	315
			(16-24)	Fr	0.020	0.040	0.081	0.108	0.135	0.162	0.216	0.270
				Feed (mm/min)	85	85	85	85	85	85	85	85

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Series 135 3D Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (inch)									
			1.5	3	6	8	10	12	16	20		
<b>SUPER ALLOYS</b> (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	≤ 300 Bhn or ≤ 32 HRc	17	RPM	3555	1777	889	666	533	444	333	267	
		(13-20)	Fr	0.010	0.020	0.039	0.053	0.066	0.079	0.105	0.131	
			Feed (mm/min)	35	35	35	35	35	35	35	35	
	≤ 400 Bhn or ≤ 43 HRc	9	RPM	1939	969	485	364	291	242	182	145	
		(7-11)	Fr	0.008	0.015	0.031	0.041	0.052	0.062	0.083	0.103	
			Feed (mm/min)	15	15	15	15	15	15	15	15	
	<b>TITANIUM ALLOYS</b> Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	41	RPM	8725	4362	2181	1636	1309	1091	818	654
			(33-49)	Fr	0.021	0.042	0.085	0.113	0.141	0.170	0.226	0.283
				Feed (mm/min)	185	185	185	185	185	185	185	185
		≤ 350 Bhn or ≤ 38 HRc	30	RPM	6463	3231	1616	1212	969	808	606	485
			(24-37)	Fr	0.019	0.039	0.077	0.103	0.129	0.155	0.206	0.258
				Feed (mm/min)	125	125	125	125	125	125	125	125
≤ 440 Bhn or ≤ 47 HRc		17	RPM	3555	1777	889	666	533	444	333	267	
		(13-20)	Fr	0.014	0.028	0.056	0.075	0.094	0.113	0.150	0.188	
			Feed (mm/min)	50	50	50	50	50	50	50	50	
<b>ALUMINUM ALLOYS</b> 2017, 2024, 356, 6061, 7075		≤ 80 Bhn or ≤ 47 HRb	213	RPM	45239	22620	11310	8482	6786	5655	4241	3393
			(171-256)	Fr	0.059	0.119	0.238	0.317	0.396	0.476	0.634	0.793
				Feed (mm/min)	2690	2690	2690	2690	2690	2690	2690	2690
	≤ 150 Bhn or ≤ 7 HRc	183	RPM	38777	19388	9694	7271	5816	4847	3635	2908	
		(146-219)	Fr	0.060	0.120	0.240	0.320	0.400	0.480	0.640	0.799	
			Feed (mm/min)	2325	2325	2325	2325	2325	2325	2325	2325	
	<b>COPPER ALLOYS</b> Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	152	RPM	32314	16157	8078	6059	4847	4039	3029	2424
			(122-183)	Fr	0.024	0.048	0.096	0.128	0.160	0.192	0.256	0.320
				Feed (mm/min)	776	776	776	776	776	776	776	776
		≤ 200 Bhn or ≤ 23 HRc	122	RPM	25851	12926	6463	4847	3878	3231	2424	1939
			(98-146)	Fr	0.024	0.049	0.097	0.130	0.162	0.195	0.260	0.325
				Feed (mm/min)	630	630	630	630	630	630	630	630

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fr \times rpm$   
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstoool.com](http://www.kyocera-sgstoool.com))

# Hi-PerCarb

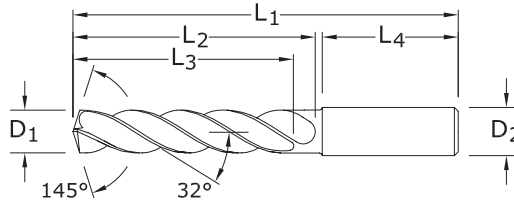


5xD



## 135 5xD

FRACTIONAL & METRIC SERIES



- Double margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials  $\leq 56$  HRc ( $\leq 577$  Bhn)

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AlTiN)	STOCK
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.	
1/64	0.0156	0.40		1/8	1 1/2	5/32	7/64	1	52300*	●
1/32	0.0312	0.79		1/8	1 1/2	5/16	7/32	1	52301*	●
3/64	0.0469	1.19	1/16-64	1/8	1 1/2	25/64	19/64	1	52302*	●
1,25 mm	0.0492			3,0	38,0	10,0	7,5	25,0	64520*	●
1,45 mm	0.0571			3,0	38,0	10,0	7,5	25,0	64521*	●
#53	0.0595	1.51		1/8	1-1/2	25/64	19/64	1	64522*	●
1/16	0.0625	1.59	5/64-60	1/8	2	15/32	23/64	1-1/4	52303*	●
1,6 mm	0.0630			3,0	50,0	12,0	9,0	32,0	64523*	●
1,75 mm	0.0689			3,0	50,0	12,0	9,0	32,0	64524*	●
#50	0.0700	1.78		1/8	2	15/32	23/64	1-1/4	64525*	●
5/64	0.0781	1.98		1/8	2	35/64	27/64	1-1/4	52304*	●
#47	0.0785	1.99		1/8	2	35/64	27/64	1-1/4	64526*	●
2,05 mm	0.0807			3,0	50,0	14,0	11,0	32,0	64527*	●
#46	0.0810	2.06		1/8	2	35/64	27/64	1-1/4	64528*	●
#43	0.0890	2.26		1/8	2	19/32	15/32	1-1/4	64529*	●
#42	0.0935	2.37		1/8	2	5/8	1/2	1-1/4	64530*	●
3/32	0.0938	2.38	1/8-32	1/8	2	5/8	1/2	1-1/4	52305	●
#40	0.0980	2.49		1/8	2	43/64	17/32	1-1/4	52306	●
2,5 mm	0.0984			3,0	50,0	17,0	13,0	32,0	64531	●
#39	0.0995	2.53		1/8	2	43/64	17/32	1-1/4	52307	●
#38	0.1015	2.58	5-40	1/8	2	43/64	17/32	1-1/4	52308	●
#37	0.1040	2.64	5-44	1/8	2	45/64	9/16	1-1/4	52309	●
#36	0.1065	2.71	6-32	1/8	2	45/64	9/16	1-1/4	52310	●
7/64	0.1094	2.78		1/8	2	3/4	19/32	1-1/4	52311	●
#35	0.1100	2.79		1/8	2	3/4	19/32	1-1/4	52312	●
#34	0.1110	2.82		1/8	2	3/4	19/32	1-1/4	52313	●
#33	0.1130	2.87	6-40	1/8	2	3/4	19/32	1-1/4	52314	●
2,9 mm	0.1142			3,0	50,0	19,0	15,0	32,0	64532	●
#32	0.1160	2.95		1/8	2	3/4	39/64	1-1/4	52315	●
3,0 mm	0.1181			6,0	66,0	28,0	23,0	36,0	64100	●
#31	0.1200	3.05		1/8	2	3/4	39/64	1-1/4	52316	●
3,1 mm	0.1220			6,0	66,0	28,0	23,0	36,0	64101	●
1/8	0.1250	3.18		1/4	3	1	53/64	1-7/16	51580	●
3,2 mm	0.1260		M3,5 X 0,35	6,0	66,0	28,0	23,0	36,0	64102	●
#30	0.1285	3.26		1/4	3	1	53/64	1-7/16	51581	●
3,3 mm	0.1299		M4 X 0,7	6,0	66,0	28,0	23,0	36,0	64103	●
3,4 mm	0.1339		8-32,8-36	6,0	66,0	28,0	23,0	36,0	64104	●
#29	0.1360	3.45		1/4	3	1	53/64	1-7/16	51582	●

\*Single Margin

continued on next page

### TOLERANCES (inch)

#### ≤.1181 DIAMETER

D<sub>1</sub> = +.0008/+0.0047

D<sub>2</sub> = h<sub>6</sub>

#### >.1181-.2362 DIAMETER

D<sub>1</sub> = +.00016/+0.00063

D<sub>2</sub> = h<sub>6</sub>

#### >.2362-.3937 DIAMETER

D<sub>1</sub> = +.00024/+0.00083

D<sub>2</sub> = h<sub>6</sub>

#### >.3937-.7087 DIAMETER

D<sub>1</sub> = +.00028/+0.00098

D<sub>2</sub> = h<sub>6</sub>

#### >.7087-1.1811 DIAMETER

D<sub>1</sub> = +.00031/+0.00114

D<sub>2</sub> = h<sub>6</sub>

### TOLERANCES (mm)

#### ≤3 DIAMETER

D<sub>1</sub> = +0,002/+0,012

D<sub>2</sub> = h<sub>6</sub>

#### >3-6 DIAMETER

D<sub>1</sub> = +0,004/+0,016

D<sub>2</sub> = h<sub>6</sub>

#### >6-10 DIAMETER

D<sub>1</sub> = +0,006/+0,021

D<sub>2</sub> = h<sub>6</sub>

#### >10-18 DIAMETER

D<sub>1</sub> = +0,007/+0,025

D<sub>2</sub> = h<sub>6</sub>

#### >18-30 DIAMETER

D<sub>1</sub> = +0,008/+0,029

D<sub>2</sub> = h<sub>6</sub>

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

NON-FERROUS

HARDENED STEELS

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



# 135 5xD

FRACTIONAL & METRIC SERIES

CONTINUED

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AITIN)	STOCK
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.	
3,5 mm	0.1378			6,0	66,0	28,0	23,0	36,0	64105	●
#28	0.1405	3.57	8-40	1/4	3	1	53/64	1-7/16	52317	●
9/64	0.1406	3.57		1/4	3	1	53/64	1-7/16	51583	●
3,6 mm	0.1417		M4 X 0,35	6,0	66,0	28,0	23,0	36,0	64106	●
#27	0.1440	3.66		1/4	3	1	53/64	1-7/16	52318	●
3,7 mm	0.1457		M4.5 X 0,75	6,0	66,0	28,0	23,0	36,0	64107	●
#26	0.1470	3.73	3/16-24	1/4	3	1	53/64	1-7/16	52319	●
#25	0.1495	3.80	10-24	1/4	3-1/4	1-1/4	1-5/64	1-7/16	51584	●
3,8 mm	0.1496			6,0	74,0	36,0	29,0	36,0	64108	●
#24	0.1520	3.86	10-28	1/4	3-1/4	1-1/4	1-5/64	1-7/16	52321	●
3,9 mm	0.1535			6,0	74,0	36,0	29,0	36,0	64109	●
#23	0.1540	3.91		1/4	3-1/4	1-1/4	1-5/64	1-7/16	52322	●
5/32	0.1562	3.97		1/4	3-1/4	1-1/4	1-5/64	1-7/16	51585	●
#22	0.1570	3.99	10-30	1/4	3-1/4	1-1/4	1-5/64	1-7/16	52323	●
4,0 mm	0.1575		M4,5 X 0,5	6,0	74,0	36,0	29,0	36,0	64110	●
#21	0.1590	4.04	10-32	1/4	3-1/4	1-1/4	1-5/64	1-7/16	51586	●
#20	0.1610	4.09	13/64-24	1/4	3-1/4	1-1/4	1-5/64	1-7/16	51587	●
4,1 mm	0.1614			6,0	74,0	36,0	29,0	36,0	64111	●
4,2 mm	0.1654		M5 / M5 X 0,75	6,0	74,0	36,0	29,0	36,0	64112	●
#19	0.1660	4.22		1/4	3-1/4	1-1/4	1-5/64	1-7/16	52324	●
4,3 mm	0.1693			6,0	74,0	36,0	29,0	36,0	64113	●
#18	0.1695	4.31		1/4	3-1/4	1-1/4	1-5/64	1-7/16	52325	●
11/64	0.1719	4.37		1/4	3-1/4	1-1/4	1-5/64	1-7/16	51588	●
#17	0.1730	4.39		1/4	3-1/4	1-1/4	1-5/64	1-7/16	52326	●
4,4 mm	0.1732			6,0	74,0	36,0	29,0	36,0	64114	●
4,5 mm	0.1772		M5 X 0,5	6,0	74,0	36,0	29,0	36,0	64115	●
#15	0.1800	4.57		1/4	3-1/4	1-1/4	1-5/64	1-7/16	52327	●
4,6 mm	0.1811		12-28	6,0	74,0	36,0	29,0	36,0	64116	●
#14	0.1820	4.62		1/4	3-1/4	1-1/4	1-5/64	1-7/16	52328	●
#13	0.1850	4.70	12-32	1/4	3-1/4	1-1/4	1-5/64	1-7/16	52329	●
4,7 mm	0.1850			6,0	74,0	36,0	29,0	36,0	64117	●
3/16	0.1875	4.76		1/4	3-1/4	1-3/4	1-37/64	1-7/16	51589	●
#12	0.1890	4.80	7/32-32	1/4	3-1/4	1-3/4	1-37/64	1-7/16	52330	●
4,8 mm	0.1890			6,0	82,0	44,0	35,0	36,0	64118	●
4,9 mm	0.1929			6,0	82,0	44,0	35,0	36,0	64119	●
#10	0.1935	4.91	14-20	1/4	3-1/4	1-3/4	1-37/64	1-7/16	52331	●
#9	0.1960	4.98		1/4	3-1/4	1-3/4	1-37/64	1-7/16	52332	●
5,0 mm	0.1969		M6 X 1	6,0	82,0	44,0	35,0	36,0	64120	●
#8	0.1990	5.05		1/4	3-1/4	1-3/4	1-37/64	1-7/16	52333	●
5,1 mm	0.2008			6,0	82,0	44,0	35,0	36,0	64121	●
#7	0.2010	5.11	1/4-20	1/4	3-1/4	1-3/4	1-37/64	1-7/16	51506	●
13/64	0.2031	5.16		1/4	3-1/4	1-3/4	1-37/64	1-7/16	51507	●
#6	0.2040	5.18		1/4	3 1/4	1 3/4	1 37/64	1 7/16	52334	●
5,2 mm	0.2047		M6 X 0,75	6,0	82,0	44,0	35,0	36,0	64122	●
#5	0.2055	5.22		1/4	3-1/4	1-3/4	1-37/64	1-7/16	51590	●
5,25 mm	0.2067			6,0	82,0	44,0	35,0	36,0	64123	●
5,3 mm	0.2087			6,0	82,0	44,0	35,0	36,0	64124	●
#4	0.2090	5.31	1/4-24	1/4	3-1/4	1-3/4	1-37/64	1-7/16	51508	●

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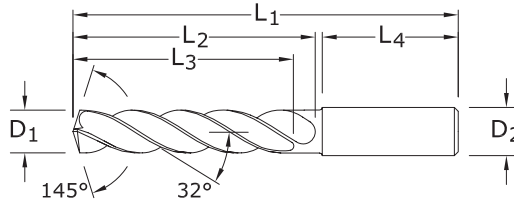
# Hi-PerCarb



5xD



2



## 135 5xD

FRACTIONAL & METRIC SERIES

- Double margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials  $\leq 56$  HRc ( $\leq 577$  Bhn)

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AlTiN)	EDP NO.	STOCK
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>			
5,4 mm	0.2126			6,0	82,0	44,0	35,0	36,0	64125	●	
#3	0.2130	5.41	1/4-28	1/4	3-1/4	1-3/4	1-37/64	1-7/16	51509	●	
5,5 mm	0.2165		M6 X 0,5	6,0	82,0	44,0	35,0	36,0	64126	●	
7/32	0.2188	5.56	1/4-32	1/4	3-1/4	1-3/4	1-37/64	1-7/16	51510	●	
5,6 mm	0.2205			6,0	82,0	44,0	35,0	36,0	64127	●	
#2	0.2210	5.61		1/4	3-1/4	1-3/4	1-37/64	1-7/16	52335	●	
5,7 mm	0.2244			6,0	82,0	44,0	35,0	36,0	64128	●	
#1	0.2280	5.79		1/4	3-1/4	1-3/4	1-37/64	1-7/16	52336	●	
5,8 mm	0.2283			6,0	82,0	44,0	35,0	36,0	64129	●	
5,9 mm	0.2323			6,0	82,0	44,0	35,0	36,0	64130	●	
A	0.2340	5.94		1/4	3-1/4	1-3/4	1-37/64	1-7/16	52337	●	
15/64	0.2344	5.95		1/4	3-1/4	1-3/4	1-37/64	1-7/16	51591	●	
6,0 mm	0.2362		M7 X 1	6,0	82,0	44,0	35,0	36,0	64131	●	
B	0.2380	6.05		1/4	3 5/8	2-5/64	1-51/64	1-7/16	52338	●	
6,1 mm	0.2402			8,0	91,0	53,0	43,0	36,0	64132	●	
C	0.2420	6.15		1/4	3 5/8	2-5/64	1-51/64	1-7/16	52339	●	
6,2 mm	0.2441			8,0	91,0	53,0	43,0	36,0	64133	●	
D	0.2460	6.25		1/4	3 5/8	2-5/64	1-51/64	1-7/16	52340	●	
6,25 mm	0.2461		M7 X 0,75	8,0	91,0	53,0	43,0	36,0	64134	●	
6,3 mm	0.2480			8,0	91,0	53,0	43,0	36,0	64135	●	
1/4	0.2500	6.35		1/4	3-5/8	2-5/64	1-51/64	1-7/16	51511	●	
6,4 mm	0.2520			8,0	91,0	53,0	43,0	36,0	64136	●	
6,5 mm	0.2559			8,0	91,0	53,0	43,0	36,0	64137	●	
F	0.2570	6.53	5/16-18	5/16	3-5/8	2-5/64	1-51/64	1-7/16	51512	●	
6,6 mm	0.2598			8,0	91,0	53,0	43,0	36,0	64138	●	
G	0.2610	6.63		5/16	3 5/8	2 5/64	1 51/64	1 7/16	52341	●	
6,7 mm	0.2638			8,0	91,0	53,0	43,0	36,0	64139	●	
17/64	0.2656	6.75	5/16-20	5/16	3-5/8	2-5/64	1-51/64	1-7/16	51513	●	
H	0.2660	6.76		5/16	3-5/8	2-5/64	1-51/64	1-7/16	52342	●	
6,8 mm	0.2677		M8 X 1,25	8,0	91,0	53,0	43,0	36,0	64140	●	
6,9 mm	0.2717			8,0	91,0	53,0	43,0	36,0	64141	●	
I	0.2720	6.91	5/16-24	5/16	3-5/8	2-5/64	1-51/64	1-7/16	51514	●	
7,0 mm	0.2756		M8 X 1	8,0	91,0	53,0	43,0	36,0	64142	●	
J	0.2770	7.04		5/16	3 5/8	2-5/64	1-51/64	1-7/16	52343	●	
7,1 mm	0.2795			8,0	91,0	53,0	43,0	36,0	64143	●	
K	0.2810	7.14		5/16	3 5/8	2-5/64	1-51/64	1-7/16	52344	●	
9/32	0.2812	7.14	5/16-32	5/16	3-5/8	2-5/64	1-51/64	1-7/16	51515	●	
7,2 mm	0.2835			8,0	91,0	53,0	43,0	36,0	64144	●	

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### TOLERANCES (inch)

$\leq .1181$  DIAMETER

D<sub>1</sub> = +.0008/+0.0047

D<sub>2</sub> = h<sub>6</sub>

$>.1181-.2362$  DIAMETER

D<sub>1</sub> = +.00016/+0.00063

D<sub>2</sub> = h<sub>6</sub>

$>.2362-.3937$  DIAMETER

D<sub>1</sub> = +.00024/+0.00083

D<sub>2</sub> = h<sub>6</sub>

$>.3937-.7087$  DIAMETER

D<sub>1</sub> = +.00028/+0.00098

D<sub>2</sub> = h<sub>6</sub>

$>.7087-1.1811$  DIAMETER

D<sub>1</sub> = +.00031/+0.00114

D<sub>2</sub> = h<sub>6</sub>

### TOLERANCES (mm)

$\leq 3$  DIAMETER

D<sub>1</sub> = +0,002/+0,012

D<sub>2</sub> = h<sub>6</sub>

$>3-6$  DIAMETER

D<sub>1</sub> = +0,004/+0,016

D<sub>2</sub> = h<sub>6</sub>

$>6-10$  DIAMETER

D<sub>1</sub> = +0,006/+0,021

D<sub>2</sub> = h<sub>6</sub>

$>10-18$  DIAMETER

D<sub>1</sub> = +0,007/+0,025

D<sub>2</sub> = h<sub>6</sub>

$>18-30$  DIAMETER

D<sub>1</sub> = +0,008/+0,029

D<sub>2</sub> = h<sub>6</sub>

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

NON-FERROUS

HARDENED STEELS

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

# 135 5xD

FRACTIONAL & METRIC SERIES

CONTINUED

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AITIN)	STOCK
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.	
7,25 mm	0.2854		M8 X 0,75	8,0	91,0	53,0	43,0	36,0	64145	●
7,3 mm	0.2874			8,0	91,0	53,0	43,0	36,0	64146	●
L	0.2900	7.37		5/16	3-5/8	2-5/64	1-51/64	1-7/16	52345	●
7,4 mm	0.2913			8,0	91,0	53,0	43,0	36,0	64147	●
M	0.2950	7.49		5/16	3-5/8	2-5/64	1-51/64	1-7/16	52346	●
7,5 mm	0.2953		M8 X 0,5	8,0	91,0	53,0	43,0	36,0	64148	●
19/64	0.2969	7.54		5/16	3-5/8	2-5/64	1-51/64	1-7/16	51516	●
7,6 mm	0.2992			8,0	91,0	53,0	43,0	36,0	64149	●
N	0.3020	7.67		5/16	3-5/8	2-5/64	1-51/64	1-7/16	52347	●
7,7 mm	0.3031			8,0	91,0	53,0	43,0	36,0	64150	●
7,8 mm	0.3071		M9 X 1,25	8,0	91,0	53,0	43,0	36,0	64151	●
7,9 mm	0.3110			8,0	91,0	53,0	43,0	36,0	64152	●
5/16	0.3125	7.94	3/8-16	5/16	3-5/8	2-5/64	1-51/64	1-7/16	51517	●
8,0 mm	0.3150		M9 X 1	8,0	91,0	53,0	43,0	36,0	64153	●
O	0.3160	8.03		3/8	4	2-13/32	2-1/8	1-9/16	52348	●
8,1 mm	0.3189			10,0	103,0	61,0	49,0	40,0	64154	●
8,2 mm	0.3228			10,0	103,0	61,0	49,0	40,0	64155	●
P	0.3230	8.20		3/8	4	2-13/32	2-1/8	1-9/16	51518	●
8,3 mm	0.3268			10,0	103,0	61,0	49,0	40,0	64156	●
21/64	0.3281	8.33	3/8-20	3/8	4	2-13/32	2-1/8	1-9/16	51519	●
8,4 mm	0.3307			10,0	103,0	61,0	49,0	40,0	64157	●
Q	0.3320	8.43	3/8-24	3/8	4	2-13/32	2-1/8	1-9/16	51520	●
8,5 mm	0.3346		M10 X 1,5	10,0	103,0	61,0	49,0	40,0	64158	●
8,6 mm	0.3386			10,0	103,0	61,0	49,0	40,0	64159	●
R	0.3390	8.61	3/8-32	3/8	4	2-13/32	2-1/8	1-9/16	52349	●
8,7 mm	0.3425		M10 X 1,25	10,0	103,0	61,0	49,0	40,0	64160	●
11/32	0.3438	8.73		3/8	4	2-13/32	2-1/8	1-9/16	51521	●
8,8 mm	0.3465			10,0	103,0	61,0	49,0	40,0	64161	●
S	0.3480	8.84		3/8	4	2-13/32	2-1/8	1-9/16	51522	●
8,9 mm	0.3504			10,0	103,0	61,0	49,0	40,0	64162	●
9,0 mm	0.3543		M10 X 1	10,0	103,0	61,0	49,0	40,0	64163	●
T	0.3580	9.09		3/8	4	2-13/32	2-1/8	1-9/16	52350	●
9,1 mm	0.3583			10,0	103,0	61,0	49,0	40,0	64164	●
23/64	0.3594	9.13		3/8	4	2-13/32	2-1/8	1-9/16	51523	●
9,2 mm	0.3622		M10 X 0,75	10,0	103,0	61,0	49,0	40,0	64165	●
9,25 mm	0.3642			10,0	103,0	61,0	49,0	40,0	64166	●
9,3 mm	0.3661			10,0	103,0	61,0	49,0	40,0	64167	●
U	0.3680	9.35	7/16-14	3/8	4	2-13/32	2-1/8	1-9/16	51524	●
9,4 mm	0.3701			10,0	103,0	61,0	49,0	40,0	64168	●
9,5 mm	0.3740		M10 X 0,5	10,0	103,0	61,0	49,0	40,0	64169	●
3/8	0.3750	9.53		3/8	4	2-13/32	2-1/8	1-9/16	51525	●
V	0.3770	9.58		1/2	4	2-13/32	2-1/8	1-9/16	52351	●
9,6 mm	0.3780			10,0	103,0	61,0	49,0	40,0	64170	●
9,7 mm	0.3819			10,0	103,0	61,0	49,0	40,0	64171	●
9,8 mm	0.3858			10,0	103,0	61,0	49,0	40,0	64172	●
W	0.3860	9.80		1/2	4	2-13/32	2-1/8	1-9/16	51526	●
9,9 mm	0.3898			10,0	103,0	61,0	49,0	40,0	64173	●
25/64	0.3906	9.92	7/16-20	1/2	4	2-13/32	2-1/8	1-9/16	51527	●

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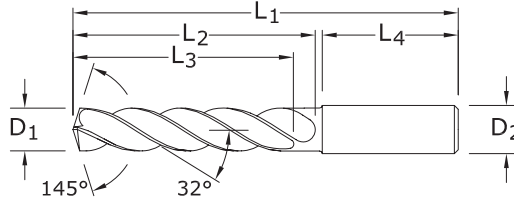
# Hi-PerCarb



5xD



2



## 135 5xD

FRACTIONAL & METRIC SERIES

- Double margin design improves accuracy and surface finish along with increased strength for aggressive drilling
- Specialized self-centering notched point eliminates the need for spot drilling decreasing thrust and deflection
- Engineered edge protection improves edge strength and reduces edge fatigue allowing for increased feed rates
- Recommended for materials  $\leq 56$  HRc ( $\leq 577$  Bhn)

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AlTiN)	EDP NO.	STOCK
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>			
10,0 mm	0.3937			10,0	103,0	61,0	49,0	40,0	64174		●
X	0.3970	10.08	7/16-24	1/2	4-11/16	2-3/4	2-23/64	1-49/64	52352		●
10,1 mm	0.3976			12,0	118,0	71,0	56,0	45,0	64175		●
10,2 mm	0.4016			12,0	118,0	71,0	56,0	45,0	64176		●
Y	0.4040	10.26	7/16-28	1/2	4-11/16	2-3/4	2-23/64	1-49/64	52353		●
10,3 mm	0.4055			12,0	118,0	71,0	56,0	45,0	64177		●
13/32	0.4062	10.32		1/2	4-11/16	2-3/4	2-23/64	1-49/64	51528		●
10,4 mm	0.4095			12,0	118,0	71,0	56,0	45,0	64178		●
Z	0.4130	10.49		1/2	4-11/16	2-3/4	2-23/64	1-49/64	52354		●
10,5 mm	0.4134		M12 X 1,5	12,0	118,0	71,0	56,0	45,0	64179		●
10,6 mm	0.4173			12,0	118,0	71,0	56,0	45,0	64180		●
10,7 mm	0.4213			12,0	118,0	71,0	56,0	45,0	64181		●
27/64	0.4219	10.72	1/2-13	1/2	4-11/16	2-3/4	2-23/64	1-49/64	51529		●
10,8 mm	0.4252		M12 X 1,25	12,0	118,0	71,0	56,0	45,0	64182		●
10,9 mm	0.4291			12,0	118,0	71,0	56,0	45,0	64183		●
11,0 mm	0.4331			12,0	118,0	71,0	56,0	45,0	64184		●
11,1 mm	0.4370		M12 X 1	12,0	118,0	71,0	56,0	45,0	64185		●
7/16	0.4375	11.11	1/4-18 NPT	1/2	4-11/16	2-3/4	2-23/64	1-49/64	51530		●
11,2 mm	0.4409			12,0	118,0	71,0	56,0	45,0	64186		●
11,25 mm	0.4429			12,0	118,0	71,0	56,0	45,0	64187		●
11,3 mm	0.4449			12,0	118,0	71,0	56,0	45,0	64188		●
11,4 mm	0.4488			12,0	118,0	71,0	56,0	45,0	64189		●
11,5 mm	0.4528		M12 X 0,5	12,0	118,0	71,0	56,0	45,0	64190		●
29/64	0.4531	11.51	1/2-20	1/2	4-11/16	2-3/4	2-23/64	1-49/64	51531		●
11,6 mm	0.4567			12,0	118,0	71,0	56,0	45,0	64191		●
11,7 mm	0.4606			12,0	118,0	71,0	56,0	45,0	64192		●
11,8 mm	0.4646			12,0	118,0	71,0	56,0	45,0	64193		●
11,9 mm	0.4685			12,0	118,0	71,0	56,0	45,0	64194		●
15/32	0.4688	11.91	1/2-28	1/2	4-11/16	2-3/4	2-23/64	1-49/64	51532		●
12,0 mm	0.4724		M14 X 2	12,0	118,0	71,0	56,0	45,0	64195		●
31/64	0.4844	12.30	9/16-12	1/2	4-7/8	3-1/32	2-19/32	1-49/64	51533		●
12,5 mm	0.4921		M14 X 1,5	14,0	124,0	77,0	60,0	45,0	64196		●
1/2	0.5000	12.70		1/2	4-7/8	3-1/32	2-19/32	1-49/64	51534		●
12,8 mm	0.5039		M14 X 1,25	14,0	124,0	77,0	60,0	45,0	64197		●
13,0 mm	0.5118		M14 X 1	14,0	124,0	77,0	60,0	45,0	64198		●
33/64	0.5156	13.10	9/16-18	5/8	4-7/8	3-1/32	2-19/32	1-49/64	51535		●
17/32	0.5312	13.49	5/8-11	5/8	4-7/8	3-1/32	2-19/32	1-49/64	51536		●
13,5 mm	0.5315			14,0	124,0	77,0	60,0	45,0	64199		●

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### TOLERANCES (inch)

$\leq .1181$  DIAMETER

D<sub>1</sub> = +.0008/+0.0047

D<sub>2</sub> = h<sub>6</sub>

$> .1181 - .2362$  DIAMETER

D<sub>1</sub> = +.00016/+0.00063

D<sub>2</sub> = h<sub>6</sub>

$> .2362 - .3937$  DIAMETER

D<sub>1</sub> = +.00024/+0.00083

D<sub>2</sub> = h<sub>6</sub>

$> .3937 - .7087$  DIAMETER

D<sub>1</sub> = +.00028/+0.00098

D<sub>2</sub> = h<sub>6</sub>

$> .7087 - 1.1811$  DIAMETER

D<sub>1</sub> = +.00031/+0.00114

D<sub>2</sub> = h<sub>6</sub>

### TOLERANCES (mm)

$\leq 3$  DIAMETER

D<sub>1</sub> = +0,002/+0,012

D<sub>2</sub> = h<sub>6</sub>

$> 3 - 6$  DIAMETER

D<sub>1</sub> = +0,004/+0,016

D<sub>2</sub> = h<sub>6</sub>

$> 6 - 10$  DIAMETER

D<sub>1</sub> = +0,006/+0,021

D<sub>2</sub> = h<sub>6</sub>

$> 10 - 18$  DIAMETER

D<sub>1</sub> = +0,007/+0,025

D<sub>2</sub> = h<sub>6</sub>

$> 18 - 30$  DIAMETER

D<sub>1</sub> = +0,008/+0,029

D<sub>2</sub> = h<sub>6</sub>

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

NON-FERROUS

HARDENED STEELS

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery



# 135 5xD

FRACTIONAL & METRIC SERIES

CONTINUED

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AITIN)	STOCK
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.	
35/64	0.5469	13.89	5/8-12	5/8	4-7/8	3-1/32	2-19/32	1-49/64	51537	●
14,0 mm	0.5512		M16 X 2	14,0	124,0	77,0	60,0	45,0	64200	●
9/16	0.5625	14.29		5/8	5-1/4	3-1/4	2-3/4	1-57/64	51538	●
14,5 mm	0.5709		M16 X 1,5	16,0	133,0	83,0	63,0	48,0	64201	●
37/64	0.5781	14.68	5/8-18	5/8	5-1/4	3-1/4	2-3/4	1-57/64	51539	●
15,0 mm	0.5906		M16 X 1	16,0	133,0	83,0	63,0	48,0	64202	●
19/32	0.5938	15.08	11/16-11	5/8	5-1/4	3-1/4	2-3/4	1-57/64	51592	●
39/64	0.6094	15.48	11/16-12	5/8	5-1/4	3-1/4	2-3/4	1-57/64	51593	●
15,5 mm	0.6102		M18 X 2,5	16,0	133,0	83,0	63,0	48,0	64203	●
5/8	0.6250	15.88	11/16-16	5/8	5-1/4	3-1/4	2-3/4	1-57/64	51540	●
16,0 mm	0.6299			16,0	133,0	83,0	63,0	48,0	64204	●
41/64	0.6406	16.27	11/16-24	3/4	5-5/8	3-5/8	3-3/16	1-57/64	51594	●
16,5 mm	0.6496		M18 X 1,5	18,0	143,0	93,0	71,0	48,0	64205	●
21/32	0.6562	16.67	3/4-10	3/4	5-5/8	3-5/8	3-3/16	1-57/64	51541	●
17,0 mm	0.6693			18,0	143,0	93,0	71,0	48,0	64206	●
43/64	0.6719	17.07	3/4-12	3/4	5-5/8	3-5/8	3-3/16	1-57/64	51595	●
11/16	0.6875	17.46	3/4-16	3/4	5-5/8	3-5/8	3-3/16	1-57/64	51542	●
17,5 mm	0.6890		M20 X 2,5	18,0	143,0	93,0	71,0	48,0	64207	●
45/64	0.7031	17.86	3/4-20, 1/2-14 NPT	3/4	5-5/8	3-5/8	3-3/16	1-57/64	51543	●
18,0 mm	0.7087			18,0	143,0	93,0	71,0	48,0	64208	●
23/32	0.7188	18.26		3/4	6	4	3-3/8	1-31/32	51596	●
18,5 mm	0.7283		M20 X 1,5	20,0	153,0	101,0	77,0	50,0	64209	●
47/64	0.7344	18.65	13/16-12	3/4	6	4	3-3/8	1-31/32	51544	●
19,0 mm	0.7480			20,0	153,0	101,0	77,0	50,0	64210	●
3/4	0.7500	19.05	13/16-16	3/4	6	4	3-3/8	1-31/32	51545	●
49/64	0.7656	19.45	7/8-9	7/8	6	4	3-3/8	1-31/32	52355	●
19,5 mm	0.7677		M22 X 2,5	20,0	153,0	101,0	77,0	50,0	64211	●
25/32	0.7812	19.84		7/8	6	4	3-3/8	1-31/32	52356	●
20,0 mm	0.7874			20,0	153,0	101,0	77,0	50,0	64212	●
51/64	0.7969	20.24	7/8-12	7/8	6	4	3-3/8	1-31/32	52357	●
20,5 mm	0.8071			22,0	153,0	101,0	77,0	50,0	64533	●
13/16	0.8125	20.64	7/8-14	7/8	6-1/2	4-1/2	3-7/8	1-31/32	52358	●
21,0 mm	0.8268			22,0	153,0	101,0	77,0	50,0	64534	●
22,0 mm	0.8661			22,0	178,0	127,0	108,0	50,0	64535	●
7/8	0.8750	22.23	15/16-16, 1-8	7/8	6-1/2	4-1/2	3-7/8	1-31/32	52359	●
59/64	0.9219	23.42	1-12	1	7	5	4-3/8	2-1/8	52360	●

# FRACTIONAL Hi-PerCarb

Series 135 5D Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/32	1/8	1/4	3/8	1/2	5/8	7/8		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	345	RPM	42173	10543	5272	3514	2636	2109	1506	
		(276-414)	Fr	0.0010	0.0040	0.0080	0.0120	0.0159	0.0199	0.0279	
			Feed (ipm)	42.0	42.0	42.0	42.0	42.0	42.0	42.0	
	≤ 275 Bhn or ≤ 28 HRc	310	RPM	37894	9474	4737	3158	2368	1895	1353	
		(248-372)	Fr	0.0009	0.0036	0.0072	0.0108	0.0144	0.0179	0.0251	
			Feed (ipm)	34.0	34.0	34.0	34.0	34.0	34.0	34.0	
	≤ 425 Bhn or ≤ 45 HRc	180	RPM	22003	5501	2750	1834	1375	1100	786	
		(144-216)	Fr	0.0007	0.0030	0.0060	0.0090	0.0120	0.0150	0.0210	
			Feed (ipm)	16.5	16.5	16.5	16.5	16.5	16.5	16.5	
	<b>H</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	270	RPM	33005	8251	4126	2750	2063	1650	1179
			(216-324)	Fr	0.0008	0.0030	0.0061	0.0091	0.0121	0.0151	0.0212
				Feed (ipm)	25.0	25.0	25.0	25.0	25.0	25.0	25.0
≤ 375 Bhn or ≤ 40 HRc		165	RPM	20170	5042	2521	1681	1261	1008	720	
		(132-198)	Fr	0.0006	0.0026	0.0052	0.0077	0.0103	0.0129	0.0180	
			Feed (ipm)	13.0	13.0	13.0	13.0	13.0	13.0	13.0	
≤ 450 Bhn or ≤ 48 HRc		115	RPM	14058	3514	1757	1171	879	703	502	
		(92-138)	Fr	0.0004	0.0018	0.0035	0.0053	0.0071	0.0088	0.0123	
			Feed (ipm)	6.2	6.2	6.2	6.2	6.2	6.2	6.2	
<b>K</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 200 Bhn or ≤ 13 HRc	120	RPM	14669	3667	1834	1222	917	733	524
			(96-144)	Fr	0.0006	0.0026	0.0051	0.0077	0.0103	0.0128	0.0179
				Feed (ipm)	9.4	9.4	9.4	9.4	9.4	9.4	9.4
	≤ 375 Bhn or ≤ 40 HRc	80	RPM	9779	2445	1222	815	611	489	349	
		(64-96)	Fr	0.0003	0.0012	0.0024	0.0036	0.0047	0.0059	0.0083	
			Feed (ipm)	2.9	2.9	2.9	2.9	2.9	2.9	2.9	
	≤ 475 Bhn or ≤ 50 HRc	70	RPM	8557	2139	1070	713	535	428	306	
		(56-84)	Fr	0.0002	0.0008	0.0016	0.0024	0.0032	0.0040	0.0056	
			Feed (ipm)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	
	<b>M</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	300	RPM	36672	9168	4584	3056	2292	1834	1310
			(240-360)	Fr	0.0011	0.0045	0.0089	0.0134	0.0179	0.0224	0.0313
				Feed (ipm)	41.0	41.0	41.0	41.0	41.0	41.0	41.0
≤ 260 Bhn or ≤ 26 HRc		265	RPM	32394	8098	4049	2699	2025	1620	1157	
		(212-318)	Fr	0.0011	0.0046	0.0091	0.0137	0.0183	0.0228	0.0320	
			Feed (ipm)	37.0	37.0	37.0	37.0	37.0	37.0	37.0	
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F, 440F		≤ 185 Bhn or ≤ 9 HRc	250	RPM	30560	7640	3820	2547	1910	1528	1091
			(200-300)	Fr	0.0006	0.0026	0.0051	0.0077	0.0102	0.0128	0.0179
				Feed (ipm)	19.5	19.5	19.5	19.5	19.5	19.5	19.5
		≤ 275 Bhn or ≤ 28 HRc	150	RPM	18336	4584	2292	1528	1146	917	655
			(120-180)	Fr	0.0005	0.0020	0.0039	0.0059	0.0079	0.0098	0.0137
				Feed (ipm)	9.0	9.0	9.0	9.0	9.0	9.0	9.0
	<b>M</b>  <b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	80	RPM	9779	2445	1222	815	611	489	349
			(64-96)	Fr	0.0005	0.0020	0.0039	0.0059	0.0079	0.0098	0.0137
				Feed (ipm)	4.8	4.8	4.8	4.8	4.8	4.8	4.8
		≤ 375 Bhn or ≤ 40 HRc	55	RPM	6723	1681	840	560	420	336	240
			(44-66)	Fr	0.0004	0.0018	0.0036	0.0054	0.0071	0.0089	0.0125
				Feed (ipm)	3.0	3.0	3.0	3.0	3.0	3.0	3.0

continued on next page

Series	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/32	1/8	1/4	3/8	1/2	5/8	7/8		
S <b>SUPER ALLOYS</b> (Nickel, Cobalt, Iron Base) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	≤ 300 Bhn or ≤ 32 HRc	40	RPM	4890	1222	611	407	306	244	175	
		(32-48)	Fr	0.0002	0.0008	0.0016	0.0025	0.0033	0.0041	0.0057	
			Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
	≤ 400 Bhn or ≤ 43 HRc	20	RPM	2445	611	306	204	153	122	87	
		(16-24)	Fr	0.0002	0.0007	0.0013	0.0020	0.0026	0.0033	0.0046	
			Feed (ipm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
	S <b>TITANIUM ALLOYS</b> Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	105	RPM	12835	3209	1604	1070	802	642	458
			(84-126)	Fr	0.0005	0.0018	0.0036	0.0054	0.0072	0.0090	0.0127
				Feed (ipm)	5.8	5.8	5.8	5.8	5.8	5.8	5.8
		≤ 350 Bhn or ≤ 38 HRc	80	RPM	9779	2445	1222	815	611	489	349
			(64-96)	Fr	0.0004	0.0016	0.0032	0.0048	0.0064	0.0080	0.0112
				Feed (ipm)	3.9	3.9	3.9	3.9	3.9	3.9	3.9
≤ 440 Bhn or ≤ 47 HRc		42	RPM	5134	1284	642	428	321	257	183	
		(34-50)	Fr	0.0003	0.0012	0.0025	0.0037	0.0050	0.0062	0.0087	
			Feed (ipm)	1.6	1.6	1.6	1.6	1.6	1.6	1.6	
N <b>ALUMINUM ALLOYS</b> 2017, 2024, 356, 6061, 7075		≤ 80 Bhn or ≤ 47 HRb	635	RPM	77622	19406	9703	6469	4851	3881	2772
			(508-762)	Fr	0.0012	0.0049	0.0099	0.0148	0.0198	0.0247	0.0346
				Feed (ipm)	96.0	96.0	96.0	96.0	96.0	96.0	96.0
	≤ 150 Bhn or ≤ 7 HRc	540	RPM	66010	16502	8251	5501	4126	3300	2357	
		(432-648)	Fr	0.0012	0.0050	0.0099	0.0149	0.0199	0.0248	0.0348	
			Feed (ipm)	82.0	82.0	82.0	82.0	82.0	82.0	82.0	
	N <b>COPPER ALLOYS</b> Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	450	RPM	55008	13752	6876	4584	3438	2750	1965
			(360-540)	Fr	0.0005	0.0020	0.0040	0.0060	0.0080	0.0100	0.0140
				Feed (ipm)	27.5	27.5	27.5	27.5	27.5	27.5	27.5
		≤ 200 Bhn or ≤ 23 HRc	360	RPM	44006	11002	5501	3667	2750	2200	1572
			(288-432)	Fr	0.0005	0.0020	0.0040	0.0060	0.0080	0.0100	0.0140
				Feed (ipm)	22.0	22.0	22.0	22.0	22.0	22.0	22.0

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fr \times rpm$   
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstoool.com](http://www.kyocera-sgstoool.com))

# Hi-PerCarb

Series 135M 5D Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)									
			1.5	3	6	8	10	12	16	20		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	105	RPM	22297	11148	5574	4181	3344	2787	2090	1672	
		(84-126)	Fr	0.048	0.095	0.190	0.254	0.317	0.380	0.507	0.634	
			Feed (mm/min)	1060	1060	1060	1060	1060	1060	1060	1060	
	≤ 275 Bhn or ≤ 28 HRc	94	RPM	20035	10017	5009	3756	3005	2504	1878	1503	
		(76-113)	Fr	0.043	0.085	0.171	0.228	0.285	0.341	0.455	0.569	
			Feed (mm/min)	855	855	855	855	855	855	855	855	
	≤ 425 Bhn or ≤ 45 HRc	55	RPM	11633	5816	2908	2181	1745	1454	1091	872	
		(44-66)	Fr	0.036	0.071	0.143	0.190	0.238	0.285	0.381	0.476	
			Feed (mm/min)	415	415	415	415	415	415	415	415	
	<b>H</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	82	RPM	17449	8725	4362	3272	2617	2181	1636	1309
			(66-99)	Fr	0.036	0.072	0.143	0.191	0.239	0.287	0.382	0.478
				Feed (mm/min)	625	625	625	625	625	625	625	625
≤ 375 Bhn or ≤ 40 HRc		50	RPM	10664	5332	2666	1999	1600	1333	1000	800	
		(40-60)	Fr	0.031	0.062	0.124	0.165	0.206	0.248	0.330	0.413	
			Feed (mm/min)	330	330	330	330	330	330	330	330	
≤ 450 Bhn or ≤ 48 HRc		35	RPM	7432	3716	1858	1394	1115	929	697	557	
		(28-42)	Fr	0.022	0.043	0.086	0.115	0.144	0.172	0.230	0.287	
			Feed (mm/min)	160	160	160	160	160	160	160	160	
<b>K</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 200 Bhn or ≤ 13 HRc	37	RPM	7755	3878	1939	1454	1163	969	727	582
			(29-44)	Fr	0.031	0.062	0.124	0.165	0.206	0.248	0.330	0.413
				Feed (mm/min)	240	240	240	240	240	240	240	240
	≤ 375 Bhn or ≤ 40 HRc	24	RPM	5170	2585	1293	969	776	646	485	388	
		(20-29)	Fr	0.015	0.029	0.058	0.077	0.097	0.116	0.155	0.193	
			Feed (mm/min)	75	75	75	75	75	75	75	75	
	≤ 475 Bhn or ≤ 50 HRc	21	RPM	4524	2262	1131	848	679	565	424	339	
		(17-26)	Fr	0.010	0.020	0.040	0.053	0.066	0.080	0.106	0.133	
			Feed (mm/min)	45	45	45	45	45	45	45	45	
	<b>M</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	91	RPM	19388	9694	4847	3635	2908	2424	1818	1454
			(73-110)	Fr	0.054	0.108	0.217	0.289	0.361	0.433	0.578	0.722
				Feed (mm/min)	1050	1050	1050	1050	1050	1050	1050	1050
≤ 260 Bhn or ≤ 26 HRc		81	RPM	17126	8563	4282	3211	2569	2141	1606	1284	
		(65-97)	Fr	0.055	0.109	0.218	0.291	0.364	0.437	0.582	0.728	
			Feed (mm/min)	935	935	935	935	935	935	935	935	
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 185 Bhn or ≤ 9 HRc	76	RPM	16157	8078	4039	3029	2424	2020	1515	1212	
		(61-91)	Fr	0.031	0.061	0.123	0.163	0.204	0.245	0.327	0.408	
			Feed (mm/min)	495	495	495	495	495	495	495	495	
	≤ 275 Bhn or ≤ 28 HRc	46	RPM	9694	4847	2424	1818	1454	1212	909	727	
		(37-55)	Fr	0.024	0.047	0.095	0.127	0.158	0.190	0.253	0.316	
			Feed (mm/min)	230	230	230	230	230	230	230	230	
	<b>M</b>  <b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	24	RPM	5170	2585	1293	969	776	646	485	388
			(20-29)	Fr	0.023	0.046	0.093	0.124	0.155	0.186	0.248	0.309
				Feed (mm/min)	120	120	120	120	120	120	120	120
		≤ 375 Bhn or ≤ 40 HRc	17	RPM	3555	1777	889	666	533	444	333	267
			(13-20)	Fr	0.021	0.042	0.084	0.113	0.141	0.169	0.225	0.281
				Feed (mm/min)	75	75	75	75	75	75	75	75

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Series 135M 5D Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)									
			1.5	3	6	8	10	12	16	20		
<b>SUPER ALLOYS</b> (Nickel, Cobalt, Iron Base) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	≤ 300 Bhn or ≤ 32 HRc	12	RPM	2585	1293	646	485	388	323	242	194	
		(10-15)	Fr	0.010	0.019	0.039	0.052	0.064	0.077	0.103	0.129	
			Feed (mm/min)	25	25	25	25	25	25	25	25	
	≤ 400 Bhn or ≤ 43 HRc	6	RPM	1293	646	323	242	194	162	121	97	
		(5-7)	Fr	0.007	0.014	0.028	0.037	0.046	0.056	0.074	0.093	
			Feed (mm/min)	9	9	9	9	9	9	9	9	
	<b>TITANIUM ALLOYS</b> Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	32	RPM	6786	3393	1696	1272	1018	848	636	509
			(26-38)	Fr	0.021	0.043	0.085	0.114	0.142	0.171	0.228	0.285
				Feed (mm/min)	145	145	145	145	145	145	145	145
		≤ 350 Bhn or ≤ 38 HRc	24	RPM	5170	2585	1293	969	776	646	485	388
			(20-29)	Fr	0.019	0.039	0.077	0.103	0.129	0.155	0.206	0.258
				Feed (mm/min)	100	100	100	100	100	100	100	100
≤ 440 Bhn or ≤ 47 HRc		13	RPM	2714	1357	679	509	407	339	254	204	
		(10-15)	Fr	0.015	0.029	0.059	0.079	0.098	0.118	0.157	0.196	
			Feed (mm/min)	40	40	40	40	40	40	40	40	
<b>ALUMINUM ALLOYS</b> 2017, 2024, 356, 6061, 7075		≤ 80 Bhn or ≤ 47 HRb	194	RPM	41039	20519	10260	7695	6156	5130	3847	3078
			(155-232)	Fr	0.059	0.118	0.237	0.316	0.395	0.474	0.632	0.790
				Feed (mm/min)	2430	2430	2430	2430	2430	2430	2430	2430
	≤ 150 Bhn or ≤ 7 HRc	165	RPM	34899	17449	8725	6544	5235	4362	3272	2617	
		(132-198)	Fr	0.059	0.118	0.237	0.316	0.394	0.473	0.631	0.789	
			Feed (mm/min)	2065	2065	2065	2065	2065	2065	2065	2065	
	<b>Copper Alloys</b> Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	137	RPM	29082	14541	7271	5453	4362	3635	2726	2181
			(110-165)	Fr	0.027	0.053	0.107	0.142	0.178	0.213	0.284	0.355
				Feed (mm/min)	775	775	775	775	775	775	775	775
		≤ 200 Bhn or ≤ 23 HRc	110	RPM	23266	11633	5816	4362	3490	2908	2181	1745
			(88-132)	Fr	0.027	0.054	0.108	0.144	0.181	0.217	0.289	0.361
				Feed (mm/min)	630	630	630	630	630	630	630	630

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fr \times rpm$   
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstoool.com](http://www.kyocera-sgstoool.com))

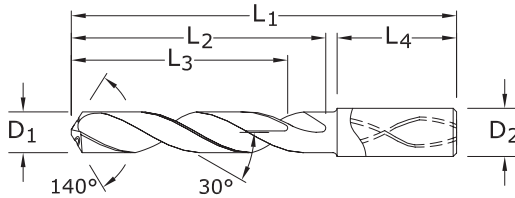
# ICe-Carb



5xD



2



## 140 5xD

FRACTIONAL & METRIC SERIES

- Coolant through design promotes controlled and consistent operating temperatures improving coolant flow to the cut while maintaining strength
- Split point geometry for improved drill penetration and accuracy
- Controlled edge honing for longevity
- Negative corner position strengthens and protects
- Recommended for materials ≤ 60 HRc (≤ 654 Bhn)

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO.	STOCK
				SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AITiN)	
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.	
3,0 mm	0.1181			6,0	66,0	28,0	23,0	36,0	63901	●
3,1 mm	0.1220			6,0	66,0	28,0	23,0	36,0	63902	●
1/8	0.1250	3.18		6,0	66,0	28,0	23,0	36,0	51901	●
3,2 mm	0.1260		M3,5 X 0,35	6,0	66,0	28,0	23,0	36,0	63903	●
3,3 mm	0.1299		M4 X 0,7	6,0	66,0	28,0	23,0	36,0	63904	●
3,4 mm	0.1339			6,0	66,0	28,0	23,0	36,0	63905	●
#29	0.1360	3.45	8-32,8-36	6,0	66,0	28,0	23,0	36,0	51902	●
3,5 mm	0.1378		M4 X 0,5	6,0	66,0	28,0	23,0	36,0	63906	●
9/64	0.1406	3.57		6,0	66,0	28,0	23,0	36,0	51903	●
3,6 mm	0.1417		M4 X 0,35	6,0	66,0	28,0	23,0	36,0	63907	●
3,7 mm	0.1457		M4,5 X 0,75	6,0	66,0	28,0	23,0	36,0	63908	●
3,8 mm	0.1496		10-24	6,0	74,0	36,0	29,0	36,0	51904	●
3,9 mm	0.1535			6,0	74,0	36,0	29,0	36,0	63909	●
5/32	0.1562	3.97		6,0	74,0	36,0	29,0	36,0	51905	●
4,0 mm	0.1575		M4,5 X 0,5	6,0	74,0	36,0	29,0	36,0	63910	●
#21	0.1590	4.04	10-32	6,0	74,0	36,0	29,0	36,0	51906	●
4,1 mm	0.1614			6,0	74,0	36,0	29,0	36,0	63911	●
4,2 mm	0.1654		M5 / M5 x 0,75	6,0	74,0	36,0	29,0	36,0	63912	●
4,3 mm	0.1693			6,0	74,0	36,0	29,0	36,0	63913	●
11/64	0.1719	4.37		6,0	74,0	36,0	29,0	36,0	51907	●
4,4 mm	0.1732		12-24	6,0	74,0	36,0	29,0	36,0	63914	●
4,5 mm	0.1772		M5 X 0,5	6,0	74,0	36,0	29,0	36,0	63915	●
4,6 mm	0.1811		12-28	6,0	74,0	36,0	29,0	36,0	63916	●
4,7 mm	0.1850		12-32	6,0	74,0	36,0	29,0	36,0	63917	●
3/16	0.1875	4.76		6,0	82,0	44,0	35,0	36,0	51908	●
4,8 mm	0.1890		7/32-32	6,0	82,0	44,0	35,0	36,0	63918	●
4,9 mm	0.1929			6,0	82,0	44,0	35,0	36,0	63919	●
5,0 mm	0.1969		M6 X 1	6,0	82,0	44,0	35,0	36,0	63920	●
5,1 mm	0.2008		1/4-20	6,0	82,0	44,0	35,0	36,0	63900	●
13/64	0.2031	5.16		6,0	82,0	44,0	35,0	36,0	51910	●
5,2 mm	0.2047		M6 X 0,75	6,0	82,0	44,0	35,0	36,0	63921	●
5,3 mm	0.2087			6,0	82,0	44,0	35,0	36,0	63922	●
5,4 mm	0.2126			6,0	82,0	44,0	35,0	36,0	63998	●
5,5 mm	0.2165		M6 X 0,5	6,0	82,0	44,0	35,0	36,0	63923	●

continued on next page

### TOLERANCES (inch)

- ≤.1181 DIAMETER  
D<sub>1</sub> = +.00008/+0.00047  
D<sub>2</sub> = h<sub>6</sub>
- >.1181-.2362 DIAMETER  
D<sub>1</sub> = +.00016/+0.00063  
D<sub>2</sub> = h<sub>6</sub>
- >.2362-.3937 DIAMETER  
D<sub>1</sub> = +.00024/+0.00083  
D<sub>2</sub> = h<sub>6</sub>
- >.3937-.7087 DIAMETER  
D<sub>1</sub> = +.00028/+0.00098  
D<sub>2</sub> = h<sub>6</sub>
- >.7087-1.1811 DIAMETER  
D<sub>1</sub> = +.00031/+0.00114  
D<sub>2</sub> = h<sub>6</sub>

### TOLERANCES (mm)

- ≤3 DIAMETER  
D<sub>1</sub> = +0,002/+0,012  
D<sub>2</sub> = h<sub>6</sub>
- >3-6 DIAMETER  
D<sub>1</sub> = +0,004/+0,016  
D<sub>2</sub> = h<sub>6</sub>
- >6-10 DIAMETER  
D<sub>1</sub> = +0,006/+0,021  
D<sub>2</sub> = h<sub>6</sub>
- >10-18 DIAMETER  
D<sub>1</sub> = +0,007/+0,025  
D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- NON-FERROUS
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# 140 5xD

FRACTIONAL & METRIC SERIES

*CONTINUED*

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO.	STOCK
				SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AITiN)	
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.	
7/32	0.2188	5.56	1/4-32	6,0	82,0	44,0	35,0	36,0	51912	●
5,6 mm	0.2205			6,0	82,0	44,0	35,0	36,0	63924	●
5,7 mm	0.2244			6,0	82,0	44,0	35,0	36,0	63925	●
5,8 mm	0.2283			6,0	82,0	44,0	35,0	36,0	63926	●
5,9 mm	0.2323			6,0	82,0	44,0	35,0	36,0	63927	●
15/64	0.2344	5.95		6,0	82,0	44,0	35,0	36,0	51913	●
6,0 mm	0.2362		M7 X 1	6,0	82,0	44,0	35,0	36,0	63928	●
6,1 mm	0.2402			8,0	91,0	53,0	43,0	36,0	63929	●
6,2 mm	0.2441		M7 X 0,75	8,0	91,0	53,0	43,0	36,0	63930	●
6,3 mm	0.2480			8,0	91,0	53,0	43,0	36,0	63931	●
1/4	0.2500	6.35		8,0	91,0	53,0	43,0	36,0	51914	●
6,4 mm	0.2520			8,0	91,0	53,0	43,0	36,0	63932	●
6,5 mm	0.2559			8,0	91,0	53,0	43,0	36,0	63933	●
F	0.2570	6.53	5/16-18	8,0	91,0	53,0	43,0	36,0	51915	●
6,6 mm	0.2598			8,0	91,0	53,0	43,0	36,0	63934	●
6,7 mm	0.2638			8,0	91,0	53,0	43,0	36,0	63935	●
17/64	0.2656	6.75	5/16-20	8,0	91,0	53,0	43,0	36,0	51916	●
6,8 mm	0.2677		M8 X 1,25	8,0	91,0	53,0	43,0	36,0	63936	●
6,9 mm	0.2717		5/16-24	8,0	91,0	53,0	43,0	36,0	63999	●
7,0 mm	0.2756		M8 X 1	8,0	91,0	53,0	43,0	36,0	63937	●
7,1 mm	0.2795			8,0	91,0	53,0	43,0	36,0	63938	●
9/32	0.2812	7.14	5/16-32	8,0	91,0	53,0	43,0	36,0	51918	●
7,2 mm	0.2835		M8 X 0,75	8,0	91,0	53,0	43,0	36,0	63939	●
7,3 mm	0.2874			8,0	91,0	53,0	43,0	36,0	63940	●
7,4 mm	0.2913			8,0	91,0	53,0	43,0	36,0	63941	●
7,5 mm	0.2953		M8 X 0,5	8,0	91,0	53,0	43,0	36,0	63942	●
19/64	0.2969	7.54		8,0	91,0	53,0	43,0	36,0	51919	●
7,6 mm	0.2992			8,0	91,0	53,0	43,0	36,0	63943	●
7,7 mm	0.3031			8,0	91,0	53,0	43,0	36,0	63944	●
7,8 mm	0.3071		M9 X 1,25	8,0	91,0	53,0	43,0	36,0	63945	●
7,9 mm	0.3110			8,0	91,0	53,0	43,0	36,0	63946	●
5/16	0.3125	7.94	3/8-16	8,0	91,0	53,0	43,0	36,0	51920	●
8,0 mm	0.3150		M9 X 1	8,0	91,0	53,0	43,0	36,0	63947	●
8,1 mm	0.3189			10,0	103,0	61,0	49,0	40,0	63948	●
8,2 mm	0.3228			10,0	103,0	61,0	49,0	40,0	63949	●
8,3 mm	0.3268			10,0	103,0	61,0	49,0	40,0	63950	●
21/64	0.3281	8.33	3/8-20	10,0	103,0	61,0	49,0	40,0	51921	●
8,4 mm	0.3307			10,0	103,0	61,0	49,0	40,0	63951	●
Q	0.3320	8.43	3/8-24	10,0	103,0	61,0	49,0	40,0	51922	●
8,5 mm	0.3346		M10 X 1,5	10,0	103,0	61,0	49,0	40,0	63952	●
8,6 mm	0.3386			10,0	103,0	61,0	49,0	40,0	63953	●
8,7 mm	0.3425			10,0	103,0	61,0	49,0	40,0	63954	●

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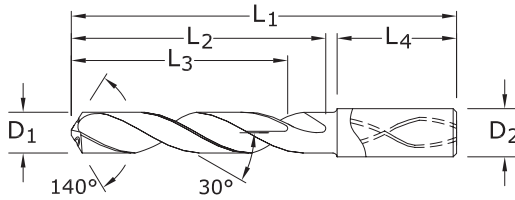
# ICe-Carb



5xD



2



## 140 5xD

FRACTIONAL & METRIC SERIES

- Coolant through design promotes controlled and consistent operating temperatures improving coolant flow to the cut while maintaining strength
- Split point geometry for improved drill penetration and accuracy
- Controlled edge honing for longevity
- Negative corner position strengthens and protects
- Recommended for materials ≤ 60 HRc (≤ 654 Bhn)

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO.	STOCK
				SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AlTiN)	
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.	
11/32	0.3438	8.73	3/8-32	10,0	103,0	61,0	49,0	40,0	51923	●
8,8 mm	0.3465		M10 X 1,25	10,0	103,0	61,0	49,0	40,0	63955	●
8,9 mm	0.3504			10,0	103,0	61,0	49,0	40,0	63956	●
9,0 mm	0.3543		M10 X 1	10,0	103,0	61,0	49,0	40,0	63957	●
9,1 mm	0.3583			10,0	103,0	61,0	49,0	40,0	63958	●
23/64	0.3594	9.13		10,0	103,0	61,0	49,0	40,0	51924	●
9,2 mm	0.3622		M10 X 0,75	10,0	103,0	61,0	49,0	40,0	63959	●
9,3 mm	0.3661			10,0	103,0	61,0	49,0	40,0	63960	●
U	0.3680	9.35	7/16-14	10,0	103,0	61,0	49,0	40,0	51925	●
9,4 mm	0.3701			10,0	103,0	61,0	49,0	40,0	63961	●
9,5 mm	0.3740		M11 / M10 X 0,5	10,0	103,0	61,0	49,0	40,0	63962	●
3/8	0.3750	9.53		10,0	103,0	61,0	49,0	40,0	51926	●
9,6 mm	0.3780			10,0	103,0	61,0	49,0	40,0	63963	●
9,7 mm	0.3819			10,0	103,0	61,0	49,0	40,0	63964	●
9,8 mm	0.3858			10,0	103,0	61,0	49,0	40,0	63965	●
9,9 mm	0.3898			10,0	103,0	61,0	49,0	40,0	63966	●
25/64	0.3906	9.92	7/16-20	10,0	103,0	61,0	49,0	40,0	51927	●
10,0 mm	0.3937			10,0	103,0	61,0	49,0	40,0	63967	●
10,1 mm	0.3976			12,0	118,0	71,0	56,0	45,0	63968	●
10,2 mm	0.4016		M12 X 1,75	12,0	118,0	71,0	56,0	45,0	63969	●
10,3 mm	0.4055			12,0	118,0	71,0	56,0	45,0	63970	●
13/32	0.4062	10.32		12,0	118,0	71,0	56,0	45,0	51928	●
10,4 mm	0.4094			12,0	118,0	71,0	56,0	45,0	63971	●
10,5 mm	0.4134		M12 X 1,5	12,0	118,0	71,0	56,0	45,0	63972	●
10,6 mm	0.4173			12,0	118,0	71,0	56,0	45,0	63973	●
10,7 mm	0.4213			12,0	118,0	71,0	56,0	45,0	63974	●
27/64	0.4219	10.72	1/2-13	12,0	118,0	71,0	56,0	45,0	51929	●
10,8 mm	0.4252		M12 X 1,25	12,0	118,0	71,0	56,0	45,0	63975	●
10,9 mm	0.4291			12,0	118,0	71,0	56,0	45,0	63976	●
11,0 mm	0.4331		M12 X 1	12,0	118,0	71,0	56,0	45,0	63977	●
11,1 mm	0.4370			12,0	118,0	71,0	56,0	45,0	63978	●
7/16	0.4375	11.11	1/4-18NPT	12,0	118,0	71,0	56,0	45,0	51930	●
11,2 mm	0.4409			12,0	118,0	71,0	56,0	45,0	63979	●
11,3 mm	0.4449			12,0	118,0	71,0	56,0	45,0	63980	●

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### TOLERANCES (inch)

- ≤.1181 DIAMETER  
D<sub>1</sub> = +.00008/+0.00047  
D<sub>2</sub> = h<sub>6</sub>
- >.1181-.2362 DIAMETER  
D<sub>1</sub> = +.00016/+0.00063  
D<sub>2</sub> = h<sub>6</sub>
- >.2362-.3937 DIAMETER  
D<sub>1</sub> = +.00024/+0.00083  
D<sub>2</sub> = h<sub>6</sub>
- >.3937-.7087 DIAMETER  
D<sub>1</sub> = +.00028/+0.00098  
D<sub>2</sub> = h<sub>6</sub>
- >.7087-1.1811 DIAMETER  
D<sub>1</sub> = +.00031/+0.00114  
D<sub>2</sub> = h<sub>6</sub>

### TOLERANCES (mm)

- ≤3 DIAMETER  
D<sub>1</sub> = +0,002/+0,012  
D<sub>2</sub> = h<sub>6</sub>
- >3-6 DIAMETER  
D<sub>1</sub> = +0,004/+0,016  
D<sub>2</sub> = h<sub>6</sub>
- >6-10 DIAMETER  
D<sub>1</sub> = +0,006/+0,021  
D<sub>2</sub> = h<sub>6</sub>
- >10-18 DIAMETER  
D<sub>1</sub> = +0,007/+0,025  
D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- NON-FERROUS
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED— Call for Delivery

## 140 5xD

FRACTIONAL & METRIC SERIES

CONTINUED

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO.	STOCK
				SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AITiN)	
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.	
11,4 mm	0.4488			12,0	118,0	71,0	56,0	45,0	63981	●
11,5 mm	0.4528		M12 X 0,5	12,0	118,0	71,0	56,0	45,0	64000	●
11,6 mm	0.4567			12,0	118,0	71,0	56,0	45,0	63982	●
11,7 mm	0.4606			12,0	118,0	71,0	56,0	45,0	63983	●
11,8 mm	0.4646			12,0	118,0	71,0	56,0	45,0	63984	●
11,9 mm	0.4685			12,0	118,0	71,0	56,0	45,0	63985	●
15/32	0.4688	11.91	1/2-28	12,0	118,0	71,0	56,0	45,0	51932	●
12,0 mm	0.4724		M14 X 2	12,0	118,0	71,0	56,0	45,0	63986	●
31/64	0.4844	12.30	9/16-12	14,0	124,0	77,0	60,0	45,0	51933	●
12,5 mm	0.4921		M14 X 1,5	14,0	124,0	77,0	60,0	45,0	63987	●
1/2	0.5000	12.70		14,0	124,0	77,0	60,0	45,0	51934	●
12,8 mm	0.5039		M14 X 1,25	14,0	124,0	77,0	60,0	45,0	63988	●
13,0 mm	0.5118		M14 X 1	14,0	124,0	77,0	60,0	45,0	63989	●
33/64	0.5156	13.10	9/16-18	14,0	124,0	77,0	60,0	45,0	51935	●
13,5 mm	0.5315		5/8-11	14,0	124,0	77,0	60,0	45,0	64001	●
13,8 mm	0.5433			14,0	124,0	77,0	60,0	45,0	63990	●
14,0 mm	0.5512		M16 X 2	14,0	124,0	77,0	60,0	45,0	63991	●
9/16	0.5625	14.29		16,0	133,0	83,0	63,0	48,0	51937	●
14,5 mm	0.5709		M16 X 1,5	16,0	133,0	83,0	63,0	48,0	63992	●
37/64	0.5781	14.68	5/8-18	16,0	133,0	83,0	63,0	48,0	51938	●
14,8 mm	0.5827			16,0	133,0	83,0	63,0	48,0	63993	●
15,0 mm	0.5906		M16 X 1	16,0	133,0	83,0	63,0	48,0	63994	●
15,5 mm	0.6102		M18 X 2,5	16,0	133,0	83,0	63,0	48,0	63995	●
15,8 mm	0.6220			16,0	133,0	83,0	63,0	48,0	63996	●
5/8	0.6250	15.88	11/16-16	16,0	133,0	83,0	63,0	48,0	51939	●
16,0 mm	0.6299			16,0	133,0	83,0	63,0	48,0	63997	●
21/32	0.6562	16.67	3/4-10	18,0	143,0	93,0	71,0	48,0	51940	●
11/16	0.6875	17.46	3/4-16	18,0	143,0	93,0	71,0	48,0	51941	●
3/4	0.7500	19.05	13/16-16	20,0	153,0	101,0	77,0	50,0	51942	●

# FRACTIONAL ICe-Carb

Series 140 5D Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/8	3/16	1/4	3/8	1/2	5/8	3/4		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	425 (340-510)	RPM	12988	8659	6494	4329	3247	2598	2165	
			Fr	0.0039	0.0059	0.0079	0.0118	0.0157	0.0196	0.0236	
			Feed (ipm)	51.0	51.0	51.0	51.0	51.0	51.0	51.0	
	≤ 275 Bhn or ≤ 28 HRc	380 (304-456)	RPM	11613	7742	5806	3871	2903	2323	1935	
			Fr	0.0035	0.0053	0.0071	0.0106	0.0141	0.0177	0.0212	
			Feed (ipm)	41.0	41.0	41.0	41.0	41.0	41.0	41.0	
	≤ 425 Bhn or ≤ 45 HRc	220 (176-264)	RPM	6723	4482	3362	2241	1681	1345	1121	
			Fr	0.0030	0.0045	0.0059	0.0089	0.0119	0.0149	0.0178	
			Feed (ipm)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
	<b>H</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	330 (264-396)	RPM	10085	6723	5042	3362	2521	2017	1681
				Fr	0.0030	0.0045	0.0059	0.0089	0.0119	0.0149	0.0178
				Feed (ipm)	30.0	30.0	30.0	30.0	30.0	30.0	30.0
≤ 375 Bhn or ≤ 40 HRc		200 (160-240)	RPM	6112	4075	3056	2037	1528	1222	1019	
			Fr	0.0025	0.0038	0.0051	0.0076	0.0101	0.0127	0.0152	
			Feed (ipm)	15.5	15.5	15.5	15.5	15.5	15.5	15.5	
≤ 450 Bhn or ≤ 48 HRc		140 (112-168)	RPM	4278	2852	2139	1426	1070	856	713	
			Fr	0.0018	0.0027	0.0036	0.0054	0.0072	0.0090	0.0108	
			Feed (ipm)	7.7	7.7	7.7	7.7	7.7	7.7	7.7	
<b>K</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 200 Bhn or ≤ 13 HRc	145 (116-174)	RPM	4431	2954	2216	1477	1108	886	739
				Fr	0.0026	0.0039	0.0052	0.0078	0.0104	0.0130	0.0156
				Feed (ipm)	11.5	11.5	11.5	11.5	11.5	11.5	11.5
	≤ 375 Bhn or ≤ 40 HRc	95 (76-114)	RPM	2903	1935	1452	968	726	581	484	
			Fr	0.0012	0.0018	0.0024	0.0036	0.0048	0.0060	0.0072	
			Feed (ipm)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
	≤ 475 Bhn or ≤ 50 HRc	85 (68-102)	RPM	2598	1732	1299	866	649	520	433	
			Fr	0.0008	0.0012	0.0015	0.0023	0.0031	0.0038	0.0046	
			Feed (ipm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
	<b>M</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	360 (288-432)	RPM	11002	7334	5501	3667	2750	2200	1834
				Fr	0.0045	0.0068	0.0091	0.0136	0.0182	0.0227	0.0273
				Feed (ipm)	50.0	50.0	50.0	50.0	50.0	50.0	50.0
≤ 260 Bhn or ≤ 26 HRc		335 (268-402)	RPM	10238	6825	5119	3413	2559	2048	1706	
			Fr	0.0045	0.0068	0.0091	0.0136	0.0182	0.0227	0.0273	
			Feed (ipm)	46.5	46.5	46.5	46.5	46.5	46.5	46.5	
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F, 440F		≤ 185 Bhn or ≤ 9 HRc	305 (244-366)	RPM	9321	6214	4660	3107	2330	1864	1553
				Fr	0.0026	0.0039	0.0051	0.0077	0.0103	0.0129	0.0154
				Feed (ipm)	24.0	24.0	24.0	24.0	24.0	24.0	24.0
		≤ 275 Bhn or ≤ 28 HRc	195 (156-234)	RPM	5959	3973	2980	1986	1490	1192	993
				Fr	0.0020	0.0030	0.0040	0.0060	0.0081	0.0101	0.0121
				Feed (ipm)	12.0	12.0	12.0	12.0	12.0	12.0	12.0
	<b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	150 (120-180)	RPM	4584	3056	2292	1528	1146	917	764
				Fr	0.0020	0.0030	0.0040	0.0060	0.0079	0.0099	0.0119
				Feed (ipm)	9.1	9.1	9.1	9.1	9.1	9.1	9.1
		≤ 375 Bhn or ≤ 40 HRc	110 (88-132)	RPM	3362	2241	1681	1121	840	672	560
				Fr	0.0018	0.0027	0.0036	0.0054	0.0071	0.0089	0.0107
				Feed (ipm)	6.0	6.0	6.0	6.0	6.0	6.0	6.0

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Series 140 5D Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)							
			1/8	3/16	1/4	3/8	1/2	5/8	3/4	
<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy</b>	≤ 300 Bhn or ≤ 32 HRc	95	RPM	2903	1935	1452	968	726	581	484
		(76-114)	Fr	0.0008	0.0012	0.0016	0.0024	0.0032	0.0040	0.0048
			Feed (ipm)	2.3	2.3	2.3	2.3	2.3	2.3	2.3
	≤ 400 Bhn or ≤ 43 HRc	50	RPM	1528	1019	764	509	382	306	255
		(40-60)	Fr	0.0007	0.0010	0.0013	0.0020	0.0026	0.0033	0.0039
			Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
<b>S</b>	≤ 275 Bhn or ≤ 28 HRc	215	RPM	6570	4380	3285	2190	1643	1314	1095
		(172-258)	Fr	0.0018	0.0026	0.0035	0.0053	0.0070	0.0088	0.0105
			Feed (ipm)	11.5	11.5	11.5	11.5	11.5	11.5	11.5
	≤ 350 Bhn or ≤ 38 HRc	160	RPM	4890	3260	2445	1630	1222	978	815
		(128-192)	Fr	0.0016	0.0024	0.0032	0.0048	0.0064	0.0080	0.0096
			Feed (ipm)	7.8	7.8	7.8	7.8	7.8	7.8	7.8
≤ 440 Bhn or ≤ 47 HRc	85	RPM	2598	1732	1299	866	649	520	433	
	(68-102)	Fr	0.0012	0.0018	0.0024	0.0036	0.0048	0.0060	0.0072	
		Feed (ipm)	3.1	3.1	3.1	3.1	3.1	3.1	3.1	
<b>N</b>	≤ 80 Bhn or ≤ 47 HRb	770	RPM	23531	15687	11766	7844	5883	4706	3922
		(616-924)	Fr	0.0049	0.0073	0.0098	0.0147	0.0195	0.0244	0.0293
			Feed (ipm)	115.0	115.0	115.0	115.0	115.0	115.0	115.0
	≤ 150 Bhn or ≤ 7 HRc	660	RPM	20170	13446	10085	6723	5042	4034	3362
		(528-792)	Fr	0.0050	0.0074	0.0099	0.0149	0.0198	0.0248	0.0297
			Feed (ipm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
≤ 140 Bhn or ≤ 3 HRc	550	RPM	16808	11205	8404	5603	4202	3362	2801	
	(440-660)	Fr	0.0020	0.0030	0.0040	0.0060	0.0080	0.0100	0.0120	
		Feed (ipm)	33.5	33.5	33.5	33.5	33.5	33.5	33.5	
<b>COPPER ALLOYS Alum Bronze, C110, Muntz Brass</b>	≤ 200 Bhn or ≤ 23 HRc	440	RPM	13446	8964	6723	4482	3362	2689	2241
		(352-528)	Fr	0.0020	0.0030	0.0040	0.0060	0.0080	0.0100	0.0120
			Feed (ipm)	27.0	27.0	27.0	27.0	27.0	27.0	27.0

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

$rpm = Vc \times 3.82 / D_1$

$ipm = Fr \times rpm$

reduce speed and feed for materials harder than listed

refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# ICe-Carb

Series 140M 5D Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
			3	6	8	10	12	14	16		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	130	RPM	13733	6867	5150	4120	3433	2943	2575	
		(104-155)	Fr	0.095	0.189	0.252	0.316	0.379	0.442	0.505	
			Feed (mm/min)	1300	1300	1300	1300	1300	1300	1300	
	≤ 275 Bhn or ≤ 28 HRc	116	RPM	12279	6140	4605	3684	3070	2631	2302	
		(93-139)	Fr	0.086	0.171	0.228	0.285	0.342	0.399	0.456	
			Feed (mm/min)	1050	1050	1050	1050	1050	1050	1050	
	≤ 425 Bhn or ≤ 45 HRc	67	RPM	7109	3555	2666	2133	1777	1523	1333	
		(54-80)	Fr	0.071	0.142	0.189	0.237	0.284	0.332	0.379	
			Feed (mm/min)	505	505	505	505	505	505	505	
	<b>H</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	101	RPM	10664	5332	3999	3199	2666	2285	1999
			(80-121)	Fr	0.071	0.143	0.190	0.238	0.285	0.333	0.380
				Feed (mm/min)	760	760	760	760	760	760	760
≤ 375 Bhn or ≤ 40 HRc		61	RPM	6463	3231	2424	1939	1616	1385	1212	
		(49-73)	Fr	0.062	0.124	0.165	0.206	0.248	0.289	0.330	
			Feed (mm/min)	400	400	400	400	400	400	400	
≤ 450 Bhn or ≤ 48 HRc		43	RPM	4524	2262	1696	1357	1131	969	848	
		(34-51)	Fr	0.043	0.086	0.115	0.144	0.172	0.201	0.230	
			Feed (mm/min)	195	195	195	195	195	195	195	
<b>K</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 200 Bhn or ≤ 13 HRc	44	RPM	4686	2343	1757	1406	1171	1004	879
			(35-53)	Fr	0.061	0.122	0.162	0.203	0.243	0.284	0.324
				Feed (mm/min)	285	285	285	285	285	285	285
	≤ 375 Bhn or ≤ 40 HRc	29	RPM	3070	1535	1151	921	767	658	576	
		(23-35)	Fr	0.029	0.059	0.078	0.098	0.117	0.137	0.156	
			Feed (mm/min)	90	90	90	90	90	90	90	
	≤ 475 Bhn or ≤ 50 HRc	26	RPM	2747	1373	1030	824	687	589	515	
		(21-31)	Fr	0.018	0.036	0.049	0.061	0.073	0.085	0.097	
			Feed (mm/min)	50	50	50	50	50	50	50	
	<b>M</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	110	RPM	11633	5816	4362	3490	2908	2493	2181
			(88-132)	Fr	0.109	0.218	0.291	0.364	0.437	0.509	0.582
				Feed (mm/min)	1270	1270	1270	1270	1270	1270	1270
≤ 260 Bhn or ≤ 26 HRc		102	RPM	10825	5413	4059	3248	2706	2320	2030	
		(82-123)	Fr	0.109	0.218	0.291	0.363	0.436	0.509	0.581	
			Feed (mm/min)	1180	1180	1180	1180	1180	1180	1180	
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 185 Bhn or ≤ 9 HRc	93	RPM	9856	4928	3696	2957	2464	2112	1848	
		(74-112)	Fr	0.061	0.123	0.164	0.205	0.246	0.286	0.327	
			Feed (mm/min)	605	605	605	605	605	605	605	
	≤ 275 Bhn or ≤ 28 HRc	59	RPM	6301	3151	2363	1890	1575	1350	1181	
		(48-71)	Fr	0.048	0.095	0.127	0.159	0.190	0.222	0.254	
			Feed (mm/min)	300	300	300	300	300	300	300	
	<b>M</b>  <b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	46	RPM	4847	2424	1818	1454	1212	1039	909
			(37-55)	Fr	0.047	0.095	0.127	0.158	0.190	0.221	0.253
				Feed (mm/min)	230	230	230	230	230	230	230
		≤ 375 Bhn or ≤ 40 HRc	34	RPM	3555	1777	1333	1066	889	762	666
			(27-40)	Fr	0.042	0.084	0.113	0.141	0.169	0.197	0.225
				Feed (mm/min)	150	150	150	150	150	150	150

continued on next page

Series 140M 5D Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)							
			3	6	8	10	12	14	16	
<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy</b>	≤ 300 Bhn or ≤ 32 HRc	29	RPM	3070	1535	1151	921	767	658	576
		(23-35)	Fr	0.020	0.039	0.052	0.065	0.078	0.091	0.104
			Feed (mm/min)	60	60	60	60	60	60	60
	≤ 400 Bhn or ≤ 43 HRc	15	RPM	1616	808	606	485	404	346	303
		(12-18)	Fr	0.015	0.031	0.041	0.052	0.062	0.072	0.083
			Feed (mm/min)	25	25	25	25	25	25	25
<b>S TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V</b>	≤ 275 Bhn or ≤ 28 HRc	66	RPM	6947	3474	2605	2084	1737	1489	1303
		(52-79)	Fr	0.040	0.079	0.106	0.132	0.158	0.185	0.211
			Feed (mm/min)	275	275	275	275	275	275	275
	≤ 350 Bhn or ≤ 38 HRc	49	RPM	5170	2585	1939	1551	1293	1108	969
		(39-59)	Fr	0.039	0.077	0.103	0.129	0.155	0.181	0.206
			Feed (mm/min)	200	200	200	200	200	200	200
≤ 440 Bhn or ≤ 47 HRc	26	RPM	2747	1373	1030	824	687	589	515	
	(21-31)	Fr	0.029	0.058	0.078	0.097	0.117	0.136	0.155	
		Feed (mm/min)	80	80	80	80	80	80	80	
<b>N ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075</b>	≤ 80 Bhn or ≤ 47 HRb	235	RPM	24882	12441	9331	7465	6220	5332	4665
		(188-282)	Fr	0.118	0.237	0.316	0.395	0.473	0.552	0.631
			Feed (mm/min)	2945	2945	2945	2945	2945	2945	2945
	≤ 150 Bhn or ≤ 7 HRc	201	RPM	21327	10664	7998	6398	5332	4570	3999
		(161-241)	Fr	0.119	0.238	0.318	0.397	0.476	0.556	0.635
			Feed (mm/min)	2540	2540	2540	2540	2540	2540	2540
<b>COPPER ALLOYS Alum Bronze, C110, Muntz Brass</b>	≤ 140 Bhn or ≤ 3 HRc	168	RPM	17773	8886	6665	5332	4443	3808	3332
		(134-201)	Fr	0.048	0.096	0.128	0.159	0.191	0.223	0.255
			Feed (mm/min)	850	850	850	850	850	850	850
	≤ 200 Bhn or ≤ 23 HRc	134	RPM	14218	7109	5332	4265	3555	3047	2666
		(107-161)	Fr	0.048	0.096	0.128	0.161	0.193	0.225	0.257
			Feed (mm/min)	685	685	685	685	685	685	685

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fr \times rpm$   
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

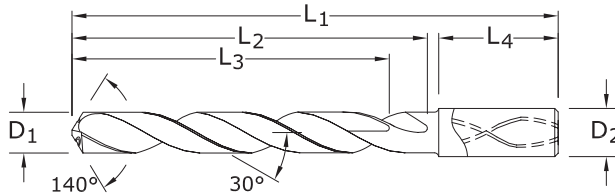
# ICe-Carb



8xD



2



## 140 8xD

FRACTIONAL & METRIC SERIES

- Coolant through design promotes controlled and consistent operating temperatures improving coolant flow to the cut while maintaining strength
- Split point geometry for improved drill penetration and accuracy
- Controlled edge honing for longevity
- Negative corner position strengthens and protects
- Recommended for materials ≤ 60 HRc (≤ 654 Bhn)

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO.	STOCK
				SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AlTiN)	
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.	
3,0 mm	0.1181			6,0	72,0	34,0	29,0	36,0	63575	●
3,1 mm	0.1220			6,0	72,0	34,0	29,0	36,0	63576	●
1/8	0.1250	3.18		6,0	72,0	34,0	29,0	36,0	51801	●
3,2 mm	0.1260		M3,5 X 0,35	6,0	72,0	34,0	29,0	36,0	63577	●
3,3 mm	0.1299		M4 X 0,7	6,0	72,0	34,0	29,0	36,0	63578	●
3,4 mm	0.1339			6,0	72,0	34,0	29,0	36,0	63579	●
#29	0.1360	3.45	8-32,8-36	6,0	72,0	34,0	29,0	36,0	51802	●
3,5 mm	0.1378		M4 X 0,5	6,0	72,0	34,0	29,0	36,0	63580	●
9/64	0.1406	3.57		6,0	72,0	34,0	29,0	36,0	51803	●
3,6 mm	0.1417		M4 X 0,35	6,0	72,0	34,0	29,0	36,0	63581	●
3,7 mm	0.1457		M4,5 X 0,75	6,0	72,0	34,0	29,0	36,0	63582	●
3,8 mm	0.1496		10-24	6,0	81,0	43,0	36,0	36,0	63583	●
3,9 mm	0.1535			6,0	81,0	43,0	36,0	36,0	63584	●
5/32	0.1562	3.97		6,0	81,0	43,0	36,0	36,0	51804	●
4,0 mm	0.1575		M4,5 X 0,5	6,0	81,0	43,0	36,0	36,0	63585	●
#21	0.1590	4.04	10-32	6,0	81,0	43,0	36,0	36,0	51805	●
4,1 mm	0.1614			6,0	81,0	43,0	36,0	36,0	63586	●
4,2 mm	0.1654		M5 / M5 X 0,75	6,0	81,0	43,0	36,0	36,0	63587	●
4,3 mm	0.1693			6,0	81,0	43,0	36,0	36,0	63588	●
11/64	0.1719	4.37		6,0	81,0	43,0	36,0	36,0	51806	●
4,4 mm	0.1732		12-24	6,0	81,0	43,0	36,0	36,0	63589	●
4,5 mm	0.1772		M5 X 0,5	6,0	81,0	43,0	36,0	36,0	63590	●
4,6 mm	0.1811		12-28	6,0	81,0	43,0	36,0	36,0	63591	●
4,7 mm	0.1850		12-32	6,0	81,0	43,0	36,0	36,0	63592	●
3/16	0.1875	4.76		6,0	95,0	57,0	48,0	36,0	51807	●
4,8 mm	0.1890		7/32-32	6,0	95,0	57,0	48,0	36,0	63593	●
4,9 mm	0.1929			6,0	95,0	57,0	48,0	36,0	63594	●
5,0 mm	0.1969		M6 X 1	6,0	95,0	57,0	48,0	36,0	63595	●
5,1 mm	0.2008		1/4-20	6,0	95,0	57,0	48,0	36,0	63596	●
13/64	0.2031	5.16		6,0	95,0	57,0	48,0	36,0	51808	●
5,2 mm	0.2047		M6 X 0,75	6,0	95,0	57,0	48,0	36,0	63597	●
5,3 mm	0.2087			6,0	95,0	57,0	48,0	36,0	63598	●
5,4 mm	0.2126			6,0	95,0	57,0	48,0	36,0	63599	●
5,5 mm	0.2165		M6 X 0,5	6,0	95,0	57,0	48,0	36,0	63600	●

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### TOLERANCES (inch)

- ≤.1181 DIAMETER  
D<sub>1</sub> = +.00008/+0.00047  
D<sub>2</sub> = h<sub>6</sub>
- >.1181-.2362 DIAMETER  
D<sub>1</sub> = +.00016/+0.00063  
D<sub>2</sub> = h<sub>6</sub>
- >.2362-.3937 DIAMETER  
D<sub>1</sub> = +.00024/+0.00083  
D<sub>2</sub> = h<sub>6</sub>
- >.3937-.7087 DIAMETER  
D<sub>1</sub> = +.00028/+0.00098  
D<sub>2</sub> = h<sub>6</sub>
- >.7087-1.1811 DIAMETER  
D<sub>1</sub> = +.00031/+0.00114  
D<sub>2</sub> = h<sub>6</sub>

### TOLERANCES (mm)

- ≤3 DIAMETER  
D<sub>1</sub> = +0,002/+0,012  
D<sub>2</sub> = h<sub>6</sub>
- >3-6 DIAMETER  
D<sub>1</sub> = +0,004/+0,016  
D<sub>2</sub> = h<sub>6</sub>
- >6-10 DIAMETER  
D<sub>1</sub> = +0,006/+0,021  
D<sub>2</sub> = h<sub>6</sub>
- >10-18 DIAMETER  
D<sub>1</sub> = +0,007/+0,025  
D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- NON-FERROUS
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# 140 8xD

FRACTIONAL & METRIC SERIES

CONTINUED

CUTTING DIA.	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO.	STOCK
				SHANK DIA.	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AITiN)	
D <sub>1</sub>				D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.	
7/32	0.2188	5.56	1/4-32	6,0	95,0	57,0	48,0	36,0	51809	●
5,6 mm	0.2205			6,0	95,0	57,0	48,0	36,0	63601	●
5,7 mm	0.2244			6,0	95,0	57,0	48,0	36,0	63602	●
5,8 mm	0.2283			6,0	95,0	57,0	48,0	36,0	63603	●
5,9 mm	0.2323			6,0	95,0	57,0	48,0	36,0	63604	●
15/64	0.2344	5.95		6,0	95,0	57,0	48,0	36,0	51810	●
6,0 mm	0.2362		M7 X 1	6,0	95,0	57,0	48,0	36,0	63605	●
6,1 mm	0.2402			8,0	114,0	76,0	64,0	36,0	63606	●
6,2 mm	0.2441		M7 X 0,75	8,0	114,0	76,0	64,0	36,0	63607	●
6,3 mm	0.2480			8,0	114,0	76,0	64,0	36,0	63608	●
1/4	0.2500	6.35		8,0	114,0	76,0	64,0	36,0	51811	●
6,4 mm	0.2520			8,0	114,0	76,0	64,0	36,0	63609	●
6,5 mm	0.2559			8,0	114,0	76,0	64,0	36,0	63610	●
F	0.2570	6.53	5/16-18	8,0	114,0	76,0	64,0	36,0	51812	●
6,6 mm	0.2598			8,0	114,0	76,0	64,0	36,0	63611	●
6,7 mm	0.2638			8,0	114,0	76,0	64,0	36,0	63612	●
17/64	0.2656	6.75	5/16-20	8,0	114,0	76,0	64,0	36,0	51813	●
6,8 mm	0.2677		M8 X 1,25	8,0	114,0	76,0	64,0	36,0	63613	●
6,9 mm	0.2717			8,0	114,0	76,0	64,0	36,0	63614	●
7,0 mm	0.2756		M8 X 1	8,0	114,0	76,0	64,0	36,0	63615	●
7,1 mm	0.2795			8,0	114,0	76,0	64,0	36,0	63616	●
9/32	0.2812	7.14	5/16-32	8,0	114,0	76,0	64,0	36,0	51814	●
7,2 mm	0.2835		M8 X 0,75	8,0	114,0	76,0	64,0	36,0	63617	●
7,3 mm	0.2874			8,0	114,0	76,0	64,0	36,0	63618	●
7,4 mm	0.2913			8,0	114,0	76,0	64,0	36,0	63619	●
7,5 mm	0.2953		M8 X 0,5	8,0	114,0	76,0	64,0	36,0	63620	●
19/64	0.2969	7.54		8,0	114,0	76,0	64,0	36,0	51815	●
7,6 mm	0.2992			8,0	114,0	76,0	64,0	36,0	63621	●
7,7 mm	0.3031			8,0	114,0	76,0	64,0	36,0	63622	●
7,8 mm	0.3071		M9 X 1,25	8,0	114,0	76,0	64,0	36,0	63623	●
7,9 mm	0.3110			8,0	114,0	76,0	64,0	36,0	63624	●
5/16	0.3125	7.94	3/8-16	8,0	114,0	76,0	64,0	36,0	51816	●
8,0 mm	0.3150		M9 X 1	8,0	114,0	76,0	64,0	36,0	63625	●
8,1 mm	0.3189			10,0	142,0	95,0	80,0	40,0	63626	●
8,2 mm	0.3228			10,0	142,0	95,0	80,0	40,0	63627	●
8,3 mm	0.3268			10,0	142,0	95,0	80,0	40,0	63628	●
21/64	0.3281	8.33	3/8-20	10,0	142,0	95,0	80,0	40,0	51817	●
8,4 mm	0.3307			10,0	142,0	95,0	80,0	40,0	63629	●
Q	0.3320	8.43	3/8-24	10,0	142,0	95,0	80,0	40,0	51818	●
8,5 mm	0.3346		M10 X 1,5	10,0	142,0	95,0	80,0	40,0	63630	●
8,6 mm	0.3386			10,0	142,0	95,0	80,0	40,0	63631	●
8,7 mm	0.3425			10,0	142,0	95,0	80,0	40,0	63632	●

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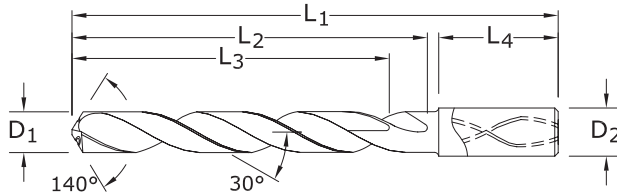
# ICe-Carb



8xD



2



## 140 8xD

FRACTIONAL & METRIC SERIES

- Coolant through design promotes controlled and consistent operating temperatures improving coolant flow to the cut while maintaining strength
- Split point geometry for improved drill penetration and accuracy
- Controlled edge honing for longevity
- Negative corner position strengthens and protects
- Recommended for materials  $\leq 60$  HRc ( $\leq 654$  Bhn)

CUTTING DIA. D <sub>1</sub>	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO.	Ti-NAMITE-A (AlTiN)	STOCK
				SHANK DIA. D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	SHANK LENGTH L <sub>4</sub>			
11/32	0.3438	8.73	3/8-32	10,0	142,0	95,0	80,0	40,0	51819	●	
8,8 mm	0.3465		M10 X 1,25	10,0	142,0	95,0	80,0	40,0	63633	●	
8,9 mm	0.3504			10,0	142,0	95,0	80,0	40,0	63634	●	
9,0 mm	0.3543		M10 X 1	10,0	142,0	95,0	80,0	40,0	63635	●	
9,1 mm	0.3583			10,0	142,0	95,0	80,0	40,0	63636	●	
23/64	0.3594	9.13		10,0	142,0	95,0	80,0	40,0	51820	●	
9,2 mm	0.3622		M10 X 0,75	10,0	142,0	95,0	80,0	40,0	63637	●	
9,3 mm	0.3661			10,0	142,0	95,0	80,0	40,0	63638	●	
U	0.3680	9.35	7/16-14	10,0	142,0	95,0	80,0	40,0	51821	●	
9,4 mm	0.3701			10,0	142,0	95,0	80,0	40,0	63639	●	
9,5 mm	0.3740		M11 / M10 X 0,5	10,0	142,0	95,0	80,0	40,0	63640	●	
3/8	0.3750	9.53		10,0	142,0	95,0	80,0	40,0	51822	●	
9,6 mm	0.3780			10,0	142,0	95,0	80,0	40,0	63641	●	
9,7 mm	0.3819			10,0	142,0	95,0	80,0	40,0	63642	●	
9,8 mm	0.3858			10,0	142,0	95,0	80,0	40,0	63643	●	
9,9 mm	0.3898			10,0	142,0	95,0	80,0	40,0	63644	●	
25/64	0.3906	9.92	7/16-20	10,0	142,0	95,0	80,0	40,0	51823	●	
10,0 mm	0.3937			10,0	142,0	95,0	80,0	40,0	63645	●	
10,1 mm	0.3976			12,0	162,0	114,0	96,0	45,0	63646	●	
10,2 mm	0.4016		M12 X 1,75	12,0	162,0	114,0	96,0	45,0	63647	●	
10,3 mm	0.4055			12,0	162,0	114,0	96,0	45,0	63648	●	
13/32	0.4062	10.32		12,0	162,0	114,0	96,0	45,0	51824	●	
10,4 mm	0.4094			12,0	162,0	114,0	96,0	45,0	63649	●	
10,5 mm	0.4134		M12 X 1,5	12,0	162,0	114,0	96,0	45,0	63650	●	
10,6 mm	0.4173			12,0	162,0	114,0	96,0	45,0	63651	●	
10,7 mm	0.4213			12,0	162,0	114,0	96,0	45,0	63652	●	
27/64	0.4219	10.72	1/2-13	12,0	162,0	114,0	96,0	45,0	51825	●	
10,8 mm	0.4252		M12 X 1,25	12,0	162,0	114,0	96,0	45,0	63653	●	
10,9 mm	0.4291			12,0	162,0	114,0	96,0	45,0	63654	●	
11,0 mm	0.4331		M12 X 1	12,0	162,0	114,0	96,0	45,0	63655	●	
11,1 mm	0.4370			12,0	162,0	114,0	96,0	45,0	63656	●	
7/16	0.4375	11.11	1/4-18NPT	12,0	162,0	114,0	96,0	45,0	51826	●	

continued on next page

### TOLERANCES (inch)

- ≤.1181 DIAMETER  
D<sub>1</sub> = +.00008/+0.00047  
D<sub>2</sub> = h<sub>6</sub>
- >.1181-.2362 DIAMETER  
D<sub>1</sub> = +.00016/+0.00063  
D<sub>2</sub> = h<sub>6</sub>
- >.2362-.3937 DIAMETER  
D<sub>1</sub> = +.00024/+0.00083  
D<sub>2</sub> = h<sub>6</sub>
- >.3937-.7087 DIAMETER  
D<sub>1</sub> = +.00028/+0.00098  
D<sub>2</sub> = h<sub>6</sub>
- >.7087-1.1811 DIAMETER  
D<sub>1</sub> = +.00031/+0.00114  
D<sub>2</sub> = h<sub>6</sub>

### TOLERANCES (mm)

- ≤3 DIAMETER  
D<sub>1</sub> = +0,002/+0,012  
D<sub>2</sub> = h<sub>6</sub>
- >3-6 DIAMETER  
D<sub>1</sub> = +0,004/+0,016  
D<sub>2</sub> = h<sub>6</sub>
- >6-10 DIAMETER  
D<sub>1</sub> = +0,006/+0,021  
D<sub>2</sub> = h<sub>6</sub>
- >10-18 DIAMETER  
D<sub>1</sub> = +0,007/+0,025  
D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- NON-FERROUS
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# 140 8xD

FRACTIONAL & METRIC SERIES

CONTINUED

CUTTING DIA. D <sub>1</sub>	DECIMAL EQUIV.	METRIC EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO.	STOCK
				SHANK DIA. D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	SHANK LENGTH L <sub>4</sub>	Ti-NAMITE-A (AITiN) EDP NO.	
11,2 mm	0.4409			12,0	162,0	114,0	96,0	45,0	63657	●
11,3 mm	0.4449			12,0	162,0	114,0	96,0	45,0	63658	●
11,4 mm	0.4488			12,0	162,0	114,0	96,0	45,0	63659	●
11,5 mm	0.4528		M12 X 0,5	12,0	162,0	114,0	96,0	45,0	63660	●
11,6 mm	0.4567			12,0	162,0	114,0	96,0	45,0	63661	●
11,7 mm	0.4606			12,0	162,0	114,0	96,0	45,0	63662	●
11,8 mm	0.4646			12,0	162,0	114,0	96,0	45,0	63663	●
11,9 mm	0.4685			12,0	162,0	114,0	96,0	45,0	63664	●
15/32	0.4688	11.91	1/2-28	12,0	162,0	114,0	96,0	45,0	51827	●
12,0 mm	0.4724		M14 X 2	12,0	162,0	114,0	96,0	45,0	63665	●
31/64	0.4844	12.30	9/16-12	14,0	178,0	133,0	112,0	45,0	51828	●
12,5 mm	0.4921		M14 X 1,5	14,0	178,0	133,0	112,0	45,0	63666	●
1/2	0.5000	12.70		14,0	178,0	133,0	112,0	45,0	51829	●
12,8 mm	0.5039		M14 X 1,25	14,0	178,0	133,0	112,0	45,0	63667	●
13,0 mm	0.5118		M14 X 1	14,0	178,0	133,0	112,0	45,0	63668	●
33/64	0.5156	13.10	9/16-18	14,0	178,0	133,0	112,0	45,0	51830	●
13,5 mm	0.5315		5/8-11	14,0	178,0	133,0	112,0	45,0	63669	●
13,8 mm	0.5433			14,0	178,0	133,0	112,0	45,0	63670	●
14,0 mm	0.5512		M16 X 2	14,0	178,0	133,0	112,0	45,0	63671	●
9/16	0.5625	14.29		16,0	203,0	152,0	128,0	48,0	51831	●
14,5 mm	0.5709		M16 X 1,5	16,0	203,0	152,0	128,0	48,0	63672	●
37/64	0.5781	14.68	5/8-18	16,0	203,0	152,0	128,0	48,0	51832	●
14,8 mm	0.5827			16,0	203,0	152,0	128,0	48,0	63673	●
15,0 mm	0.5906		M16 X 1	16,0	203,0	152,0	128,0	48,0	63674	●
15,5 mm	0.6102		M18 X 2,5	16,0	203,0	152,0	128,0	48,0	63675	●
15,8 mm	0.6220			16,0	203,0	152,0	128,0	48,0	63676	●
5/8	0.6250	15.88	11/16-16	16,0	203,0	152,0	128,0	48,0	51833	●
16,0 mm	0.6299			16,0	203,0	152,0	128,0	48,0	63677	●
21/32	0.6562	16.67	3/4-10	18,0	222,0	171,0	144,0	48,0	51834	●
11/16	0.6875	17.46	3/4-16	18,0	222,0	171,0	144,0	48,0	51835	●
3/4	0.7500	19.05	13/16-16	20,0	243,0	190,0	160,0	50,0	51836	●

# FRACTIONAL Ice-Carb

Series 140 8D Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/8	3/16	1/4	3/8	1/2	5/8	3/4		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	405 (324-486)	RPM	12377	8251	6188	4126	3094	2475	2063	
			Fr	0.0036	0.0053	0.0071	0.0107	0.0142	0.0178	0.0213	
			Feed (ipm)	44.0	44.0	44.0	44.0	44.0	44.0	44.0	
	≤ 275 Bhn or ≤ 28 HRc	370 (296-444)	RPM	11307	7538	5654	3769	2827	2261	1885	
			Fr	0.0030	0.0045	0.0060	0.0090	0.0120	0.0150	0.0180	
			Feed (ipm)	34.0	34.0	34.0	34.0	34.0	34.0	34.0	
	≤ 425 Bhn or ≤ 45 HRc	210 (168-252)	RPM	6418	4278	3209	2139	1604	1284	1070	
			Fr	0.0026	0.0039	0.0051	0.0077	0.0103	0.0129	0.0154	
			Feed (ipm)	16.5	16.5	16.5	16.5	16.5	16.5	16.5	
	<b>H</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	320 (256-384)	RPM	9779	6519	4890	3260	2445	1956	1630
				Fr	0.0026	0.0038	0.0051	0.0077	0.0102	0.0128	0.0153
				Feed (ipm)	25.0	25.0	25.0	25.0	25.0	25.0	25.0
≤ 375 Bhn or ≤ 40 HRc		190 (152-228)	RPM	5806	3871	2903	1935	1452	1161	968	
			Fr	0.0020	0.0030	0.0040	0.0059	0.0079	0.0099	0.0119	
			Feed (ipm)	11.5	11.5	11.5	11.5	11.5	11.5	11.5	
≤ 450 Bhn or ≤ 48 HRc		135 (108-162)	RPM	4126	2750	2063	1375	1031	825	688	
			Fr	0.0016	0.0024	0.0032	0.0047	0.0063	0.0079	0.0095	
			Feed (ipm)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	
<b>K</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 200 Bhn or ≤ 13 HRc	140 (112-168)	RPM	4278	2852	2139	1426	1070	856	713
				Fr	0.0020	0.0030	0.0040	0.0060	0.0079	0.0099	0.0119
				Feed (ipm)	8.5	8.5	8.5	8.5	8.5	8.5	8.5
	≤ 375 Bhn or ≤ 40 HRc	90 (72-108)	RPM	2750	1834	1375	917	688	550	458	
			Fr	0.0011	0.0016	0.0022	0.0033	0.0044	0.0055	0.0065	
			Feed (ipm)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
	≤ 475 Bhn or ≤ 50 HRc	80 (64-96)	RPM	2445	1630	1222	815	611	489	407	
			Fr	0.0006	0.0009	0.0012	0.0018	0.0025	0.0031	0.0037	
			Feed (ipm)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	
	<b>M</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	350 (280-420)	RPM	10696	7131	5348	3565	2674	2139	1783
				Fr	0.0037	0.0056	0.0075	0.0112	0.0150	0.0187	0.0224
				Feed (ipm)	40.0	40.0	40.0	40.0	40.0	40.0	40.0
≤ 260 Bhn or ≤ 26 HRc		310 (248-372)	RPM	9474	6316	4737	3158	2368	1895	1579	
			Fr	0.0039	0.0059	0.0078	0.0117	0.0156	0.0195	0.0234	
			Feed (ipm)	37.0	37.0	37.0	37.0	37.0	37.0	37.0	
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F, 440F		≤ 185 Bhn or ≤ 9 HRc	290 (232-348)	RPM	8862	5908	4431	2954	2216	1772	1477
				Fr	0.0020	0.0030	0.0039	0.0059	0.0079	0.0099	0.0118
				Feed (ipm)	17.5	17.5	17.5	17.5	17.5	17.5	17.5
		≤ 275 Bhn or ≤ 28 HRc	180 (144-216)	RPM	5501	3667	2750	1834	1375	1100	917
				Fr	0.0018	0.0027	0.0036	0.0055	0.0073	0.0091	0.0109
				Feed (ipm)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
	<b>M</b>  <b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	130 (104-156)	RPM	3973	2649	1986	1324	993	795	662
				Fr	0.0018	0.0026	0.0035	0.0053	0.0070	0.0088	0.0106
				Feed (ipm)	7.0	7.0	7.0	7.0	7.0	7.0	7.0
		≤ 375 Bhn or ≤ 40 HRc	95 (76-114)	RPM	2903	1935	1452	968	726	581	484
				Fr	0.0016	0.0023	0.0031	0.0047	0.0062	0.0078	0.0093
				Feed (ipm)	4.5	4.5	4.5	4.5	4.5	4.5	4.5

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Series 140 8D Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/8	3/16	1/4	3/8	1/2	5/8	3/4		
S  <b>SUPER ALLOYS</b> (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy	≤ 300 Bhn or ≤ 32 HRc	65	RPM	1986	1324	993	662	497	397	331	
		(52-78)	Fr	0.0009	0.0013	0.0017	0.0026	0.0034	0.0043	0.0051	
			Feed (ipm)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	
	≤ 400 Bhn or ≤ 43 HRc	35	RPM	1070	713	535	357	267	214	178	
		(28-42)	Fr	0.0006	0.0008	0.0011	0.0017	0.0022	0.0028	0.0034	
			Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
	TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	185	RPM	5654	3769	2827	1885	1413	1131	942
			(148-222)	Fr	0.0016	0.0024	0.0032	0.0048	0.0064	0.0080	0.0096
				Feed (ipm)	9.0	9.0	9.0	9.0	9.0	9.0	9.0
		≤ 350 Bhn or ≤ 38 HRc	140	RPM	4278	2852	2139	1426	1070	856	713
			(112-168)	Fr	0.0012	0.0018	0.0023	0.0035	0.0047	0.0058	0.0070
				Feed (ipm)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
≤ 440 Bhn or ≤ 47 HRc		75	RPM	2292	1528	1146	764	573	458	382	
		(60-90)	Fr	0.0010	0.0015	0.0020	0.0030	0.0040	0.0050	0.0060	
			Feed (ipm)	2.3	2.3	2.3	2.3	2.3	2.3	2.3	
N  <b>ALUMINUM ALLOYS</b> 2017, 2024, 356, 6061, 7075		≤ 80 Bhn or ≤ 47 HRb	730	RPM	22309	14873	11154	7436	5577	4462	3718
			(584-876)	Fr	0.0045	0.0067	0.0090	0.0134	0.0179	0.0224	0.0269
				Feed (ipm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	≤ 150 Bhn or ≤ 7 HRc	635	RPM	19406	12937	9703	6469	4851	3881	3234	
		(508-762)	Fr	0.0046	0.0070	0.0093	0.0139	0.0186	0.0232	0.0278	
			Feed (ipm)	90.0	90.0	90.0	90.0	90.0	90.0	90.0	
	<b>COPPER ALLOYS</b> Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	255	RPM	7793	5195	3896	2598	1948	1559	1299
			(204-306)	Fr	0.0018	0.0027	0.0036	0.0054	0.0072	0.0090	0.0108
				Feed (ipm)	14.0	14.0	14.0	14.0	14.0	14.0	14.0
		≤ 200 Bhn or ≤ 23 HRc	235	RPM	7182	4788	3591	2394	1795	1436	1197
			(188-282)	Fr	0.0018	0.0027	0.0036	0.0054	0.0072	0.0091	0.0109
				Feed (ipm)	13.0	13.0	13.0	13.0	13.0	13.0	13.0

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fr \times rpm$   
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstoool.com](http://www.kyocera-sgstoool.com))

# ICe-Carb

Series 140M 8D Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
			3	6	8	10	12	14	16		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	123	RPM	13087	6544	4908	3926	3272	2804	2454	
		(100-170)	Fr	0.085	0.171	0.228	0.285	0.342	0.399	0.455	
			Feed (mm/min)	1118	1118	1118	1118	1118	1118	1118	
	≤ 275 Bhn or ≤ 28 HRc	113	RPM	11956	5978	4484	3587	2989	2562	32	
		(90-135)	Fr	0.072	0.144	0.193	0.241	0.289	0.337	26.908	
			Feed (mm/min)	864	864	864	864	864	864	864	
	≤ 425 Bhn or ≤ 45 HRc	64	RPM	6786	3393	2545	2036	1696	1454	1272	
		(51-77)	Fr	0.062	0.124	0.165	0.206	0.247	0.288	0.329	
			Feed (mm/min)	419	419	419	419	419	419	419	
	<b>H</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	98	RPM	10340	5170	3878	3102	2585	2216	1939
			(78-117)	Fr	0.061	0.123	0.164	0.205	0.246	0.287	0.328
				Feed (mm/min)	635	635	635	635	635	635	635
≤ 375 Bhn or ≤ 40 HRc		58	RPM	6140	3070	2302	1842	1535	1316	1151	
		(46-69)	Fr	0.048	0.095	0.127	0.159	0.190	0.222	0.254	
			Feed (mm/min)	292	292	292	292	292	292	292	
≤ 450 Bhn or ≤ 48 HRc		41	RPM	4362	2181	1636	1309	1091	935	818	
		(33-49)	Fr	0.038	0.076	0.101	0.126	0.151	0.177	0.202	
			Feed (mm/min)	165	165	165	165	165	165	165	
<b>K</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 200 Bhn or ≤ 13 HRc	43	RPM	4524	2262	1696	1357	1131	969	848
			(34-51)	Fr	0.048	0.095	0.127	0.159	0.191	0.223	0.255
				Feed (mm/min)	216	216	216	216	216	216	216
	≤ 375 Bhn or ≤ 40 HRc	27	RPM	2908	1454	1091	872	727	623	545	
		(22-33)	Fr	0.026	0.052	0.070	0.087	0.105	0.122	0.140	
			Feed (mm/min)	76	76	76	76	76	76	76	
	≤ 475 Bhn or ≤ 50 HRc	24	RPM	2585	1293	969	776	646	554	485	
		(20-29)	Fr	0.015	0.029	0.039	0.049	0.059	0.069	0.079	
			Feed (mm/min)	38	38	38	38	38	38	38	
	<b>M</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	107	RPM	11310	5655	4241	3393	2827	2424	2121
			(85-128)	Fr	0.090	0.180	0.240	0.299	0.359	0.419	0.479
				Feed (mm/min)	1016	1016	1016	1016	1016	1016	1016
≤ 260 Bhn or ≤ 26 HRc		94	RPM	10017	5009	3756	3005	2504	2147	1878	
		(76-113)	Fr	0.094	0.188	0.250	0.313	0.375	0.438	0.500	
			Feed (mm/min)	940	940	940	940	940	940	940	
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F, 440F	≤ 185 Bhn or ≤ 9 HRc	88	RPM	9371	4686	3514	2811	2343	2008	1757	
		(71-106)	Fr	0.047	0.095	0.126	0.158	0.190	0.221	0.253	
			Feed (mm/min)	445	445	445	445	445	445	445	
	≤ 275 Bhn or ≤ 28 HRc	55	RPM	5816	2908	2181	1745	1454	1246	1091	
		(44-66)	Fr	0.044	0.087	0.116	0.146	0.175	0.204	0.233	
			Feed (mm/min)	254	254	254	254	254	254	254	
	<b>M</b>  <b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	40	RPM	4201	2100	1575	1260	1050	900	788
			(32-48)	Fr	0.042	0.085	0.113	0.141	0.169	0.198	0.226
				Feed (mm/min)	178	178	178	178	178	178	178
		≤ 375 Bhn or ≤ 40 HRc	29	RPM	3070	1535	1151	921	767	658	576
			(23-35)	Fr	0.037	0.074	0.099	0.124	0.149	0.174	0.199
				Feed (mm/min)	114	114	114	114	114	114	114

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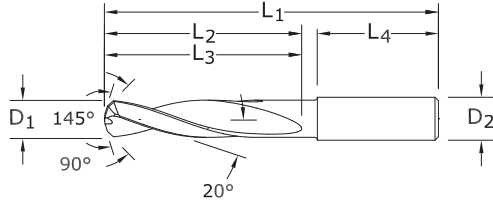
Series 140M 8D Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
			3	6	8	10	12	14	16		
<b>S</b>  <b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy, Monel 400, Rene, Waspaloy</b>	≤ 300 Bhn or ≤ 32 HRc	20	RPM	2100	1050	788	630	525	450	394	
		(16-24)	Fr	0.021	0.041	0.055	0.069	0.082	0.096	0.110	
			Feed (mm/min)	43	43	43	43	43	43	43	
	≤ 400 Bhn or ≤ 43 HRc	11	RPM	1131	565	424	339	283	242	212	
		(9-13)	Fr	0.013	0.027	0.036	0.045	0.054	0.063	0.072	
			Feed (mm/min)	15	15	15	15	15	15	15	
	<b>TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V</b>	≤ 275 Bhn or ≤ 28 HRc	56	RPM	5978	2989	2242	1793	1495	1281	1121
			(45-68)	Fr	0.038	0.076	0.102	0.127	0.153	0.178	0.204
				Feed (mm/min)	229	229	229	229	229	229	229
		≤ 350 Bhn or ≤ 38 HRc	43	RPM	4524	2262	1696	1357	1131	969	848
			(34-51)	Fr	0.028	0.056	0.075	0.094	0.112	0.131	0.150
				Feed (mm/min)	127	127	127	127	127	127	127
≤ 440 Bhn or ≤ 47 HRc		23	RPM	2424	1212	909	727	606	519	454	
		(18-27)	Fr	0.024	0.048	0.064	0.080	0.096	0.112	0.129	
			Feed (mm/min)	58	58	58	58	58	58	58	
<b>N</b>  <b>ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075</b>		≤ 80 Bhn or ≤ 47 HRb	223	RPM	23589	11795	8846	7077	5897	5055	4423
			(178-267)	Fr	0.108	0.215	0.287	0.359	0.431	0.502	0.574
				Feed (mm/min)	2540	2540	2540	2540	2540	2540	2540
	≤ 150 Bhn or ≤ 7 HRc	194	RPM	20519	10260	7695	6156	5130	4397	3847	
		(155-232)	Fr	0.111	0.223	0.297	0.371	0.446	0.520	0.594	
			Feed (mm/min)	2286	2286	2286	2286	2286	2286	2286	
	<b>COPPER ALLOYS Alum Bronze, C110, Muntz Brass</b>	≤ 140 Bhn or ≤ 3 HRc	78	RPM	8240	4120	3090	2472	2060	1766	1545
			(62-93)	Fr	0.043	0.086	0.115	0.144	0.173	0.201	0.230
				Feed (mm/min)	356	356	356	356	356	356	356
		≤ 200 Bhn or ≤ 23 HRc	72	RPM	7594	3797	2848	2278	1898	1627	1424
			(57-86)	Fr	0.043	0.087	0.116	0.145	0.174	0.203	0.232
				Feed (mm/min)	330	330	330	330	330	330	330

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fr \times rpm$   
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstoool.com](http://www.kyocera-sgstoool.com))

# Series 120



3xD



## 120

FRACTIONAL & METRIC SERIES

- Double margin construction design stabilizes the drill for greater hole accuracy and improved surface finish in final hole
- Compound angle creates 4 cutting edges along the drill point
- Distinct double angle prevents abrasiveness of the Composite from localizing along the point

CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	METRIC EQUIV.	SHANK DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub> /L <sub>3</sub>	SHANK LENGTH L <sub>4</sub>	Di-NAMITE (Diamond) EDP NO.	STOCK
#40	0.0980	2.49	1/8	2	9/16	1-1/4	50000	●
2,7 mm	0.1063		6,0	63,0	20,0	32,0	50001	●
3,0 mm	0.1181		6,0	63,0	20,0	36,0	50002	●
1/8	0.1250	3.18	1/4	2-1/2	3/4	1-7/16	50003	●
3,2 mm	0.1260		6,0	63,0	20,0	36,0	50004	●
#30	0.1285	3.26	1/4	2-1/2	3/4	1-7/16	50005	●
#28	0.1405	3.57	1/4	2-1/2	3/4	1-7/16	50006	●
#22	0.1570	3.99	1/4	2-5/8	7/8	1-7/16	50007	●
#21	0.1590	4.04	1/4	2-5/8	7/8	1-7/16	50008	●
4,1 mm	0.1614		6,0	66,0	24,0	36,0	50009	●
#19	0.1660	4.22	1/4	2-5/8	7/8	1-7/16	50010	●
11/64	0.1719	4.37	1/4	2-5/8	7/8	1-7/16	50011	●
3/16	0.1875	4.76	1/4	2-5/8	1	1-7/16	50012	●
#11	0.1910	4.85	1/4	2-5/8	1	1-7/16	50013	●
#8	0.1990	5.05	1/4	2-5/8	1	1-7/16	50014	●
#7	0.2010	5.11	1/4	2-5/8	1	1-7/16	50015	●
#2	0.2210	5.61	1/4	2-5/8	1	1-7/16	50016	●
6,0 mm	0.2362		6,0	66,0	28,0	36,0	50017	●
1/4	0.2500	6.35	1/4	3-1/8	1-5/16	1-7/16	50018	●
.2510	0.2510	6.38	5/16	3-1/8	1-5/16	1-7/16	50019	●
F	0.2570	6.53	5/16	3-1/8	1-5/16	1-7/16	50020	●
I	0.2720	6.91	5/16	3-1/8	1-5/16	1-7/16	50021	●
J	0.2770	7.04	5/16	3-1/8	1-5/16	1-7/16	50022	●
K	0.2810	7.14	5/16	3-1/8	1-9/16	1-7/16	50023	●
5/16	0.3125	7.94	5/16	3-1/8	1-9/16	1-7/16	50024	●
8,0 mm	0.3150		8,0	79,0	41,0	36,0	50025	●
3/8	0.3750	9.53	3/8	3-1/2	1-27/32	1-9/16	50026	●
V	0.3770	9.58	1/2	3-1/2	1-27/32	1-9/16	50027	●
10,0 mm	0.3937		10,0	89,0	47,0	40,0	50028	●
7/16	0.4375	11.11	1/2	4-1/16	2-3/16	1-9/16	50029	●
12,0 mm	0.4724		12,0	102,0	55,0	45,0	50030	●
1/2	0.5000	12.70	1/2	4-1/4	2-5/16	1-3/4	50031	●

**TOLERANCES (inch)**

#40-1/2 DIAMETER  
D<sub>1</sub> = +.0000/-0.0005  
D<sub>2</sub> = h<sub>6</sub>

**TOLERANCES (mm)**

2,7-12 DIAMETER  
D<sub>1</sub> = +0,000/-0,013  
D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED— Call for Delivery

Series 120 Fractional	Vc (sfm)		Diameter (D <sub>1</sub> ) (inch)						
			1/8	3/16	1/4	5/16	3/8	7/16	1/2
N CFRP, AFRP (Carbon Fiber, Aramid Fiber)	320 (256-384)	RPM	9779	6519	4890	3912	3260	2794	2445
		Fr	0.0006	0.0009	0.0012	0.0015	0.0018	0.0021	0.0024
		Feed (ipm)	5.9	5.9	5.9	5.9	5.9	5.9	5.9
N GFRP (Fiberglass)	240 (192-288)	RPM	7334	4890	3667	2934	2445	2096	1834
		Fr	0.0006	0.0009	0.0012	0.0015	0.0018	0.0021	0.0024
		Feed (ipm)	4.4	4.4	4.4	4.4	4.4	4.4	4.4
N CARBON, GRAPHITE	400 (320-480)	RPM	12224	8149	6112	4890	4075	3493	3056
		Fr	0.0008	0.0012	0.0016	0.0020	0.0024	0.0028	0.0032
		Feed (ipm)	9.8	9.8	9.8	9.8	9.8	9.8	9.8

rpm = Vc x 3.82 / D<sub>1</sub>  
 ipm = Fr x rpm  
 adjust speed and / or feed based on resin type and / or fiber structure  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

Series 120 Metric	Vc (m/min)		Diameter (D <sub>1</sub> ) (mm)						
			2.5	3	4	6	8	10	12
N CFRP, AFRP (Carbon Fiber, Aramid Fiber)	100 (80-120)	RPM	12722	10602	7951	5301	3976	3181	2650
		Fr	0.012	0.014	0.019	0.028	0.038	0.047	0.057
		Feed (mm/min)	150	150	150	150	150	150	150
N GFRP (Fiberglass)	75 (65-90)	RPM	9542	7951	5963	3976	2982	2385	1988
		Fr	0.012	0.014	0.019	0.029	0.039	0.048	0.058
		Feed (mm/min)	115	115	115	115	115	115	115
N CARBON, GRAPHITE	120 (96-144)	RPM	15266	12722	9542	6361	4771	3817	3181
		Fr	0.015	0.018	0.025	0.037	0.049	0.062	0.074
		Feed (mm/min)	235	235	235	235	235	235	235

rpm = (Vc x 1000) / (D<sub>1</sub> x 3.14)  
 mm/min = Fr x rpm  
 adjust speed and / or feed based on resin type and / or fiber structure  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



## General Purpose Drills



## Hole Making

GENERAL PURPOSE DRILLS	SERIES	DESCRIPTION	PAGE
2 Flute	101	2 Flute Slow Spiral	272
Short Length Self Centering (DIN6539)	108M Plus	2 Flute Short Length DIN 6539	277
Straight Flute	106	Straight Flute 140 Point Geometry	284
3 Flute with 150 Point Geometry	103	3 Flute 150 Point Geometry	288

GENERAL PURPOSE COUNTERSINKS	SERIES	DESCRIPTION	PAGE
Combined Drill & Countersink	301	2 Flute Straight Flute Combined Drill and Countersink Fractional	294
	301M	2 Flute Straight Flute Combined Drill and Countersink Metric	295
Single Flute Countersink	601	Single Flute Fractional	300
3 Flute Countersink	603	3 Flute Fractional	303
6 Flute Countersink	606	6 Flute Fractional	306

GENERAL PURPOSE REAMERS	SERIES	DESCRIPTION	PAGE
Straight Flute Reamer	201M	Metric Reamer	310
Straight Flute Accu-Reamer	200	Accu-Reamer	314

*Speed & Feed Recommendations listed after each series*

# Taladrado

TALADROS DE USO GENERAL	SERIE	DESCRIPCIÓN	PÁGINA
2 filos	101	2 filos, espiral de avance lento	272
Autocentrante de longitud corta (DIN6539)	108M Plus	2 filos, longitud corta, DIN 6539	277
Filo recto	106	Filo recto, geometría de 140 puntos	284
3 filos con geometría de 150 puntos	103	3 filos, geometría de 150 puntos	288

TALADROS DE USO AVELLANADORES	SERIE	DESCRIPCIÓN	PÁGINA
Taladro y avellanador combinados	301	2 filos, filo recto, taladro y avellanador combinados, fraccional	294
	301M	2 filos, filo recto, taladro y avellanador combinados, métrico	295
Avellanador de filo único	601	Filo único, fraccional	300
Avellanador de 3 filos	603	3 filos, fraccional	303
Avellanador de 6 filos	606	6 filos, fraccional	306

TALADROS DE USO ESCARIADORES	SERIE	DESCRIPCIÓN	PÁGINA
Escariador de filo recto	201M	Escariador métrico	310
Escariador Accu de filo recto	200	Escariador Accu	314

*Recomendaciones de velocidades y avances mostradas tras cada serie*

## Outils de perçage

FORETS UNIVERSELS	SERIES	DESCRIPTION	PAGE
2 dents	101	2 dents à spirale lente	272
Court autocentrant (DIN 6539)	108M Plus	2 dents court DIN 6539	277
Denture droite	106B17	Denture droite à angle de pointe 140°	284
3 dents à angle de pointe 150°	103	3 dents à angle de pointe 150°	288
FORETS À FRAISER	SERIES	DESCRIPTION	PAGE
Foret et foret à fraiser combinés	301	2 dents denture droite foret et foret à fraiser combinés (fractionnel)	294
	301M	2 dents denture droite foret et foret à fraiser combinés (métrique)	295
Foret à fraiser à dent simple	601	Foret à dent simple (fractionnel)	300
Foret à fraiser 3 dents	603	3 dents (fractionnel)	303
foret à fraiser 6 dents	606	6 dents (fractionnel)	306
FORETS À ALÉSOIRS	SERIES	DESCRIPTION	PAGE
Alésoir denture droite	201M	Alésoir (métrique)	310
Alésoir denture droite Accu-Reamer	200	Alésoir Accu-Reamer	314

*Recommandations de vitesse et avance indiquées après chaque série*

# 2 Flute Drills • Metric: DIN 338

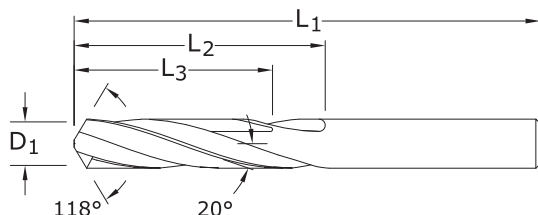


5xD



101

FRACTIONAL & METRIC SERIES



CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	METRIC EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-A (AlTiN)	
#80	0.0135	0.34	3/4	3/16	5/32	51080	57076	●
#79	0.0145	0.37	3/4	3/16	5/32	51079	57077	●
1/64	0.0156	0.40	3/4	3/16	5/32	51101	57078	●
#78	0.0160	0.41	3/4	3/16	5/32	51078	57079	●
#77	0.0180	0.46	3/4	3/16	5/32	51077	57080	●
#76	0.0200	0.51	7/8	1/4	13/64	51076	57081	●
#75	0.0210	0.53	7/8	1/4	13/64	51075	57082	●
#74	0.0225	0.57	7/8	1/4	13/64	51074	57083	●
#73	0.0240	0.61	7/8	1/4	13/64	51073	57084	●
#72	0.0250	0.64	1	5/16	1/4	51072	57085	●
#71	0.0260	0.66	1	5/16	1/4	51071	57086	●
0,7 mm	0.0276		28,0	9,0	7,0	61001	68268	●
#70	0.0280	0.71	1-1/4	1/2	13/32	51070	57087	●
#69	0.0292	0.74	1-1/4	1/2	13/32	51069	57088	●
#68	0.0310	0.79	1-1/4	1/2	13/32	51068	57089	●
1/32	0.0312	0.79	1-1/4	1/2	13/32	51102	57090	●
0,8 mm	0.0315		30,0	10,0	8,0	61003	68269	●
#67	0.0320	0.81	1-1/4	1/2	13/32	51067	57091	●
#66	0.0330	0.84	1-1/4	1/2	13/32	51066	57092	●
#65	0.0350	0.89	1-3/8	5/8	1/2	51065	57093	●
0,9 mm	0.0354		32,0	11,0	8,0	61005	68270	●
#64	0.0360	0.91	1-3/8	5/8	1/2	51064	57094	●
#63	0.0370	0.94	1-3/8	5/8	1/2	51063	57095	●
#62	0.0380	0.97	1-3/8	5/8	1/2	51062	57096	●
#61	0.0390	0.99	1-3/8	5/8	1/2	51061	57097	●
1,0 mm	0.0394		34,0	12,0	9,0	61007	68271	●
#60	0.0400	1.02	1-1/2	3/4	39/64	51060	57098	●
#59	0.0410	1.04	1-1/2	3/4	39/64	51059	57099	●
#58	0.0420	1.07	1-1/2	3/4	39/64	51058	57100	●
#57	0.0430	1.09	1-1/2	3/4	39/64	51057	57101	●
1,1 mm	0.0433		36,0	14,0	11,0	61052	68294	●
#56	0.0465	1.18	1-1/2	3/4	39/64	51056	57102	●
3/64	0.0469	1.19	1-1/2	3/4	39/64	51103	57103	●
1,2 mm	0.0472		38,0	16,0	12,0	61053	68295	●
1,3 mm	0.0512		38,0	16,0	12,0	61054	68296	●
#55	0.0520	1.32	1-1/2	3/4	39/64	51055	57104	●
#54	0.0550	1.40	1-1/2	3/4	39/64	51054	57105	●
1,4 mm	0.0551		40,0	18,0	14,0	61055	68297	●
1,5 mm	0.0591		40,0	18,0	14,0	61009	68272	●
#53	0.0595	1.51	1-1/2	3/4	39/64	51053	57106	●
*1/16	0.0625	1.59	1-1/2	3/4	39/64	51104	57107	●
1,6 mm	0.0630		43,0	20,0	16,0	61056	68298	●
#52	0.0635	1.61	1-1/2	3/4	39/64	51052	57108	●
1,7 mm	0.0669		43,0	20,0	17,0	61057	68299	●

continued on next page

**TOLERANCES (inch)**

D<sub>1</sub> = +.0000/- .0005

**TOLERANCES (mm)**

D<sub>1</sub> = +0,0000/-0,0127

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

## 2 Flute Drills • Metric: DIN 338

101

FRACTIONAL &amp; METRIC SERIES

CONTINUED

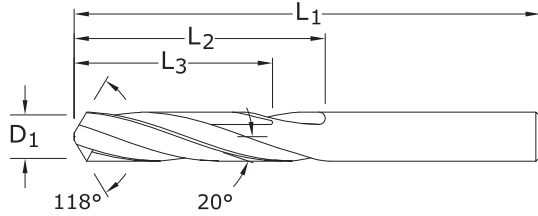
CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	METRIC EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-A (AITiN)	
#51	0.0670	1.70	1-1/2	3/4	39/64	51051	57109	●
#50	0.0700	1.78	1-3/4	7/8	45/64	51050	57110	●
1,8 mm	0.0709		46,0	22,0	17,0	61058	68300	●
#49	0.0730	1.85	1-3/4	7/8	45/64	51049	57111	●
1,9 mm	0.0748		46,0	22,0	17,0	61059	68301	●
#48	0.0760	1.93	1-3/4	7/8	45/64	51048	57112	●
5/64	0.0781	1.98	1-3/4	7/8	45/64	51105	57113	●
#47	0.0785	1.99	1-3/4	7/8	45/64	51047	57114	●
2,0 mm	0.0787		49,0	24,0	19,0	61011	68273	●
#46	0.0810	2.06	1-3/4	7/8	45/64	51046	57115	●
#45	0.0820	2.08	1-3/4	7/8	45/64	51045	57116	●
2,1 mm	0.0827		49,0	24,0	19,0	61060	68302	●
#44	0.0860	2.18	2	1	51/64	51044	57117	●
2,2 mm	0.0866		53,0	27,0	21,0	61061	68303	●
#43	0.0890	2.26	2	1	51/64	51043	57118	●
2,3 mm	0.0906		53,0	27,0	21,0	61062	68304	●
#42	0.0935	2.37	2	1	51/64	51042	57119	●
3/32	0.0938	2.38	2	1	51/64	51106	57120	●
2,4 mm	0.0945		57,0	30,0	24,0	61063	68305	●
#41	0.0960	2.44	2	1	51/64	51041	57121	●
#40	0.0980	2.49	2	1	51/64	51040	57122	●
2,5 mm	0.0984		57,0	30,0	24,0	61013	68274	●
#39	0.0995	2.53	2-1/4	1-1/4	1	51039	57123	●
#38	0.1015	2.58	2-1/4	1-1/4	1	51038	57124	●
2,6 mm	0.1024		57,0	30,0	24,0	61064	68306	●
#37	0.1040	2.64	2-1/4	1-1/4	1	51037	57125	●
2,7 mm	0.1063		61,0	33,0	26,0	61065	68307	●
#36	0.1065	2.71	2-1/4	1-1/4	1	51036	57126	●
7/64	0.1094	2.78	2-1/4	1-1/4	1	51107	57127	●
#35	0.1100	2.79	2-1/4	1-1/4	1	51035	57128	●
2,8 mm	0.1102		61,0	33,0	26,0	61066	68308	●
#34	0.1110	2.82	2-1/4	1-1/4	1	51034	57129	●
#33	0.1130	2.87	2-1/4	1-1/4	1	51033	57130	●
2,9 mm	0.1142		61,0	33,0	26,0	61067	68309	●
#32	0.1160	2.95	2-1/4	1-1/4	1	51032	57131	●
3,0 mm	0.1181		61,0	33,0	26,0	61015	68275	●
#31	0.1200	3.05	2-1/4	1-1/4	1	51031	57132	●
3,1 mm	0.1220		65,0	36,0	28,0	61068	68310	●
*1/8	0.1250	3.18	2-1/4	1-1/4	1	51108	57133	●
3,2 mm	0.1260		65,0	36,0	28,0	61069	68311	●
#30	0.1285	3.26	2-1/4	1-1/4	1	51030	57134	●
3,3 mm	0.1299		65,0	36,0	28,0	61070	68312	●
3,4 mm	0.1339		70,0	39,0	31,0	61071	68313	●
#29	0.1360	3.45	2-1/2	1-3/8	1-7/64	51029	57135	●
3,5 mm	0.1378		70,0	39,0	31,0	61017	68276	●
#28	0.1405	3.57	2-1/2	1-3/8	1-7/64	51028	57136	●
9/64	0.1406	3.57	2-1/2	1-3/8	1-7/64	51109	57137	●
3,6 mm	0.1417		70,0	39,0	31,0	61072	68314	●
#27	0.1440	3.66	2-1/2	1-3/8	1-7/64	51027	57138	●
3,7 mm	0.1457		70,0	39,0	31,0	61073	68315	●
#26	0.1470	3.73	2-1/2	1-3/8	1-7/64	51026	57139	●
#25	0.1495	3.80	2-1/2	1-3/8	1-7/64	51025	57140	●
3,8 mm	0.1496		75,0	43,0	34,0	61074	68316	●
#24	0.1520	3.86	2-1/2	1-3/8	1-7/64	51024	57141	●
3,9 mm	0.1535		75,0	43,0	34,0	61075	68317	●
#23	0.1540	3.91	2-1/2	1-3/8	1-7/64	51023	57142	●

continued on next page

# 2 Flute Drills • Metric: DIN 338



5xD



101

FRACTIONAL & METRIC SERIES

CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	METRIC EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-A (AlTiN)	
5/32	0.1562	3.97	2-1/2	1-3/8	1-7/64	51110	57143	●
#22	0.1570	3.99	2-1/2	1-3/8	1-7/64	51022	57144	●
4,0 mm	0.1575		75,0	43,0	34,0	61019	68277	●
#21	0.1590	4.04	2-1/2	1-3/8	1-7/64	51021	57145	●
#20	0.1610	4.09	2-1/2	1-3/8	1-7/64	51020	57146	●
4,1 mm	0.1614		75,0	43,0	34,0	61076	68318	●
4,2 mm	0.1654		75,0	43,0	34,0	61077	68319	●
#19	0.1660	4.22	2-1/2	1-5/8	1-19/64	51019	57147	●
4,3 mm	0.1693		80,0	47,0	37,0	61078	68320	●
#18	0.1695	4.31	2-3/4	1-5/8	1-19/64	51018	57148	●
11/64	0.1719	4.37	2-3/4	1-5/8	1-19/64	51111	57149	●
#17	0.1730	4.39	2-3/4	1-5/8	1-19/64	51017	57150	●
4,4 mm	0.1732		80,0	47,0	37,0	61079	68321	●
#16	0.1770	4.50	2-3/4	1-5/8	1-19/64	51016	57151	●
4,5 mm	0.1772		80,0	47,0	37,0	61021	68278	●
#15	0.1800	4.57	2-3/4	1-5/8	1-19/64	51015	57152	●
4,6 mm	0.1811		80,0	47,0	37,0	61080	68322	●
#14	0.1820	4.62	2-3/4	1-5/8	1-19/64	51014	57153	●
4,7 mm	0.1850		80,0	47,0	37,0	61081	68323	●
#13	0.1850	4.70	2-3/4	1-5/8	1-19/64	51013	57154	●
*3/16	0.1875	4.76	2-3/4	1-5/8	1-19/64	51112	57155	●
4,8 mm	0.1890		86,0	52,0	41,0	61082	68324	●
#12	0.1890	4.80	2-3/4	1-5/8	1-19/64	51012	57156	●
#11	0.1910	4.85	2-3/4	1-5/8	1-19/64	51011	57157	●
4,9 mm	0.1929		86,0	52,0	41,0	61083	68325	●
#10	0.1935	4.91	2-3/4	1-5/8	1-19/64	51010	57158	●
#9	0.1960	4.98	3	1-3/4	1-13/32	51009	57159	●
5,0 mm	0.1969		86,0	52,0	41,0	61023	68279	●
#8	0.1990	5.05	3	1-3/4	1-13/32	51008	57160	●
5,1 mm	0.2008		86,0	52,0	41,0	61084	68326	●
#7	0.2010	5.11	3	1-3/4	1-13/32	51007	57161	●
13/64	0.2031	5.16	3	1-3/4	1-13/32	51113	57162	●
#6	0.2040	5.18	3	1-3/4	1-13/32	51006	57163	●
5,2 mm	0.2047		86,0	52,0	41,0	61085	68327	●
#5	0.2055	5.22	3	1-3/4	1-13/32	51005	57164	●
5,3 mm	0.2087		86,0	52,0	41,0	61086	68328	●
#4	0.2090	5.31	3	1-3/4	1-13/32	51004	57165	●
5,4 mm	0.2126		93,0	57,0	45,0	61087	68329	●
#3	0.2130	5.41	3	1-3/4	1-13/32	51003	57166	●
5,5 mm	0.2165		93,0	57,0	45,0	61025	68280	●
7/32	0.2188	5.56	3	1-3/4	1-13/32	51114	57167	●
5,6 mm	0.2205		93,0	57,0	45,0	61088	68330	●
#2	0.2210	5.61	3	1-3/4	1-13/32	51002	57168	●
5,7 mm	0.2244		93,0	57,0	45,0	61089	68331	●

continued on next page

**TOLERANCES (inch)**

D<sub>1</sub> = +.0000/- .0005

**TOLERANCES (mm)**

D<sub>1</sub> = +0,0000/-0,0127

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

## 2 Flute Drills • Metric: DIN 338

101

FRACTIONAL &amp; METRIC SERIES

CONTINUED

CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	METRIC EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-A (AITiN)	
#1	0.2280	5.79	3	1-3/4	1-13/32	51001	57169	●
5,8 mm	0.2283		93,0	57,0	45,0	61090	68332	●
5,9 mm	0.2323		93,0	57,0	45,0	61091	68333	●
A	0.2340	5.94	3-1/4	2	1-39/64	51201	57170	●
15/64	0.2344	5.95	3-1/4	2	1-39/64	51115	57171	●
6,0 mm	0.2362		93,0	57,0	45,0	61027	68281	●
B	0.2380	6.05	3-1/4	2	1-39/64	51202	57172	●
6,1 mm	0.2402		101,0	63,0	50,0	61092	68334	●
C	0.2420	6.15	3-1/4	2	1-39/64	51203	57173	●
6,2 mm	0.2441		101,0	63,0	50,0	61093	68335	●
D	0.2460	6.25	3-1/4	2	1-39/64	51204	57174	●
6,3 mm	0.2480		101,0	63,0	50,0	61094	68336	●
1/4	0.2500	6.35	3-1/4	2	1-39/64	51116	57175	●
6,4 mm	0.2520		101,0	63,0	50,0	61095	68337	●
6,5 mm	0.2559		101,0	63,0	50,0	61029	68282	●
F	0.2570	6.53	3-1/4	2	1-39/64	51206	57177	●
6,6 mm	0.2598		101,0	63,0	50,0	61096	68338	●
G	0.2610	6.63	3-1/2	2-1/8	1-45/64	51207	57178	●
6,7 mm	0.2638		101,0	63,0	50,0	61097	68339	●
17/64	0.2656	6.75	3-1/2	2-1/8	1-45/64	51117	57179	●
H	0.2660	6.76	3-1/2	2-1/8	1-45/64	51208	57180	●
6,8 mm	0.2677		109,0	69,0	55,0	61098	68340	●
6,9 mm	0.2717		109,0	69,0	55,0	61099	68341	●
I	0.2720	6.91	3-1/2	2-1/8	1-45/64	51209	57181	●
7,0 mm	0.2756		109,0	69,0	55,0	61031	68283	●
J	0.2770	7.04	3-1/2	2-1/8	1-45/64	51210	57182	●
7,1 mm	0.2795		109,0	69,0	55,0	61100	68342	●
K	0.2810	7.14	3-1/2	2-1/8	1-45/64	51211	57183	●
9/32	0.2812	7.14	3-1/2	2-1/8	1-45/64	51118	57184	●
7,2 mm	0.2835		109,0	69,0	55,0	61101	68343	●
7,3 mm	0.2874		109,0	69,0	55,0	61102	68344	●
L	0.2900	7.37	3-1/2	2-1/8	1-45/64	51212	57185	●
7,4 mm	0.2913		109,0	69,0	55,0	61103	68345	●
M	0.2950	7.49	3-3/4	2-3/8	1-29/32	51213	57186	●
7,5 mm	0.2953		109,0	69,0	55,0	61033	68284	●
19/64	0.2969	7.54	3-3/4	2-3/8	1-29/32	51119	57187	●
7,6 mm	0.2992		117,0	75,0	60,0	61104	68346	●
N	0.3020	7.67	3-3/4	2-3/8	1-29/32	51214	57188	●
7,7 mm	0.3031		117,0	75,0	60,0	61105	68347	●
7,8 mm	0.3071		117,0	75,0	60,0	61106	68348	●
7,9 mm	0.3110		117,0	75,0	60,0	61107	68349	●
*5/16	0.3125	7.94	3-3/4	2-3/8	1-29/32	51120	57189	●
8,0 mm	0.3150		117,0	75,0	60,0	61035	68285	●
O	0.3160	8.03	3-3/4	2-3/8	1-29/32	51215	57190	●
8,1 mm	0.3189		117,0	75,0	60,0	61108	68350	●
8,2 mm	0.3228		117,0	75,0	60,0	61109	68351	●
P	0.3230	8.20	3-3/4	2-3/8	1-29/32	51216	57191	●
8,3 mm	0.3268		117,0	75,0	60,0	61110	68352	●
21/64	0.3281	8.33	4	2-1/2	2	51121	57192	●
8,4 mm	0.3307		117,0	75,0	60,0	61111	68353	●
Q	0.3320	8.43	4	2-1/2	2	51217	57193	●
8,5 mm	0.3346		117,0	75,0	60,0	61037	68286	●
8,6 mm	0.3386		125,0	81,0	64,0	61112	68354	●
R	0.3390	8.61	4	2-1/2	2	51218	57194	●

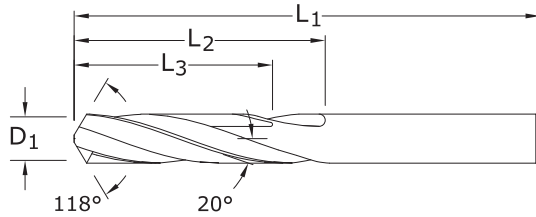
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# 2 Flute Drills • Metric: DIN 338



5xD



## 101

FRACTIONAL & METRIC SERIES

CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	METRIC EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-A (AlTiN)	
8,7 mm	0.3425		125,0	81,0	64,0	61113	68355	●
11/32	0.3438	8.73	4	2-1/2	2	51122	57195	●
8,8 mm	0.3465		125,0	81,0	64,0	61114	68356	●
S	0.3480	8.84	4	2-1/2	2	51219	57196	●
8,9 mm	0.3504		125,0	81,0	64,0	61115	68357	●
9,0 mm	0.3543		125,0	81,0	64,0	61039	68287	●
T	0.3580	9.09	4-1/4	2-3/4	2-13/64	51220	57197	●
9,1 mm	0.3583		125,0	81,0	64,0	61116	68358	●
23/64	0.3594	9.13	4-1/4	2-3/4	2-13/64	51123	57198	●
9,2 mm	0.3622		125,0	81,0	64,0	61117	68359	●
9,3 mm	0.3661		125,0	81,0	64,0	61118	68360	●
U	0.3680	9.35	4-1/4	2-3/4	2-13/64	51221	57199	●
9,4 mm	0.3701		125,0	81,0	64,0	61119	68361	●
9,5 mm	0.3740		125,0	81,0	64,0	61041	68288	●
*3/8	0.3750	9.53	4-1/4	2-3/4	2-13/64	51124	57200	●
V	0.3770	9.58	4-1/4	2-3/4	2-13/64	51222	57201	●
9,6 mm	0.3780		133,0	87,0	69,0	61120	68362	●
9,7 mm	0.3819		133,0	87,0	69,0	61121	68363	●
9,8 mm	0.3858		133,0	87,0	69,0	61122	68364	●
W	0.3860	9.80	4-1/2	2-7/8	2-19/64	51223	57202	●
9,9 mm	0.3898		133,0	87,0	69,0	61123	68365	●
25/64	0.3906	9.92	4-1/2	2-7/8	2-19/64	51125	57203	●
10,0 mm	0.3937		133,0	87,0	69,0	61043	68289	●
X	0.3970	10.08	4-1/2	2-7/8	2-19/64	51224	57204	●
10,2 mm	0.4016		133,0	87,0	69,0	61124	68366	●
Y	0.4040	10.26	4-1/2	2-7/8	2-19/64	51225	57205	●
13/32	0.4062	10.32	4-1/2	2-7/8	2-19/64	51126	57206	●
Z	0.4130	10.49	4-1/2	2-7/8	2-19/64	51226	57207	●
10,5 mm	0.4134		133,0	87,0	69,0	61045	68290	●
27/64	0.4219	10.72	4-1/2	2-7/8	2-19/64	51127	57208	●
11,0 mm	0.4331		142,0	94,0	75,0	61047	68291	●
7/16	0.4375	11.11	4-1/2	2-7/8	2-19/64	51128	57209	●
11,5 mm	0.4528		142,0	94,0	75,0	61049	68292	●
29/64	0.4531	11.51	4-3/4	3	2-13/32	51129	57210	●
15/32	0.4688	11.91	4-3/4	3	2-13/32	51130	57211	●
12,0 mm	0.4724		151,0	101,0	80,0	61051	68293	●
31/64	0.4844	12.30	4-3/4	3	2-13/32	51131	57212	●
1/2	0.5000	12.70	4-3/4	3	2-13/32	51132	57213	●
*Series 101 Set						61175	57351	●

**TOLERANCES (inch)**

D<sub>1</sub> = +.0000/- .0005

**TOLERANCES (mm)**

D<sub>1</sub> = +0,0000/-0,0127

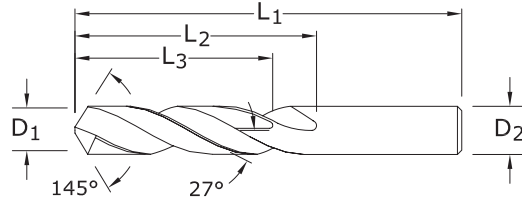
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—Call for Delivery

# Short Length Self Centering Drills • DIN 6539



3XD



## 108M Plus METRIC SERIES

**TOLERANCES (mm)**

**≤3 DIAMETER**

D<sub>1</sub> = +0,000/-0,010

D<sub>2</sub> = h<sub>6</sub>

**>3-6 DIAMETER**

D<sub>1</sub> = +0,000/-0,012

D<sub>2</sub> = h<sub>6</sub>

**>6-10 DIAMETER**

D<sub>1</sub> = +0,000/-0,015

D<sub>2</sub> = h<sub>6</sub>

**>10-18 DIAMETER**

D<sub>1</sub> = +0,000/-0,018

D<sub>2</sub> = h<sub>6</sub>

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

HARDENED STEELS

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

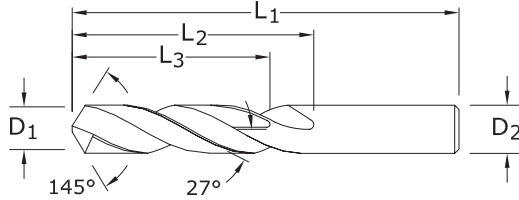
mm				EDP NO.		STOCK
CUTTING DIAMETER D <sub>1</sub> /D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	UNCOATED	Ti-NAMITE-A (AlTiN)	
0,5	20,0	3,0	2,1	62001	68643	●
0,55	21,0	3,5	2,5	62003	68644	●
0,6	21,0	3,5	2,5	62005	68645	●
0,65	22,0	4,0	2,9	62007	68646	●
0,7	23,0	4,5	3,2	62009	68647	●
0,75	23,0	4,5	3,2	62011	68648	●
0,8	24,0	5,0	3,6	62013	68649	●
0,85	24,0	5,0	3,6	62015	68650	●
0,9	25,0	5,5	4,0	62017	68651	●
0,95	25,0	5,5	4,0	62019	68652	●
1,0	26,0	6,0	4,7	62021	68653	●
1,05	26,0	6,0	4,7	62023	68654	●
1,1	28,0	7,0	5,4	62025	68655	●
1,15	28,0	7,0	5,4	62027	68656	●
1,2	30,0	8,0	6,0	62029	68657	●
1,25	30,0	8,0	6,0	62031	68658	●
1,3	30,0	8,0	6,0	62033	68659	●
1,35	32,0	9,0	7,0	62035	68660	●
1,4	32,0	9,0	7,0	62037	68661	●
1,45	32,0	9,0	7,0	62039	68662	●
1,5	32,0	9,0	7,0	62041	68663	●
1,6	34,0	10,0	7,0	62043	68664	●
1,7	34,0	10,0	7,0	62045	68665	●
1,8	36,0	11,0	8,0	62047	68666	●
1,9	36,0	11,0	8,0	62049	68667	●
2,0	38,0	12,0	9,0	62051	68668	●
2,1	38,0	12,0	9,0	62053	68669	●
2,2	40,0	13,0	10,0	62055	68670	●
2,3	40,0	13,0	10,0	62057	68671	●
2,4	43,0	14,0	11,0	62059	68672	●
2,5	43,0	14,0	11,0	62061	68673	●
2,6	43,0	14,0	11,0	62063	68674	●
2,7	46,0	16,0	12,0	62065	68675	●
2,8	46,0	16,0	12,0	62067	68676	●

continued on next page

# Short Length Self Centering Drills • DIN 6539



3xD



## 108M Plus

METRIC SERIES

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- NON-FERROUS
- PLASTICS/COMPOSITES

CUTTING DIAMETER D <sub>1</sub> /D <sub>2</sub>	mm			EDP NO.		STOCK
	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	UNCOATED	Ti-NAMITE-A (AlTiN)	
2,9	46,0	16,0	12,0	62069	68677	●
3,0	46,0	16,0	12,0	62071	68678	●
3,1	49,0	18,0	14,0	62073	68679	●
3,2	49,0	18,0	14,0	62075	68680	●
3,3	49,0	18,0	14,0	62077	68681	●
3,4	52,0	20,0	15,0	62079	68682	●
3,5	52,0	20,0	15,0	62081	68683	●
3,6	52,0	20,0	15,0	62083	68684	●
3,7	52,0	20,0	15,0	62085	68685	●
3,8	55,0	22,0	17,0	62087	68686	●
3,9	55,0	22,0	17,0	62089	68687	●
4,0	55,0	22,0	17,0	62091	68688	●
4,1	55,0	22,0	17,0	62093	68689	●
4,2	55,0	22,0	17,0	62095	68690	●
4,3	58,0	24,0	18,0	62097	68691	●
4,4	58,0	24,0	18,0	62099	68692	●
4,5	58,0	24,0	18,0	62101	68693	●
4,6	58,0	24,0	18,0	62103	68694	●
4,7	58,0	24,0	18,0	62105	68695	●
4,8	62,0	26,0	20,0	62107	68696	●
4,9	62,0	26,0	20,0	62109	68697	●
5,0	62,0	26,0	20,0	62111	68698	●
5,1	62,0	26,0	20,0	62113	68699	●
5,2	62,0	26,0	20,0	62115	68700	●
5,3	62,0	26,0	20,0	62117	68701	●
5,4	66,0	28,0	21,0	62119	68702	●
5,5	66,0	28,0	21,0	62121	68703	●
5,6	66,0	28,0	21,0	62123	68704	●
5,7	66,0	28,0	21,0	62125	68705	●
5,8	66,0	28,0	21,0	62127	68706	●
5,9	66,0	28,0	21,0	62129	68707	●
6,0	66,0	28,0	21,0	62131	68708	●

### TOLERANCES (mm)

≤3 DIAMETER

D<sub>1</sub> = +0,000/-0,010

D<sub>2</sub> = h<sub>6</sub>

>3-6 DIAMETER

D<sub>1</sub> = +0,000/-0,012

D<sub>2</sub> = h<sub>6</sub>

>6-10 DIAMETER

D<sub>1</sub> = +0,000/-0,015

D<sub>2</sub> = h<sub>6</sub>

>10-16 DIAMETER

D<sub>1</sub> = +0,000/-0,018

D<sub>2</sub> = h<sub>6</sub>

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

continued on next page

## Short Length Self Centering Drills • DIN 6539

## 108M Plus

METRIC SERIES

CUTTING DIAMETER D <sub>1</sub> /D <sub>2</sub>	mm			EDP NO.		STOCK	CONTINUED
	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	UNCOATED	Ti-NAMITE-A (AlTiN)		
6,1	70,0	31,0	23,0	62133	68709	●	
6,2	70,0	31,0	23,0	62135	68710	●	
6,3	70,0	31,0	23,0	62137	68711	●	
6,4	70,0	31,0	23,0	62139	68712	●	
6,5	70,0	31,0	23,0	62141	68713	●	
6,8	70,0	31,0	23,0	62142	68603	●	
7,0	74,0	34,0	25,0	62143	68718	●	
7,5	74,0	34,0	25,0	62145	68723	●	
7,8	79,0	37,0	27,0	62146	68604	●	
8,0	79,0	37,0	27,0	62147	68728	●	
8,5	79,0	37,0	27,0	62149	68733	●	
9,0	84,0	40,0	29,0	62151	68738	●	
9,5	84,0	40,0	29,0	62153	68743	●	
9,8	89,0	43,0	31,0	62154	68606	●	
10,0	89,0	43,0	31,0	62155	68748	●	
10,2	89,0	43,0	31,0	62156	68607	●	
10,5	89,0	43,0	31,0	62066	68753	●	
11,0	95,0	47,0	33,0	62157	68758	●	
11,5	95,0	47,0	33,0	62084	68763	●	
11,8	102,0	51,0	35,0	62158	68608	●	
12,0	102,0	51,0	35,0	62159	68768	●	
12,5	102,0	51,0	35,0	62102	68773	●	
13,0	102,0	51,0	35,0	62112	68778	●	
13,8	107,0	54,0	37,0	62164	68609	●	
14,0	107,0	54,0	37,0	62116	68780	●	
14,5	111,0	56,0	38,0	62166	68611	●	
14,8	111,0	56,0	38,0	62167	68612	●	
15,0	111,0	56,0	38,0	62168	68613	●	
15,8	115,0	58,0	38,0	62170	68614	●	
16,0	115,0	58,0	38,0	62171	68616	●	

# 2 Flute Drills

Series	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/64	1/32	1/16	1/8	1/4	3/8	1/2		
P <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	265 (212-318)	RPM	64787	32394	16197	8098	4049	2699	2025	
			Fr	0.00021	0.0004	0.0008	0.0017	0.0033	0.0050	0.0067	
			Feed (ipm)	13.5	13.5	13.5	13.5	13.5	13.5	13.5	
	≤ 300 Bhn or ≤ 32 HRc	125 (100-150)	RPM	30560	15280	7640	3820	1910	1273	955	
			Fr	0.00020	0.0004	0.0008	0.0016	0.0031	0.0047	0.0063	
			Feed (ipm)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
	≤ 425 Bhn or ≤ 45 HRc	85 (68-102)	RPM	20781	10390	5195	2598	1299	866	649	
			Fz	0.00011	0.0002	0.0004	0.0008	0.0017	0.0025	0.0034	
			Feed (ipm)	2.2	2.2	2.2	2.2	2.2	2.2	2.2	
	H <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	230 (184-276)	RPM	56230	28115	14058	7029	3514	2343	1757
				Fz	0.00019	0.0004	0.0007	0.0015	0.0030	0.0045	0.0060
				Feed (ipm)	10.5	10.5	10.5	10.5	10.5	10.5	10.5
≤ 375 Bhn or ≤ 40 HRc		145 (116-174)	RPM	35450	17725	8862	4431	2216	1477	1108	
			Fr	0.00019	0.0004	0.0007	0.0015	0.0030	0.0045	0.0060	
			Feed (ipm)	6.6	6.6	6.6	6.6	6.6	6.6	6.6	
≤ 450 Bhn or ≤ 48 HRc		60 (48-72)	RPM	14669	7334	3667	1834	917	611	458	
			Fr	0.00008	0.0002	0.0003	0.0007	0.0013	0.0020	0.0026	
			Feed (ipm)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
K <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 250 Bhn or ≤ 24 HRc	85 (68-102)	RPM	20781	10390	5195	2598	1299	866	649
				Fr	0.00011	0.0002	0.0004	0.0009	0.0018	0.0027	0.0035
				Feed (ipm)	2.3	2.3	2.3	2.3	2.3	2.3	2.3
	≤ 375 Bhn or ≤ 40 HRc	55 (44-66)	RPM	13446	6723	3362	1681	840	560	420	
			Fr	0.00005	0.0001	0.0002	0.0004	0.0008	0.0012	0.0017	
			Feed (ipm)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	
	≤ 475 Bhn or ≤ 50 HRc	40 (32-48)	RPM	9779	4890	2445	1222	611	407	306	
			Fr	0.00005	0.0001	0.0002	0.0004	0.0008	0.0012	0.0016	
			Feed (ipm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
	M <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	280 (224-336)	RPM	68454	34227	17114	8557	4278	2852	2139
				Fr	0.00026	0.0005	0.0010	0.0020	0.0041	0.0061	0.0082
				Feed (ipm)	17.5	17.5	17.5	17.5	17.5	17.5	17.5
≤ 330 Bhn or ≤ 36 HRc		250 (200-300)	RPM	61120	30560	15280	7640	3820	2547	1910	
			Fr	0.00025	0.0005	0.0010	0.0020	0.0041	0.0061	0.0081	
			Feed (ipm)	15.5	15.5	15.5	15.5	15.5	15.5	15.5	
M <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F 440F		≤ 250 Bhn or ≤ 24 HRc	210 (168-252)	RPM	51341	25670	12835	6418	3209	2139	1604
				Fr	0.00015	0.0003	0.0006	0.0012	0.0024	0.0036	0.0048
				Feed (ipm)	7.7	7.7	7.7	7.7	7.7	7.7	7.7
		≤ 330 Bhn or ≤ 36 HRc	110 (88-132)	RPM	26893	13446	6723	3362	1681	1121	840
				Fr	0.00009	0.0002	0.0004	0.0007	0.0015	0.0022	0.0030
				Feed (ipm)	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	M <b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	65 (52-78)	RPM	15891	7946	3973	1986	993	662	497
				Fr	0.00010	0.0002	0.0005	0.0009	0.0018	0.0025	0.0035
				Feed (ipm)	1.7	1.7	1.7	1.7	1.7	1.7	1.7
		≤ 375 Bhn or ≤ 40 HRc	55 (44-66)	RPM	13446	6723	3362	1681	840	560	420
				Fr	0.00010	0.0002	0.0004	0.0008	0.0015	0.0023	0.0031
				Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	1.3

continued on next page

# FRACTIONAL 2 Flute Drills

Series 101 Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/64	1/32	1/16	1/8	1/4	3/8	1/2		
<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy</b>	≤ 220 Bhn or ≤ 19 HRc	40 (32-48)	RPM	9779	4890	2445	1222	611	407	306	
			Fr	0.00010	0.0002	0.0004	0.0008	0.0016	0.0025	0.0033	
			Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
	≤ 320 Bhn or ≤ 34 HRc	25 (20-30)	RPM	6112	3056	1528	764	382	255	191	
			Fr	0.00010	0.0002	0.0004	0.0008	0.0016	0.0024	0.0031	
			Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
	≤ 425 Bhn or ≤ 45 HRc	20 (16-24)	RPM	4890	2445	1222	611	306	204	153	
			Fr	0.00004	0.0001	0.0002	0.0003	0.0007	0.0010	0.0013	
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
	<b>TITANIUM ALLOYS (DIFFICULT) Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V</b>	≤ 275 Bhn or ≤ 28 HRc	85 (68-102)	RPM	20781	10390	5195	2598	1299	866	649
				Fr	0.00020	0.0004	0.0008	0.0016	0.0032	0.0049	0.0065
				Feed (ipm)	4.2	4.2	4.2	4.2	4.2	4.2	4.2
≤ 350 Bhn or ≤ 38 HRc		65 (52-78)	RPM	15891	7946	3973	1986	993	662	497	
			Fr	0.00011	0.0002	0.0004	0.0009	0.0017	0.0026	0.0034	
			Feed (ipm)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	
≤ 440 Bhn or ≤ 47 HRc		55 (44-66)	RPM	13446	6723	3362	1681	840	560	420	
			Fr	0.00010	0.0002	0.0004	0.0008	0.0015	0.0023	0.0031	
			Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	1.3	
<b>ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075</b>		≤ 80 Bhn or ≤ 47 HRb	540 (432-648)	RPM	132019	66010	33005	16502	8251	5501	4126
				Fr	0.00030	0.0006	0.0012	0.0024	0.0048	0.0073	0.0097
				Feed (ipm)	40.0	40.0	40.0	40.0	40.0	40.0	40.0
	≤ 150 Bhn or ≤ 7 HRc	455 (364-546)	RPM	111238	55619	27810	13905	6952	4635	3476	
			Fr	0.00031	0.0006	0.0013	0.0025	0.0050	0.0076	0.0101	
			Feed (ipm)	35.0	35.0	35.0	35.0	35.0	35.0	35.0	
	<b>COPPER ALLOYS Alum Bronze, C110, Muntz Brass</b>	≤ 140 Bhn or ≤ 3 HRc	190 (152-228)	RPM	46451	23226	11613	5806	2903	1935	1452
				Fr	0.00015	0.0003	0.0006	0.0012	0.0024	0.0036	0.0048
				Feed (ipm)	7.0	7.0	7.0	7.0	7.0	7.0	7.0
		≤ 200 Bhn or ≤ 23 HRc	175 (140-210)	RPM	42784	21392	10696	5348	2674	1783	1337
				Fr	0.00015	0.0003	0.0006	0.0012	0.0024	0.0036	0.0048
				Feed (ipm)	6.4	6.4	6.4	6.4	6.4	6.4	6.4
<b>PLASTICS Polycarbonate, PVC</b>	500 (400-600)	RPM	122240	61120	30560	15280	7640	5093	3820		
		Fr	0.00031	0.0006	0.0012	0.0025	0.0050	0.0075	0.0099		
			Feed (ipm)	38.0	38.0	38.0	38.0	38.0	38.0	38.0	

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fr \times rpm$   
 reduce speed and feed 30 percent when using uncoated drills  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# 2 Flute Drills

## Short Length Self Centering Drills • DIN 6539

Series 101M, 108M Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
			1	3	6	8	10	12	16		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	81 (65-97)	RPM	25690	8563	4282	3211	2569	2141	1606	
			Fr	0.014	0.041	0.082	0.109	0.136	0.163	0.218	
			Feed (mm/min)	350	350	350	350	350	350	350	
	≤ 300 Bhn or ≤ 32 HRc	38 (30-46)	RPM	12118	4039	2020	1515	1212	1010	757	
			Fr	0.012	0.036	0.072	0.096	0.120	0.144	0.191	
			Feed (mm/min)	145	145	145	145	145	145	145	
	≤ 425 Bhn or ≤ 45 HRc	26 (21-31)	RPM	8240	2747	1373	1030	824	687	515	
			Fz	0.007	0.020	0.040	0.053	0.067	0.080	0.107	
			Feed (mm/min)	55	55	55	55	55	55	55	
	<b>H</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	70 (56-84)	RPM	22297	7432	3716	2787	2230	1858	1394
				Fz	0.012	0.036	0.073	0.097	0.121	0.145	0.194
				Feed (mm/min)	270	270	270	270	270	270	270
≤ 375 Bhn or ≤ 40 HRc		44 (35-53)	RPM	14057	4686	2343	1757	1406	1171	879	
			Fr	0.012	0.036	0.073	0.097	0.121	0.145	0.194	
			Feed (mm/min)	170	170	170	170	170	170	170	
≤ 450 Bhn or ≤ 48 HRc		18 (15-22)	RPM	5816	1939	969	727	582	485	364	
			Fr	0.005	0.015	0.030	0.040	0.050	0.060	0.080	
			Feed (mm/min)	29	29	29	29	29	29	29	
<b>K</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 250 Bhn or ≤ 24 HRc	26 (21-31)	RPM	8240	2747	1373	1030	824	687	515
				Fr	0.007	0.020	0.040	0.053	0.067	0.080	0.107
				Feed (mm/min)	55	55	55	55	55	55	55
	≤ 375 Bhn or ≤ 40 HRc	17 (13-20)	RPM	5332	1777	889	666	533	444	333	
			Fr	0.003	0.010	0.020	0.027	0.034	0.041	0.054	
			Feed (mm/min)	18	18	18	18	18	18	18	
	≤ 475 Bhn or ≤ 50 HRc	12 (10-15)	RPM	3878	1293	646	485	388	323	242	
			Fr	0.003	0.009	0.019	0.025	0.031	0.037	0.050	
			Feed (mm/min)	12	12	12	12	12	12	12	
	<b>M</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	85 (68-102)	RPM	27144	9048	4524	3393	2714	2262	1696
				Fr	0.016	0.049	0.097	0.130	0.162	0.195	0.259
				Feed (mm/min)	440	440	440	440	440	440	440
≤ 330 Bhn or ≤ 36 HRc		76 (61-91)	RPM	24235	8078	4039	3029	2424	2020	1515	
			Fr	0.017	0.050	0.099	0.132	0.165	0.198	0.264	
			Feed (mm/min)	400	400	400	400	400	400	400	
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F 440F	≤ 250 Bhn or ≤ 24 HRc	64 (51-77)	RPM	20358	6786	3393	2545	2036	1696	1272	
			Fr	0.010	0.029	0.059	0.079	0.098	0.118	0.157	
			Feed (mm/min)	200	200	200	200	200	200	200	
	≤ 330 Bhn or ≤ 36 HRc	34 (27-40)	RPM	10664	3555	1777	1333	1066	889	666	
			Fr	0.006	0.017	0.034	0.045	0.056	0.068	0.090	
			Feed (mm/min)	60	60	60	60	60	60	60	
	<b>M</b>  <b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	20 (16-24)	RPM	6301	2100	1050	788	630	525	394
				Fr	0.007	0.021	0.043	0.057	0.071	0.086	0.114
				Feed (mm/min)	45	45	45	45	45	45	45
		≤ 375 Bhn or ≤ 40 HRc	17 (13-20)	RPM	5332	1777	889	666	533	444	333
				Fr	0.007	0.020	0.039	0.053	0.066	0.079	0.105
				Feed (mm/min)	35	35	35	35	35	35	35

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# 2 Flute Drills

## Short Length Self Centering Drills • DIN 6539

Series 101M, 108M Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
			1	3	6	8	10	12	16		
<b>S</b>  <b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy</b>	≤ 220 Bhn or ≤ 19 HRc	12  (10-15)	RPM	3878	1293	646	485	388	323	242	
			Fr	0.006	0.019	0.039	0.052	0.064	0.077	0.103	
			Feed (mm/min)	25	25	25	25	25	25	25	
	≤ 320 Bhn or ≤ 34 HRc	8  (6-9)	RPM	2424	808	404	303	242	202	151	
			Fr	0.006	0.019	0.037	0.050	0.062	0.074	0.099	
			Feed (mm/min)	15	15	15	15	15	15	15	
	≤ 425 Bhn or ≤ 45 HRc	6  (5-7)	RPM	1939	646	323	242	194	162	121	
			Fr	0.005	0.015	0.031	0.041	0.052	0.062	0.083	
			Feed (mm/min)	10	10	10	10	10	10	10	
<b>S</b>  <b>TITANIUM ALLOYS (DIFFICULT) Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V</b>	≤ 275 Bhn or ≤ 28 HRc	26  (21-31)	RPM	8240	2747	1373	1030	824	687	515	
			Fr	0.013	0.040	0.080	0.107	0.133	0.160	0.214	
			Feed (mm/min)	110	110	110	110	110	110	110	
	≤ 350 Bhn or ≤ 38 HRc	20  (16-24)	RPM	6301	2100	1050	788	630	525	394	
			Fr	0.007	0.021	0.043	0.057	0.071	0.086	0.114	
			Feed (mm/min)	45	45	45	45	45	45	45	
	≤ 440 Bhn or ≤ 47 HRc	17  (13-20)	RPM	5332	1777	889	666	533	444	333	
			Fr	0.007	0.020	0.039	0.053	0.066	0.079	0.105	
			Feed (mm/min)	35	35	35	35	35	35	35	
<b>N</b>  <b>ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075</b>	≤ 80 Bhn or ≤ 47 HRb	165  (132-198)	RPM	52348	17449	8725	6544	5235	4362	3272	
			Fr	0.020	0.060	0.120	0.160	0.200	0.240	0.319	
			Feed (mm/min)	1045	1045	1045	1045	1045	1045	1045	
	≤ 150 Bhn or ≤ 7 HRc	139  (111-166)	RPM	44108	14703	7351	5514	4411	3676	2757	
			Fr	0.020	0.060	0.120	0.160	0.200	0.239	0.319	
			Feed (mm/min)	880	880	880	880	880	880	880	
	<b>N</b>  <b>COPPER ALLOYS Alum Bronze, C110, Muntz Brass</b>	≤ 140 Bhn or ≤ 3 HRc	58  (46-69)	RPM	18419	6140	3070	2302	1842	1535	1151
				Fr	0.010	0.030	0.060	0.080	0.100	0.121	0.161
				Feed (mm/min)	185	185	185	185	185	185	185
≤ 200 Bhn or ≤ 23 HRc		53  (43-64)	RPM	16965	5655	2827	2121	1696	1414	1060	
			Fr	0.010	0.030	0.060	0.080	0.100	0.120	0.160	
			Feed (mm/min)	170	170	170	170	170	170	170	
<b>N</b>  <b>PLASTICS Polycarbonate, PVC</b>	152  (122-183)	RPM	48471	16157	8078	6059	4847	4039	3029		
		Fr	0.020	0.060	0.120	0.160	0.200	0.240	0.320		
		Feed (mm/min)	970	970	970	970	970	970	970		

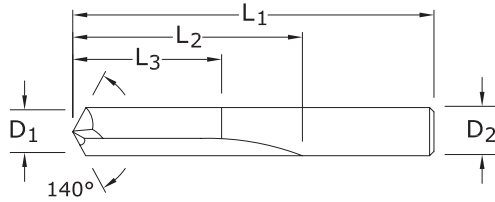
Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fr \times rpm$   
 reduce speed and feed 30 percent when using uncoated drills  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstoool.com](http://www.kyocera-sgstoool.com))



# Straight Flute Drills • Metric: DIN 6539



3xD



## 106

FRACTIONAL & METRIC SERIES

CUTTING DIAMETER D <sub>1</sub> /D <sub>2</sub>	DECIMAL EQUIV.	METRIC EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-A (AlTiN)	
1,0 mm	0.0394		26,0	6,0	4,5	66001	66002	●
#60	0.0400	1.02	1-1/2	1/2	13/32	56060	56269	●
#59	0.0410	1.04	1-1/2	1/2	13/32	56059	56268	●
#58	0.0420	1.07	1-1/2	1/2	13/32	56058	56267	●
#57	0.0430	1.09	1-1/2	1/2	13/32	56057	56266	●
#56	0.0465	1.18	1-1/2	1/2	13/32	56056	56265	●
3/64	0.0469	1.19	1-1/2	1/2	13/32	56103	56135	●
#55	0.0520	1.32	1-1/2	1/2	13/32	56055	56264	●
#54	0.0550	1.40	1-1/2	1/2	13/32	56054	56263	●
1,5 mm	0.0591		32,0	9,0	7,0	66003	66004	●
#53	0.0595	1.51	1-1/2	1/2	13/32	56053	56262	●
1/16	0.0625	1.59	1-1/2	5/8	1/2	56104	56136	●
#52	0.0635	1.61	1-11/16	11/16	35/64	56052	56261	●
#51	0.0670	1.70	1-11/16	11/16	35/64	56051	56260	●
#50	0.0700	1.78	1-11/16	11/16	35/64	56050	56259	●
#49	0.0730	1.85	1-11/16	11/16	35/64	56049	56258	●
#48	0.0760	1.93	1-11/16	11/16	35/64	56048	56257	●
5/64	0.0781	1.98	1-11/16	11/16	35/64	56105	56137	●
#47	0.0785	1.99	1-3/4	3/4	39/64	56047	56256	●
2,0 mm	0.0787		38,0	12,0	9,0	66005	66006	●
#46	0.0810	2.06	1-3/4	3/4	39/64	56046	56255	●
#45	0.0820	2.08	1-3/4	3/4	39/64	56045	56254	●
#44	0.0860	2.18	1-3/4	3/4	39/64	56044	56253	●
#43	0.0890	2.26	1-3/4	3/4	39/64	56043	56252	●
#42	0.0935	2.37	1-3/4	3/4	39/64	56042	56251	●
3/32	0.0938	2.38	1-3/4	3/4	39/64	56106	56138	●
#41	0.0960	2.44	1-13/16	13/16	21/32	56041	56250	●
#40	0.0980	2.49	1-13/16	13/16	21/32	56040	56249	●
2,5 mm	0.0984		43,0	14,0	11,0	66007	66008	●
#39	0.0995	2.53	1-13/16	13/16	21/32	56039	56248	●
#38	0.1015	2.58	1-13/16	13/16	21/32	56038	56247	●
#37	0.1040	2.64	1-13/16	13/16	21/32	56037	56246	●
#36	0.1065	2.71	1-13/16	13/16	21/32	56036	56245	●
7/64	0.1094	2.78	1-13/16	13/16	21/32	56107	56139	●
#35	0.1100	2.79	1-7/8	7/8	45/64	56035	56244	●
#34	0.1110	2.82	1-7/8	7/8	45/64	56034	56243	●

**TOLERANCES (inch)**

D<sub>1</sub> = +.0000/- .0005  
D<sub>2</sub> = h6

**TOLERANCES (mm)**

D<sub>1</sub> = +0,0000/-0,0127  
D<sub>2</sub> = h6

STEELS  
CAST IRON  
HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

continued on next page

## Straight Flute Drills • Metric: DIN 6539

106

FRACTIONAL &amp; METRIC SERIES

CUTTING DIAMETER D <sub>1</sub> / D <sub>2</sub>	DECIMAL EQUIV.	METRIC EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-A (AITiN)	
#33	0.1130	2.87	1-7/8	7/8	45/64	56033	56242	●
#32	0.1160	2.95	1-7/8	7/8	45/64	56032	56241	●
3,0 mm	0.1181		46,0	16,0	12,0	66009	66010	●
#31	0.1200	3.05	1-7/8	7/8	45/64	56031	56240	●
1/8	0.1250	3.18	1-7/8	7/8	45/64	56108	56140	●
#30	0.1285	3.26	1-15/16	15/16	3/4	56030	56239	●
#29	0.1360	3.45	1-15/16	15/16	3/4	56029	56238	●
3,5 mm	0.1378		52,0	20,0	15,0	66011	66012	●
#28	0.1405	3.57	1-15/16	15/16	3/4	56028	56237	●
9/64	0.1406	3.57	1-15/16	15/16	3/4	56109	56141	●
#27	0.1440	3.66	2-1/16	1	51/64	56027	56236	●
#26	0.1470	3.73	2-1/16	1	51/64	56026	56235	●
#25	0.1495	3.80	2-1/16	1	51/64	56025	56234	●
#24	0.1520	3.86	2-1/16	1	51/64	56024	56233	●
#23	0.1540	3.91	2-1/16	1	51/64	56023	56232	●
5/32	0.1562	3.97	2-1/16	1	51/64	56110	56142	●
#22	0.1570	3.99	2-1/8	1-1/16	55/64	56022	56231	●
4,0 mm	0.1575		55,0	22,0	17,0	66013	66014	●
#21	0.1590	4.04	2-1/8	1-1/16	55/64	56021	56230	●
#20	0.1610	4.09	2-1/8	1-1/16	55/64	56020	56229	●
#19	0.1660	4.22	2-1/8	1-1/16	55/64	56019	56228	●
#18	0.1695	4.31	2-1/8	1-1/16	55/64	56018	56227	●
11/64	0.1719	4.37	2-1/8	1-1/16	55/64	56111	56143	●
#17	0.1730	4.39	2-3/16	1-1/8	29/32	56017	56226	●
#16	0.1770	4.50	2-3/16	1-1/8	29/32	56016	56225	●
4,5 mm	0.1772		58,0	24,0	18,0	66015	66016	●
#15	0.1800	4.57	2-3/16	1-1/8	29/32	56015	56224	●
#14	0.1820	4.62	2-3/16	1-1/8	29/32	56014	56223	●
#13	0.1850	4.70	2-3/16	1-1/8	29/32	56013	56222	●
3/16	0.1875	4.76	2-3/16	1-1/8	29/32	56112	56144	●
#12	0.1890	4.80	2-3/16	1-1/8	29/32	56012	56221	●
#11	0.1910	4.85	2-3/16	1-1/8	29/32	56011	56220	●
#10	0.1935	4.91	2-3/16	1-1/8	29/32	56010	56219	●
#9	0.1960	4.98	2-1/4	1-3/16	61/64	56009	56218	●
5,0 mm	0.1969		62,0	26,0	20,0	66017	66018	●
#8	0.1990	5.05	2-1/4	1-3/16	61/64	56008	56217	●
#7	0.2010	5.11	2-1/4	1-3/16	61/64	56007	56216	●
13/64	0.2031	5.16	2-1/4	1-3/16	61/64	56113	56145	●
#6	0.2040	5.18	2-3/8	1-1/4	1	56006	56215	●
#5	0.2055	5.22	2-3/8	1-1/4	1	56005	56214	●
#4	0.2090	5.31	2-3/8	1-1/4	1	56004	56213	●
#3	0.2130	5.41	2-3/8	1-1/4	1	56003	56212	●
5,5 mm	0.2165		66,0	28,0	21,0	66019	66020	●
7/32	0.2188	5.56	2-3/8	1-1/4	1	56114	56146	●
#2	0.2210	5.61	2-7/16	1-5/16	1-3/64	56002	56211	●
#1	0.2280	5.79	2-7/16	1-5/16	1-3/64	56001	56210	●

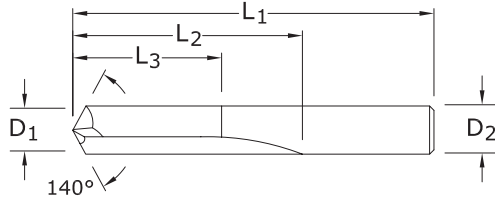
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# Straight Flute Drills • Metric: DIN 6539



3xD



## 106

FRACTIONAL & METRIC SERIES

CUTTING DIAMETER D <sub>1</sub> /D <sub>2</sub>	DECIMAL EQUIV.	METRIC EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-A (AlTiN)	
15/64	0.2344	5.95	2-7/16	1-5/16	1-3/64	56115	56147	●
6,0 mm	0.2362		66,0	28,0	21,0	66021	66045	●
1/4	0.2500	6.35	2-1/2	1-3/8	1-7/64	56116	56148	●
6,5 mm	0.2559		70,0	31,0	23,0	66022	66046	●
17/64	0.2656	6.75	2-5/8	1-7/16	1-7/64	56117	56149	●
7,0 mm	0.2756		74,0	34,0	25,0	66023	66024	●
9/32	0.2812	7.14	2-11/16	1-1/2	1-13/64	56118	56150	●
7,5 mm	0.2953		74,0	34,0	25,0	66025	66026	●
19/64	0.2969	7.54	2-3/4	1-9/16	1-1/4	56119	56151	●
5/16	0.3125	7.94	2-13/16	1-5/8	1-19/64	56120	56152	●
8,0 mm	0.3150		79,0	37,0	27,0	66027	66028	●
21/64	0.3281	8.33	2-15/16	1-11/16	1-23/64	56121	56153	●
8,5 mm	0.3346		79,0	37,0	27,0	66029	66030	●
11/32	0.3438	8.73	3	1-11/16	1-23/64	56122	56154	●
9,0 mm	0.3543		84,0	40,0	29,0	66031	66032	●
23/64	0.3594	9.13	3-1/16	1-3/4	1-13/32	56123	56155	●
9,5 mm	0.3740		84,0	40,0	29,0	66033	66034	●
3/8	0.3750	9.53	3-1/8	1-13/16	1-29/64	56124	56156	●
25/64	0.3906	9.92	3-1/4	1-7/8	1-1/2	56125	56157	●
10,0 mm	0.3937		89,0	43,0	31,0	66035	66036	●
13/32	0.4062	10.32	3-5/16	1-15/16	1-35/64	56126	56158	●
10,5 mm	0.4134		95,0	43,0	31,0	66037	66038	●
27/64	0.4219	10.72	3-3/8	2	1-39/64	56127	56159	●
11,0 mm	0.4331		95,0	43,0	31,0	66039	66040	●
7/16	0.4375	11.11	3-7/16	2-1/16	1-21/32	56128	56160	●
11,5 mm	0.4528		95,0	43,0	31,0	66041	66042	●
29/64	0.4531	11.51	3-9/16	2-1/8	1-45/64	56129	56161	●
15/32	0.4688	11.91	3-5/8	2-1/8	1-45/64	56130	56162	●
12,0 mm	0.4724		102,0	51,0	35,0	66043	66044	●
31/64	0.4844	12.30	3-11/16	2-3/16	1-3/4	56131	56163	●
1/2	0.5000	12.70	3-3/4	2-1/4	1-51/64	56132	56164	●

**TOLERANCES (inch)**

D<sub>1</sub> = +.0000/- .0005  
D<sub>2</sub> = h6

**TOLERANCES (mm)**

D<sub>1</sub> = +0,0000/-0,0127  
D<sub>2</sub> = h6

STEELS

CAST IRON

HARDENED STEELS

● U.S. Stock Standard  
■ NOT STOCKED—  
Call for Delivery

FRACTIONAL & METRIC  
**Straight Flute Drills**

Series 106 Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)						
			1/16	1/8	3/16	1/4	3/8	1/2	
<b>P</b> <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 500 Bhn or ≤ 52 HRc	60 (48-72)	RPM	3667	1834	1222	917	611	458
			Fz	0.0004	0.0007	0.0011	0.0014	0.0021	0.0028
			Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3
	≤ 615 Bhn or ≤ 58 HRc	50 (40-60)	RPM	3056	1528	1019	764	509	382
			Fr	0.0004	0.0008	0.0012	0.0016	0.0024	0.0031
			Feed (ipm)	1.2	1.2	1.2	1.2	1.2	1.2
<b>H</b> <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 500 Bhn or ≤ 52 HRc	60 (48-72)	RPM	3667	1834	1222	917	611	458
			Fr	0.0004	0.0007	0.0011	0.0014	0.0021	0.0028
			Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3
	≤ 615 Bhn or ≤ 58 HRc	50 (40-60)	RPM	3056	1528	1019	764	509	382
			Fr	0.0004	0.0008	0.0012	0.0016	0.0024	0.0031
			Feed (ipm)	1.2	1.2	1.2	1.2	1.2	1.2
<b>K</b> <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	250 (200-300)	RPM	15280	7640	5093	3820	2547	1910
			Fr	0.0010	0.0020	0.0030	0.0041	0.0061	0.0081
			Feed (ipm)	15.5	15.5	15.5	15.5	15.5	15.5
	≤ 330 Bhn or ≤ 36 HRc	195 (156-234)	RPM	11918	5959	3973	2980	1986	1490
			Fr	0.0010	0.0020	0.0030	0.0040	0.0060	0.0081
			Feed (ipm)	12.0	12.0	12.0	12.0	12.0	12.0

Bhn (Brinell)    HRc (Rockwell C)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fr \times rpm$   
 reduce speed and feed 30 percent when using uncoated drills  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

Series 106M Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)						
			1	3	6	8	10	12	
<b>P</b> <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 500 Bhn or ≤ 52 HRc	18 (15-22)	RPM	5816	1939	969	727	582	485
			Fz	0.006	0.018	0.035	0.047	0.058	0.070
			Feed (mm/min)	34	34	34	34	34	34
	≤ 615 Bhn or ≤ 58 HRc	15 (12-18)	RPM	4847	1616	808	606	485	404
			Fr	0.006	0.017	0.033	0.045	0.056	0.067
			Feed (mm/min)	27	27	27	27	27	27
<b>H</b> <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 500 Bhn or ≤ 52 HRc	18 (15-22)	RPM	5816	1939	969	727	582	485
			Fr	0.006	0.018	0.035	0.047	0.058	0.070
			Feed (mm/min)	34	34	34	34	34	34
	≤ 615 Bhn or ≤ 58 HRc	15 (12-18)	RPM	4847	1616	808	606	485	404
			Fr	0.006	0.017	0.033	0.045	0.056	0.067
			Feed (mm/min)	27	27	27	27	27	27
<b>K</b> <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	76 (61-91)	RPM	24235	8078	4039	3029	2424	2020
			Fr	0.016	0.048	0.096	0.128	0.160	0.192
			Feed (mm/min)	395	395	395	395	395	395
	≤ 330 Bhn or ≤ 36 HRc	59 (48-71)	RPM	18904	6301	3151	2363	1890	1575
			Fr	0.016	0.048	0.096	0.128	0.160	0.192
			Feed (mm/min)	305	305	305	305	305	305

Bhn (Brinell)    HRc (Rockwell C)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fr \times rpm$   
 reduce speed and feed 30 percent when using uncoated drills  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# 3 Flute Drills • Metric: DIN 6539



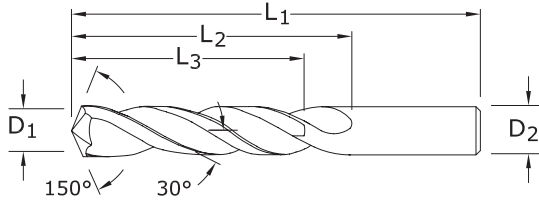
3xD  
(mm)

5xD  
(inch)



103

FRACTIONAL & METRIC SERIES



CUTTING DIAMETER D <sub>1</sub> /D <sub>2</sub>	DECIMAL EQUIV.	METRIC EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-A (AlTiN)	
#36	0.1065	2.71	2-1/4	1-1/4	1	53036	58011	●
7/64	0.1094	2.78	2-1/4	1-1/4	1	53107	58012	●
#35	0.1100	2.79	2-1/4	1-1/4	1	53035	58013	●
#34	0.1110	2.82	2-1/4	1-1/4	1	53034	58014	●
#33	0.1130	2.87	2-1/4	1-1/4	1	53033	58015	●
#32	0.1160	2.95	2-1/4	1-1/4	1	53032	58016	●
3,0 mm	0.1181		46,0	16,0	12,0	63000	68965	●
#31	0.1200	3.05	2-1/4	1-1/4	1	53031	58017	●
3,1 mm	0.1220		49,0	18,0	14,0	63044	68966	●
1/8	0.1250	3.18	2-1/4	1-1/4	1	53108	58018	●
3,2 mm	0.1260		49,0	18,0	14,0	63045	68967	●
#30	0.1285	3.26	2-1/4	1-1/4	1	53030	58019	●
3,3 mm	0.1299		49,0	18,0	14,0	63001	68968	●
3,4 mm	0.1339		52,0	20,0	15,0	63046	68969	●
#29	0.1360	3.45	2-1/2	1-3/8	1-7/64	53029	58020	●
3,5 mm	0.1378		52,0	20,0	15,0	63002	68970	●
#28	0.1405	3.57	2-1/2	1-3/8	1-7/64	53028	58021	●
9/64	0.1406	3.57	2-1/2	1-3/8	1-7/64	53109	58022	●
3,6 mm	0.1417		52,0	20,0	15,0	63047	68971	●
#27	0.1440	3.66	2-1/2	1-3/8	1-7/64	53027	58023	●
3,7 mm	0.1457		52,0	20,0	15,0	63003	68972	●
#26	0.1470	3.73	2-1/2	1-3/8	1-7/64	53026	58024	●
#25	0.1495	3.80	2-1/2	1-3/8	1-7/64	53025	58025	●
3,8 mm	0.1496		55,0	22,0	17,0	63048	68973	●
#24	0.1520	3.86	2-1/2	1-3/8	1-7/64	53024	58026	●
3,9 mm	0.1535		55,0	22,0	17,0	63049	68974	●
#23	0.1540	3.91	2-1/2	1-3/8	1-7/64	53023	58027	●
5/32	0.1562	3.97	2-1/2	1-3/8	1-7/64	53110	58028	●
#22	0.1570	3.99	2-1/2	1-3/8	1-7/64	53022	58029	●
4,0 mm	0.1575		55,0	22,0	17,0	63004	68975	●
#21	0.1590	4.04	2-1/2	1-3/8	1-7/64	53021	58030	●
#20	0.1610	4.09	2-1/2	1-3/8	1-7/64	53020	58031	●
4,1 mm	0.1614		55,0	22,0	17,0	63050	68976	●
4,2 mm	0.1654		55,0	22,0	17,0	63005	68977	●
#19	0.1660	4.22	2-3/4	1-5/8	1-19/64	53019	58032	●
4,3 mm	0.1693		58,0	24,0	18,0	63051	68978	●
#18	0.1695	4.31	2-3/4	1-5/8	1-19/64	53018	58033	●
11/64	0.1719	4.37	2-3/4	1-5/8	1-19/64	53111	58034	●
#17	0.1730	4.39	2-3/4	1-5/8	1-19/64	53017	58035	●
4,4 mm	0.1732		58,0	24,0	18,0	63052	68979	●

**TOLERANCES (inch)**

D<sub>1</sub> = +.0000/-0.0005  
D<sub>2</sub> = h6

**TOLERANCES (mm)**

D<sub>1</sub> = +0,0000/-0,0127  
D<sub>2</sub> = h6

- STEELS
- CAST IRON
- HARDENED STEELS
- NON-FERROUS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

continued on next page

## 3 Flute Drills • Metric: DIN 6539

103

FRACTIONAL &amp; METRIC SERIES

CUTTING DIAMETER D <sub>1</sub> /D <sub>2</sub>	DECIMAL EQUIV.	METRIC EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-A (AITiN)	
#16	0.1770	4.50	2-3/4	1-5/8	1-19/64	53016	58036	●
4,5 mm	0.1772		58,0	24,0	18,0	63006	68980	●
#15	0.1800	4.57	2-3/4	1-5/18	1-19/64	53015	58037	●
4,6 mm	0.1811		58,0	24,0	18,0	63053	68981	●
#14	0.1820	4.62	2-3/4	1-5/8	1-19/64	53014	58038	●
#13	0.1850	4.70	2-3/4	1-5/8	1-19/64	53013	58039	●
4,7 mm	0.1850		62,0	24,0	18,0	63054	68982	●
3/16	0.1875	4.76	2-3/4	1-5/8	1-19/64	53112	58040	●
#12	0.1890	4.80	2-3/4	1-5/8	1-19/64	53012	58041	●
4,8 mm	0.1890		62,0	26,0	20,0	63055	68983	●
#11	0.1910	4.85	2-3/4	1-5/8	1-19/64	53011	58042	●
4,9 mm	0.1929		62,0	26,0	20,0	63056	68984	●
#10	0.1935	4.91	2-3/4	1-5/8	1-19/64	53010	58043	●
#9	0.1960	4.98	3	1-3/4	1-13/32	53009	58044	●
5,0 mm	0.1969		62,0	26,0	20,0	63007	68985	●
#8	0.1990	5.05	3	1-3/4	1-13/32	53008	58045	●
5,1 mm	0.2008		62,0	26,0	20,0	63057	68986	●
#7	0.2010	5.11	3	1-3/4	1-13/32	53007	58046	●
13/64	0.2031	5.16	3	1-3/4	1-13/32	53113	58047	●
#6	0.2040	5.18	3	1-3/4	1-13/32	53006	58048	●
5,2 mm	0.2047		62,0	26,0	20,0	63008	68987	●
#5	0.2055	5.22	3	1-3/4	1-13/32	53005	58049	●
5,3 mm	0.2087		62,0	26,0	20,0	63058	68988	●
#4	0.2090	5.31	3	1-3/4	1-13/32	53004	58050	●
5,4 mm	0.2126		66,0	28,0	21,0	63059	68989	●
#3	0.2130	5.41	3	1-3/4	1-13/32	53003	58051	●
5,5 mm	0.2165		66,0	28,0	21,0	63009	68990	●
7/32	0.2188	5.56	3	1-3/4	1-13/32	53114	58052	●
5,6 mm	0.2205		66,0	28,0	21,0	63060	68991	●
#2	0.2210	5.61	3	1-3/4	1-13/32	53002	58053	●
5,7 mm	0.2244		66,0	28,0	21,0	63061	68992	●
#1	0.2280	5.79	3	1-3/4	1-13/32	53001	58054	●
5,8 mm	0.2283		66,0	28,0	21,0	63062	68993	●
5,9 mm	0.2323		66,0	28,0	21,0	63063	68994	●
A	0.2340	5.94	3-1/4	2	1-39/64	53201	58055	●
15/64	0.2344	5.95	3-1/4	2	1-39/64	53115	58056	●
6,0 mm	0.2362		66,0	28,0	21,0	63010	68995	●
B	0.2380	6.05	3-1/4	2	1-39/64	53202	58057	●
6,1 mm	0.2402		70,0	31,0	23,0	63064	68996	●
C	0.2420	6.15	3-1/4	2	1-39/64	53203	58058	●
6,2 mm	0.2441		70,0	31,0	23,0	63011	68997	●
D	0.2460	6.25	3-1/4	2	1-39/64	53204	58059	●
6,3 mm	0.2480		70,0	31,0	23,0	63065	68998	●
1/4	0.2500	6.35	3-1/4	2	1-39/64	53116	58061	●
6,4 mm	0.2520		70,0	31,0	23,0	63066	68999	●
6,5 mm	0.2559		70,0	31,0	23,0	63012	69000	●
F	0.2570	6.53	3-1/4	2	1-39/64	53206	58062	●
6,6 mm	0.2598		70,0	31,0	23,0	63067	69001	●
G	0.2610	6.63	3-1/2	2-1/8	1-45/64	53207	58063	●
6,7 mm	0.2638		70,0	31,0	23,0	63068	69002	●
17/64	0.2656	6.75	3-1/2	2-1/8	1-45/64	53117	58064	●
H	0.2660	6.76	3-1/2	2-1/8	1-45/64	53208	58065	●

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# 3 Flute Drills • Metric: DIN 6539



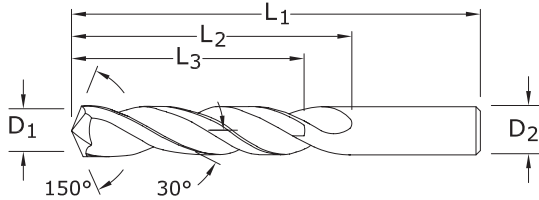
3xD  
(mm)

5xD  
(inch)



## 103

FRACTIONAL & METRIC SERIES



CUTTING DIAMETER D <sub>1</sub> /D <sub>2</sub>	DECIMAL EQUIV.	METRIC EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-A (AlTiN)	
6,8 mm	0.2677		74,0	34,0	25,0	63013	69003	●
6,9 mm	0.2717		74,0	34,0	25,0	63069	69004	●
I	0.2720	6.91	3-1/2	2-1/8	1-45/64	53209	58066	●
7,0 mm	0.2756		74,0	34,0	25,0	63014	69005	●
J	0.2770	7.04	3-1/2	2-1/8	1-45/64	53210	58067	●
7,1 mm	0.2795		74,0	34,0	25,0	63070	69006	●
K	0.2810	7.14	3-1/2	2-1/8	1-45/64	53211	58068	●
9/32	0.2812	7.14	3-1/2	2-1/8	1-45/64	53118	58069	●
7,2 mm	0.2835		74,0	34,0	25,0	63015	69007	●
7,3 mm	0.2874		74,0	34,0	25,0	63071	69008	●
L	0.2900	7.37	3-1/2	2-1/8	1-45/64	53212	58070	●
7,4 mm	0.2913		74,0	34,0	25,0	63072	69009	●
M	0.2950	7.49	3-3/4	2-3/8	1-29/32	53213	58071	●
7,5 mm	0.2953		74,0	34,0	25,0	63016	69010	●
19/64	0.2969	7.54	3-3/4	2-3/8	1-29/32	53119	58072	●
7,6 mm	0.2992		79,0	37,0	27,0	63073	69011	●
N	0.3020	7.67	2-3/8	2-3/8	1-29/32	53214	58073	●
7,7 mm	0.3031		79,0	37,0	27,0	63074	69012	●
7,8 mm	0.3071		79,0	37,0	27,0	63075	69013	●
7,9 mm	0.3110		79,0	37,0	27,0	63076	69014	●
5/16	0.3125	7.94	3-3/4	2-3/8	1-29/32	53120	58074	●
8,0 mm	0.3150		79,0	37,0	27,0	63017	69015	●
O	0.3160	8.03	3-3/4	2-3/8	1-29/32	53215	58075	●
8,1 mm	0.3189		79,0	37,0	27,0	63077	69016	●
8,2 mm	0.3228		79,0	37,0	27,0	63018	69017	●
P	0.3230	8.20	3-3/4	2-3/8	1-29/32	53216	58076	●
8,3 mm	0.3268		79,0	37,0	27,0	63078	69018	●
21/64	0.3281	8.33	4	2-1/2	2	53121	58077	●
8,4 mm	0.3307		79,0	37,0	27,0	63019	69019	●
Q	0.3320	8.43	4	2-1/2	2	53217	58078	●
8,5 mm	0.3346		79,0	37,0	27,0	63020	69020	●
8,6 mm	0.3386		84,0	40,0	29,0	63021	69021	●
R	0.3390	8.61	4	2-1/2	2	53218	58079	●
8,7 mm	0.3425		89,0	40,0	29,0	63079	69022	●
11/32	0.3438	8.73	4	2-1/2	2	53122	58080	●
8,8 mm	0.3465		89,0	40,0	29,0	63022	69023	●
S	0.3480	8.84	4	2-1/2	2	53219	58081	●
8,9 mm	0.3504		84,0	40,0	29,0	63080	69024	●
9,0 mm	0.3543		84,0	40,0	29,0	63023	69025	●
T	0.3580	9.09	4-1/4	2-3/4	2-13/64	53220	58082	●

**TOLERANCES (inch)**

D<sub>1</sub> = +.0000/- .0005  
D<sub>2</sub> = h6

**TOLERANCES (mm)**

D<sub>1</sub> = +0,0000/-0,0127  
D<sub>2</sub> = h6

- STEELS
- CAST IRON
- HARDENED STEELS
- NON-FERROUS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

continued on next page

## 3 Flute Drills • Metric: DIN 6539

103

FRACTIONAL &amp; METRIC SERIES

CUTTING DIAMETER D <sub>1</sub> /D <sub>2</sub>	DECIMAL EQUIV.	METRIC EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.		STOCK
						UNCOATED	Ti-NAMITE-A (AITiN)	
9,1 mm	0.3583		84,0	40,0	29,0	63081	69026	●
23/64	0.3594	9.13	4-1/4	2-3/4	2-13/64	53123	58083	●
9,2 mm	0.3622		84,0	40,0	29,0	63024	69027	●
9,3 mm	0.3661		84,0	40,0	29,0	63082	69028	●
U	0.3680	9.35	4-1/4	2-3/4	2-13/64	53221	58084	●
9,4 mm	0.3701		84,0	40,0	29,0	63083	69029	●
9,5 mm	0.3740		84,0	40,0	29,0	63025	69030	●
3/8	0.3750	9.53	4-1/4	2-3/4	2-13/64	53124	58085	●
V	0.3770	9.58	4-1/4	2-3/4	2-13/64	53222	58086	●
9,6 mm	0.3780		89,0	43,0	31,0	63084	69031	●
9,7 mm	0.3819		89,0	43,0	31,0	63085	69032	●
9,8 mm	0.3858		89,0	43,0	31,0	63086	69033	●
W	0.3860	9.80	4-1/2	2-7/8	2-19/64	53223	58087	●
9,9 mm	0.3898		89,0	43,0	31,0	63087	69034	●
25/64	0.3906	9.92	4-1/2	2-7/8	2-19/64	53125	58088	●
10,0 mm	0.3937		89,0	43,0	31,0	63026	69035	●
X	0.3970	10.08	4-1/2	2-7/8	2-19/64	53224	58089	●
10,1 mm	0.3976		89,0	43,0	31,0	63088	69036	●
10,2 mm	0.4016		89,0	43,0	31,0	63027	69037	●
Y	0.4040	10.26	4-1/2	2-7/8	2-19/64	53225	58090	●
13/32	0.4062	10.32	4-1/2	2-7/8	2-19/64	53126	58091	●
10,4 mm	0.4094		89,0	43,0	31,0	63028	69038	●
Z	0.4130	10.49	4-1/2	2-7/8	2-19/64	53226	58092	●
10,5 mm	0.4134		89,0	43,0	31,0	63029	69039	●
10,7 mm	0.4213		95,0	47,0	33,0	63030	69040	●
27/64	0.4219	10.72	4-1/2	2-7/8	2-19/64	53127	58093	●
10,8 mm	0.4252		95,0	47,0	33,0	63031	69041	●
11,0 mm	0.4331		95,0	47,0	33,0	63032	69042	●
7/16	0.4375	11.11	4-1/2	2-7/8	2-19/64	53128	58094	●
11,5 mm	0.4528		95,0	47,0	33,0	63033	69043	●
29/64	0.4531	11.51	4-3/4	3	2-13/32	53129	58095	●
15/32	0.4688	11.91	4-3/4	3	2-13/32	53130	58096	●
12,0 mm	0.5039		102,0	51,0	35,0	63034	69044	●
31/64	0.4844	12.30	4-3/4	3	2-13/32	53131	58097	●
12,5 mm	0.4921		102,0	51,0	35,0	63035	69045	●
1/2	0.5000	12.70	4-3/4	3	2-13/32	53132	58098	●
12,8 mm	0.5039		102,0	51,0	35,0	63036	69046	●
13,0 mm	0.5118		102,0	51,0	35,0	63089	69047	●
33/64	0.5156	13.10	4-3/4	3	2-13/32	53135	58099	●
13,1 mm	0.5157		102,0	51,0	35,0	63037	69048	●
13,5 mm	0.5315		107,0	54,0	37,0	63090	69049	●
14,0 mm	0.5512		107,0	54,0	37,0	63038	69050	●
9/16	0.5625	14.29	4-3/4	3	2-13/32	53136	58100	●
14,3 mm	0.5630		111,0	56,0	38,0	63039	69051	●
14,5 mm	0.5709		111,0	56,0	38,0	63040	69052	●
15,0 mm	0.5906		111,0	56,0	38,0	63091	69053	●
5/8	0.6250	15.88	5-3/4	3-1/2	2-51/64	53133	58101	●
11/16	0.6875	17.46	5-3/4	3-1/2	2-51/64	53137	58102	●
17,5 mm	0.6890		123,0	62,0	40,0	63041	69054	●
3/4	0.7500	19.05	5-3/4	4-1/4	3 13/32	53134	58103	●
19,5 mm	0.7677		131,0	66,0	42,0	63042	69055	●
20,0 mm	0.7874		131,0	66,0	42,0	63043	69056	●

CONTINUED



# 3 Flute Drills

Series 103 Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)							
			1/8	1/4	3/8	1/2	5/8	3/4		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	295 (236-354)	RPM	9015	4508	3005	2254	1803	1503	
			Fr	0.0026	0.0051	0.0077	0.0102	0.0128	0.0153	
			Feed (ipm)	23.0	23.0	23.0	23.0	23.0	23.0	
	≤ 300 Bhn or ≤ 32 HRc	260 (208-312)	RPM	7946	3973	2649	1986	1589	1324	
			Fr	0.0023	0.0045	0.0068	0.0091	0.0113	0.0136	
			Feed (ipm)	18.0	18.0	18.0	18.0	18.0	18.0	
	≤ 425 Bhn or ≤ 45 HRc	150 (120-180)	RPM	4584	2292	1528	1146	917	764	
			Fz	0.0013	0.0026	0.0039	0.0052	0.0065	0.0079	
			Feed (ipm)	6.0	6.0	6.0	6.0	6.0	6.0	
	<b>H</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	230 (184-276)	RPM	7029	3514	2343	1757	1406	1171
				Fz	0.0019	0.0038	0.0058	0.0077	0.0096	0.0115
				Feed (ipm)	13.5	13.5	13.5	13.5	13.5	13.5
≤ 375 Bhn or ≤ 40 HRc		145 (116-174)	RPM	4431	2216	1477	1108	886	739	
			Fr	0.0019	0.0038	0.0058	0.0077	0.0096	0.0115	
			Feed (ipm)	8.5	8.5	8.5	8.5	8.5	8.5	
≤ 450 Bhn or ≤ 48 HRc		115 (92-138)	RPM	3514	1757	1171	879	703	586	
			Fr	0.0005	0.0010	0.0015	0.0020	0.0026	0.0031	
			Feed (ipm)	1.8	1.8	1.8	1.8	1.8	1.8	
<b>K</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 250 Bhn or ≤ 24 HRc	85 (68-102)	RPM	2598	1299	866	649	520	433
				Fr	0.0013	0.0026	0.0039	0.0052	0.0065	0.0079
				Feed (ipm)	3.4	3.4	3.4	3.4	3.4	3.4
	≤ 375 Bhn or ≤ 40 HRc	65 (52-78)	RPM	1986	993	662	497	397	331	
			Fr	0.0007	0.0013	0.0020	0.0026	0.0033	0.0039	
			Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	
	≤ 475 Bhn or ≤ 50 HRc	50 (40-60)	RPM	1528	764	509	382	306	255	
			Fr	0.0007	0.0013	0.0020	0.0026	0.0033	0.0039	
			Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	
	<b>N</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	250 (200-300)	RPM	7640	3820	2547	1910	1528	1273
				Fr	0.0026	0.0052	0.0079	0.0105	0.0131	0.0157
				Feed (ipm)	20.0	20.0	20.0	20.0	20.0	20.0
≤ 330 Bhn or ≤ 36 HRc		195 (156-234)	RPM	5959	2980	1986	1490	1192	993	
			Fr	0.0026	0.0052	0.0078	0.0104	0.0130	0.0156	
			Feed (ipm)	15.5	15.5	15.5	15.5	15.5	15.5	
<b>N</b>  <b>ALUMINUM ALLOYS</b> 2017, 2024, 356, 6061, 7075		≤ 80 Bhn or ≤ 47 HRb	540 (432-648)	RPM	16502	8251	5501	4126	3300	2750
				Fr	0.0032	0.0064	0.0096	0.0128	0.0161	0.0193
				Feed (ipm)	53.0	53.0	53.0	53.0	53.0	53.0
		≤ 150 Bhn or ≤ 7 HRc	455 (364-546)	RPM	13905	6952	4635	3476	2781	2317
				Fr	0.0032	0.0065	0.0097	0.0129	0.0162	0.0194
				Feed (ipm)	45.0	45.0	45.0	45.0	45.0	45.0
	<b>N</b>  <b>COPPER ALLOYS</b> Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	305 (244-366)	RPM	9321	4660	3107	2330	1864	1553
				Fr	0.0019	0.0039	0.0058	0.0077	0.0097	0.0116
				Feed (ipm)	18.0	18.0	18.0	18.0	18.0	18.0
		≤ 200 Bhn or ≤ 23 HRc	160 (128-192)	RPM	4890	2445	1630	1222	978	815
				Fr	0.0016	0.0033	0.0049	0.0065	0.0082	0.0098
				Feed (ipm)	8.0	8.0	8.0	8.0	8.0	8.0

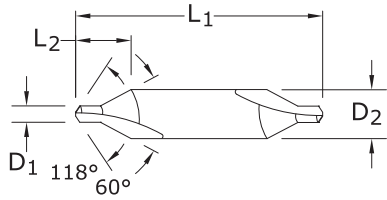
Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 rpm = Vc x 3.82 / D<sub>1</sub>  
 ipm = Fr x rpm  
 reduce speed and feed 30 percent when using uncoated drills  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# 3 Flute Drills

Series 103M Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)							
			3	6	10	12	16	20		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	90 (72-108)	RPM	9533	4766	2860	2383	1787	1430	
			Fr	0.062	0.124	0.206	0.248	0.330	0.413	
			Feed (mm/min)	590	590	590	590	590	590	
	≤ 300 Bhn or ≤ 32 HRc	79 (63-95)	RPM	8402	4201	2520	2100	1575	1260	
			Fr	0.055	0.110	0.183	0.219	0.292	0.365	
			Feed (mm/min)	460	460	460	460	460	460	
	≤ 425 Bhn or ≤ 45 HRc	46 (37-55)	RPM	4847	2424	1454	1212	909	727	
			Fz	0.032	0.064	0.107	0.128	0.171	0.213	
			Feed (mm/min)	155	155	155	155	155	155	
	<b>H</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	70 (56-84)	RPM	7432	3716	2230	1858	1394	1115
				Fz	0.046	0.093	0.155	0.186	0.248	0.309
				Feed (mm/min)	345	345	345	345	345	345
≤ 375 Bhn or ≤ 40 HRc		44 (35-53)	RPM	4686	2343	1406	1171	879	703	
			Fr	0.046	0.092	0.153	0.184	0.245	0.306	
			Feed (mm/min)	215	215	215	215	215	215	
≤ 450 Bhn or ≤ 48 HRc		35 (28-42)	RPM	3716	1858	1115	929	697	557	
			Fr	0.012	0.024	0.040	0.048	0.065	0.081	
			Feed (mm/min)	45	45	45	45	45	45	
<b>K</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 250 Bhn or ≤ 24 HRc	26 (21-31)	RPM	2747	1373	824	687	515	412
				Fr	0.031	0.062	0.103	0.124	0.165	0.206
				Feed (mm/min)	85	85	85	85	85	85
	≤ 375 Bhn or ≤ 40 HRc	20 (16-24)	RPM	2100	1050	630	525	394	315	
			Fr	0.017	0.033	0.056	0.067	0.089	0.111	
			Feed (mm/min)	35	35	35	35	35	35	
≤ 475 Bhn or ≤ 50 HRc	15 (12-18)	RPM	1616	808	485	404	303	242		
		Fr	0.015	0.031	0.052	0.062	0.083	0.103		
		Feed (mm/min)	25	25	25	25	25	25		
<b>N</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	76 (61-91)	RPM	8078	4039	2424	2020	1515	1212	
			Fr	0.063	0.126	0.210	0.253	0.337	0.421	
			Feed (mm/min)	510	510	510	510	510	510	
	≤ 330 Bhn or ≤ 36 HRc	59 (48-71)	RPM	6301	3151	1890	1575	1181	945	
			Fr	0.052	0.105	0.175	0.209	0.279	0.349	
			Feed (mm/min)	330	330	330	330	330	330	
<b>N</b>  <b>ALUMINUM ALLOYS</b> 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	165 (132-198)	RPM	17449	8725	5235	4362	3272	2617	
			Fr	0.078	0.156	0.260	0.312	0.416	0.520	
			Feed (mm/min)	1360	1360	1360	1360	1360	1360	
	≤ 150 Bhn or ≤ 7 HRc	139 (111-166)	RPM	14703	7351	4411	3676	2757	2205	
			Fr	0.078	0.156	0.261	0.313	0.417	0.521	
			Feed (mm/min)	1150	1150	1150	1150	1150	1150	
<b>N</b>  <b>COPPER ALLOYS</b> Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	93 (74-112)	RPM	9856	4928	2957	2464	1848	1478	
			Fr	0.047	0.094	0.157	0.189	0.252	0.315	
			Feed (mm/min)	465	465	465	465	465	465	
	≤ 200 Bhn or ≤ 23 HRc	49 (39-59)	RPM	5170	2585	1551	1293	969	776	
			Fr	0.039	0.077	0.129	0.155	0.206	0.258	
			Feed (mm/min)	200	200	200	200	200	200	

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 rpm = (Vc x 1000) / (D<sub>1</sub> x 3.14)  
 mm/min = Fr x rpm  
 reduce speed and feed 30 percent when using uncoated drills  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# Combined Drill & Countersink



**301**

FRACTIONAL SERIES

DRILL DIAMETER D <sub>1</sub>	BODY DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	EDP NO.		STOCK
				UNCOATED	Ti-NAMITE-A (AlTiN)	
.025*	1/8	1-1/2	.125	57005	57015	●
1/32*	1/8	1-1/2	.130	57006	57016	●
3/64*	1/8	1-1/2	.135	57007	57017	●
5/64*	3/16	1-7/8	.200	57008	57018	●
7/64*	1/4	2	.280	57009	57019	●
1/8*	5/16	2-1/8	.340	57010	57020	●
3/16*	7/16	2-3/4	.475	57011	57021	●
7/32*	1/2	3	.540	57012	57022	●
—	—	—	—	57075	—	●

\*Included in Series 301 Set (EDP No. 57075)

**TOLERANCES (inch)**

D<sub>1</sub> = +.003/-.000

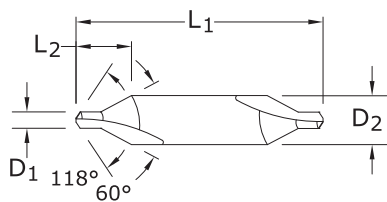
D<sub>2</sub> = -.0001/-.0005

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

# Combined Drill & Countersink



**TOLERANCES (mm)**

$D_1 = +0,076/-0,000$   
 $D_2 = -0,0025/-0,0127$

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

**301M**  
METRIC SERIES

mm				EDP NO.		STOCK
DRILL DIAMETER $D_1$	BODY DIAMETER $D_2$	OVERALL LENGTH $L_1$	FLUTE LENGTH $L_2$	UNCOATED	Ti-NAMITE-A (AlTiN)	
0,5	3,15	20,0	3,0	67005	67035	●
0,8	3,15	20,0	3,5	67007	67037	●
1	3,15	31,5	3,5	67009	67039	●
1,25	3,15	31,5	4,0	67011	67041	●
1,6	4,0	35,5	5,0	67013	67043	●
2	5,0	40,0	6,0	67015	67045	●
2,5	6,3	45,0	7,0	67017	67047	●
3,15	8,0	50,0	9,0	67019	67049	●
4	10,0	56,0	11,0	67021	67051	●
5	12,5	63,0	14,0	67023	67053	●

# Combined Drill & Countersink

Series 301 Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)						
			1/32	5/64	1/8	3/16	7/32		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	265	RPM	8098	5399	3239	2314	2025	
		(212-318)	Fr	0.00068	0.0010	0.0017	0.0024	0.0027	
			Feed (ipm)	5.5	5.5	5.5	5.5	5.5	
	≤ 300 Bhn or ≤ 32 HRc	125	RPM	3820	2547	1528	1091	955	
		(100-150)	Fr	0.00065	0.0010	0.0016	0.0023	0.0026	
			Feed (ipm)	2.5	2.5	2.5	2.5	2.5	
	≤ 425 Bhn or ≤ 45 HRc	85	RPM	2598	1732	1039	742	649	
		(68-102)	Fz	0.00038	0.0006	0.0010	0.0013	0.0015	
			Feed (ipm)	1.0	1.0	1.0	1.0	1.0	
	<b>P</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	230	RPM	7029	4686	2812	2008	1757
			(184-276)	Fz	0.00064	0.0010	0.0016	0.0022	0.0026
				Feed (ipm)	4.5	4.5	4.5	4.5	4.5
≤ 375 Bhn or ≤ 40 HRc		145	RPM	4431	2954	1772	1266	1108	
		(116-174)	Fr	0.00059	0.0009	0.0015	0.0021	0.0023	
			Feed (ipm)	2.6	2.6	2.6	2.6	2.6	
≤ 450 Bhn or ≤ 48 HRc		60	RPM	1834	1222	733	524	458	
		(48-72)	Fr	0.00027	0.0004	0.0007	0.0010	0.0011	
			Feed (ipm)	0.5	0.5	0.5	0.5	0.5	
<b>H</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 250 Bhn or ≤ 24 HRc	85	RPM	2598	1732	1039	742	649
			(68-102)	Fr	0.00035	0.0005	0.0009	0.0012	0.0014
				Feed (ipm)	0.9	0.9	0.9	0.9	0.9
	≤ 375 Bhn or ≤ 40 HRc	55	RPM	1681	1121	672	480	420	
		(44-66)	Fr	0.00016	0.0002	0.0004	0.0006	0.0006	
			Feed (ipm)	0.3	0.3	0.3	0.3	0.3	
	≤ 475 Bhn or ≤ 50 HRc	40	RPM	1222	815	489	349	306	
		(32-48)	Fr	0.00016	0.0002	0.0004	0.0006	0.0007	
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2	
	<b>K</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	280	RPM	8557	5705	3423	2445	2139
			(224-336)	Fr	0.00084	0.0013	0.0021	0.0029	0.0034
				Feed (ipm)	7.2	7.2	7.2	7.2	7.2
≤ 330 Bhn or ≤ 36 HRc		250	RPM	7640	5093	3056	2183	1910	
		(200-300)	Fr	0.00084	0.0013	0.0021	0.0029	0.0034	
			Feed (ipm)	6.4	6.4	6.4	6.4	6.4	
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F 440F	≤ 250 Bhn or ≤ 24 HRc0	210	RPM	6418	4278	2567	1834	1604	
		(168-252)	Fr	0.00048	0.0007	0.0012	0.0017	0.0019	
			Feed (ipm)	3.1	3.1	3.1	3.1	3.1	
	≤ 330 Bhn or ≤ 36 HRc	110	RPM	3362	2241	1345	960	840	
		(88-132)	Fr	0.00028	0.0004	0.0007	0.0010	0.0011	
			Feed (ipm)	0.9	0.9	0.9	0.9	0.9	
	<b>M</b>  <b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	65	RPM	1986	1324	795	568	497
			(52-78)	Fr	0.00036	0.0005	0.0009	0.0013	0.0014
				Feed (ipm)	0.7	0.7	0.7	0.7	0.7
		≤ 375 Bhn or ≤ 40 HRc	55	RPM	1681	1121	672	480	420
			(44-66)	Fr	0.00032	0.0005	0.0008	0.0011	0.0013
				Feed (ipm)	0.5	0.5	0.5	0.5	0.5

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# Combined Drill & Countersink

Series 301 Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)						
			1/32	5/64	1/8	3/16	7/32		
<b>S</b>  <b>SUPER ALLOYS</b> (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy	≤ 220 Bhn or ≤ 19 HRc	40  (32-48)	RPM	1222	815	489	349	306	
			Fr	0.00036	0.0005	0.0009	0.0013	0.0014	
			Feed (ipm)	0.4	0.4	0.4	0.4	0.4	
	≤ 320 Bhn or ≤ 34 HRc	25  (20-30)	RPM	764	509	306	218	191	
			Fr	0.00033	0.0005	0.0008	0.0011	0.0013	
			Feed (ipm)	0.3	0.3	0.3	0.3	0.3	
	≤ 425 Bhn or ≤ 45 HRc	20  (16-24)	RPM	611	407	244	175	153	
			Fr	0.00016	0.0002	0.0004	0.0006	0.0007	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	
	<b>TITANIUM ALLOYS</b> Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	85  (68-102)	RPM	2598	1732	1039	742	649
				Fr	0.00064	0.0010	0.0016	0.0022	0.0026
				Feed (ipm)	1.7	1.7	1.7	1.7	1.7
≤ 350 Bhn or ≤ 38 HRc		65  (52-78)	RPM	1986	1324	795	568	497	
			Fr	0.00036	0.0005	0.0009	0.0013	0.0014	
			Feed (ipm)	0.7	0.7	0.7	0.7	0.7	
≤ 440 Bhn or ≤ 47 HRc		55  (44-66)	RPM	1681	1121	672	480	420	
			Fr	0.00032	0.0005	0.0008	0.0011	0.0013	
			Feed (ipm)	0.5	0.5	0.5	0.5	0.5	
<b>N</b>  <b>ALUMINUM ALLOYS</b> 2017, 2024, 356, 6061, 7075		≤ 80 Bhn or ≤ 47 HRb	540  (432-648)	RPM	16502	11002	6601	4715	4126
				Fr	0.00100	0.0015	0.0025	0.0035	0.0040
				Feed (ipm)	16.5	16.5	16.5	16.5	16.5
	≤ 150 Bhn or ≤ 7 HRc	455  (364-546)	RPM	13905	9270	5562	3973	3476	
			Fr	0.00100	0.0015	0.0025	0.0035	0.0040	
			Feed (ipm)	13.9	13.9	13.9	13.9	13.9	
	≤ 140 Bhn or ≤ 3 HRc	190  (152-228)	RPM	5806	3871	2323	1659	1452	
			Fr	0.00048	0.0007	0.0012	0.0017	0.0019	
			Feed (ipm)	2.8	2.8	2.8	2.8	2.8	
	≤ 200 Bhn or ≤ 23 HRc	175  (140-210)	RPM	5348	3565	2139	1528	1337	
			Fr	0.00048	0.0007	0.0012	0.0017	0.0019	
			Feed (ipm)	2.6	2.6	2.6	2.6	2.6	
<b>PLASTICS</b> Polycarbonate, PVC	500  (400-600)	RPM	15280	10187	6112	4366	3820		
		Fr	0.00100	0.0015	0.0025	0.0035	0.0040		
		Feed (ipm)	15.3	15.3	15.3	15.3	15.3		

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fr \times rpm$   
 reduce speed and feed 30 percent when using uncoated drills  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstoool.com](http://www.kyocera-sgstoool.com))

# Combined Drill & Countersink

Series 301M Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)						
			1	1.6	2.5	4	5		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	81	RPM	8155	6422	4078	2569	2055	
		(65-97)	Fr	0.017	0.022	0.034	0.054	0.068	
			Feed (mm/min)	139	139	139	139	139	
	≤ 300 Bhn or ≤ 32 HRc	38	RPM	3847	3029	1923	1212	969	
		(30-46)	Fr	0.016	0.020	0.032	0.051	0.064	
			Feed (mm/min)	62	62	62	62	62	
	≤ 425 Bhn or ≤ 45 HRc	26	RPM	2616	2060	1308	824	659	
		(21-31)	Fz	0.010	0.013	0.020	0.032	0.039	
			Feed (mm/min)	26	26	26	26	26	
	<b>P</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	70	RPM	7078	5574	3539	2230	1784
			(56-84)	Fz	0.016	0.020	0.032	0.051	0.063
				Feed (mm/min)	113	113	113	113	113
≤ 375 Bhn or ≤ 40 HRc		44	RPM	4462	3514	2231	1406	1125	
		(35-53)	Fr	0.015	0.019	0.030	0.048	0.060	
			Feed (mm/min)	67	67	67	67	67	
≤ 450 Bhn or ≤ 48 HRc		18	RPM	1847	1454	923	582	465	
		(15-22)	Fr	0.007	0.009	0.014	0.022	0.028	
			Feed (mm/min)	13	13	13	13	13	
<b>H</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 250 Bhn or ≤ 24 HRc	26	RPM	2616	2060	1308	824	659
			(21-31)	Fr	0.009	0.012	0.018	0.029	0.036
				Feed (mm/min)	24	24	24	24	24
	≤ 375 Bhn or ≤ 40 HRc	17	RPM	1693	1333	846	533	427	
		(13-20)	Fr	0.004	0.005	0.008	0.013	0.016	
			Feed (mm/min)	7	7	7	7	7	
	≤ 475 Bhn or ≤ 50 HRc	12	RPM	1231	969	616	388	310	
		(10-15)	Fr	0.004	0.005	0.008	0.013	0.016	
			Feed (mm/min)	5	5	5	5	5	
	<b>K</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	85	RPM	8617	6786	4309	2714	2171
			(68-102)	Fr	0.021	0.027	0.042	0.067	0.083
				Feed (mm/min)	181	181	181	181	181
≤ 330 Bhn or ≤ 36 HRc		76	RPM	7694	6059	3847	2424	1939	
		(61-91)	Fr	0.021	0.027	0.042	0.067	0.084	
			Feed (mm/min)	162	162	162	162	162	
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F 440F	≤ 250 Bhn or ≤ 24 HRc	64	RPM	6463	5089	3231	2036	1629	
		(51-77)	Fr	0.012	0.015	0.024	0.038	0.048	
			Feed (mm/min)	78	78	78	78	78	
	≤ 330 Bhn or ≤ 36 HRc	34	RPM	3385	2666	1693	1066	853	
		(27-40)	Fr	0.007	0.009	0.014	0.023	0.028	
			Feed (mm/min)	24	24	24	24	24	
	<b>M</b>  <b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	20	RPM	2000	1575	1000	630	504
			(16-24)	Fr	0.009	0.011	0.018	0.029	0.036
				Feed (mm/min)	18	18	18	18	18
		≤ 375 Bhn or ≤ 40 HRc	17	RPM	1693	1333	846	533	427
			(13-20)	Fr	0.008	0.011	0.017	0.026	0.033
				Feed (mm/min)	14	14	14	14	14

continued on next page

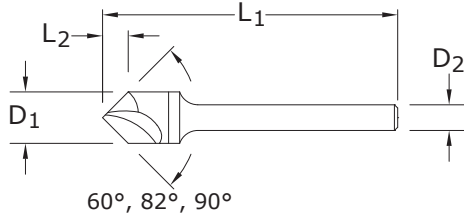
# Combined Drill & Countersink

Series 301M Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)						
			1	1.6	2.5	4	5		
<b>SUPER ALLOYS</b> (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy	≤ 220 Bhn or ≤ 19 HRc	12  (10-15)	RPM	1231	969	616	388	310	
			Fr	0.009	0.011	0.018	0.028	0.035	
			Feed (mm/min)	11	11	11	11	11	
	≤ 320 Bhn or ≤ 34 HRc	8  (6-9)	RPM	769	606	385	242	194	
			Fr	0.008	0.010	0.016	0.025	0.031	
			Feed (mm/min)	6	6	6	6	6	
	≤ 425 Bhn or ≤ 45 HRc	6  (5-7)	RPM	616	485	308	194	155	
			Fr	0.003	0.004	0.006	0.010	0.013	
			Feed (mm/min)	2	2	2	2	2	
	<b>TITANIUM ALLOYS</b> Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	26  (21-31)	RPM	2616	2060	1308	824	659
				Fr	0.016	0.020	0.032	0.051	0.064
				Feed (mm/min)	42	42	42	42	42
≤ 350 Bhn or ≤ 38 HRc		20  (16-24)	RPM	2000	1575	1000	630	504	
			Fr	0.009	0.011	0.018	0.029	0.036	
			Feed (mm/min)	18	18	18	18	18	
≤ 440 Bhn or ≤ 47 HRc		17  (13-20)	RPM	1693	1333	846	533	427	
			Fr	0.008	0.011	0.017	0.026	0.033	
			Feed (mm/min)	14	14	14	14	14	
<b>ALUMINUM ALLOYS</b> 2017, 2024, 356, 6061, 7075		≤ 80 Bhn or ≤ 47 HRb	165  (132-198)	RPM	16619	13087	8309	5235	4188
				Fr	0.025	0.032	0.050	0.079	0.099
				Feed (mm/min)	415	415	415	415	415
	≤ 150 Bhn or ≤ 7 HRc	139  (111-166)	RPM	14003	11027	7001	4411	3529	
			Fr	0.025	0.032	0.050	0.079	0.099	
			Feed (mm/min)	350	350	350	350	350	
<b>COPPER ALLOYS</b> Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	58  (46-69)	RPM	5847	4605	2924	1842	1474	
			Fr	0.012	0.015	0.024	0.038	0.048	
			Feed (mm/min)	70	70	70	70	70	
	≤ 200 Bhn or ≤ 23 HRc	53  (43-64)	RPM	5386	4241	2693	1696	1357	
			Fr	0.012	0.015	0.024	0.038	0.048	
			Feed (mm/min)	65	65	65	65	65	
<b>PLASTICS</b> Polycarbonate, PVC	152  (122-183)	RPM	15388	12118	7694	4847	3878		
		Fr	0.025	0.032	0.050	0.079	0.099		
			Feed (mm/min)	385	385	385	385	385	

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fr \times rpm$   
 reduce speed and feed 30 percent when using uncoated drills  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



# Single Flute Countersink



**601**

FRACTIONAL SERIES

CUTTING DIAMETER D <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	inch		EDP NO.			STOCK
		OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	UNCOATED 60°	UNCOATED 82°	UNCOATED 90°	
1/8	1/8	1-1/2	.062	—	—	74201	●
1/8	1/8	1-1/2	.072	—	74101	—	●
1/8	1/8	1-1/2	.108	74001	—	—	●
3/16	3/16	2	.094	—	—	74204	●
3/16	3/16	2	.108	—	74104	—	●
3/16	3/16	2	.163	74004	—	—	●
1/4	1/4	2	.125	—	—	74207	●
1/4	1/4	2	.144	—	74107	—	●
1/4	1/4	2	.217	74007	—	—	●
3/8*	1/4	2-13/16	.188	—	—	74210	●
3/8*	1/4	2-13/16	.216	—	74110	—	●
3/8*	1/4	2-13/16	.325	74010	—	—	●
1/2*	1/4	2-7/8	.250	—	—	74213	●
1/2*	1/4	2-7/8	.288	—	74113	—	●
1/2*	1/4	2-7/8	.433	74013	—	—	●
5/8*	3/8	3	.313	—	—	74216	●
5/8*	3/8	3	.360	—	74116	—	●
5/8*	3/8	3	.541	74016	—	—	●
3/4*	1/2	3	.375	—	—	74219	●
3/4*	1/2	3	.431	—	74119	—	●
3/4*	1/2	3	.650	74019	—	—	●
1*	1/2	3-1/4	.500	—	—	74222	●
1*	1/2	3-1/4	.575	—	74122	—	●
1*	1/2	3-1/4	.866	74022	—	—	●

\*Steel Shank / Con mango de acero / Avec queue en acier

**TOLERANCES (inch)**

**1/8–1/4 DIAMETER**

D<sub>1</sub> = +.0000/–.0005

**3/8–1 DIAMETER**

D<sub>1</sub> = +.003/–.000

Included Angle

+1°/–1°

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS
- NON-FERROUS
- PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# Single Flute Countersink

Series 601 Fractional	Hardness	Vc (sfm)	Diameter (D1) (inch)								
			1/8	3/16	1/4	3/8	1/2	3/4	1		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	125  (100-150)	RPM	3820	2547	1910	1273	955	637	478	
			Fr	0.0005	0.0008	0.0010	0.0016	0.0021	0.0031	0.0042	
			Feed (ipm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
	≤ 300 Bhn or ≤ 32 HRc	60  (48-72)	RPM	1834	1222	917	611	458	306	229	
			Fr	0.0005	0.0007	0.0010	0.0015	0.0020	0.0029	0.0039	
			Feed (ipm)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	
	≤ 425 Bhn or ≤ 45 HRc	45  (36-54)	RPM	1375	917	688	458	344	229	172	
			Fz	0.0003	0.0004	0.0006	0.0009	0.0012	0.0017	0.0023	
			Feed (ipm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
	≤ 275 Bhn or ≤ 28 HRc	95  (76-114)	RPM	2903	1935	1452	968	726	484	363	
			Fz	0.0004	0.0007	0.0009	0.0013	0.0018	0.0027	0.0036	
			Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	1.3	
≤ 375 Bhn or ≤ 40 HRc	60  (48-72)	RPM	1834	1222	917	611	458	306	229		
		Fr	0.0004	0.0007	0.0009	0.0013	0.0017	0.0026	0.0035		
		Feed (ipm)	0.8	0.8	0.8	0.8	0.8	0.8	0.8		
≤ 450 Bhn or ≤ 48 HRc	35  (28-42)	RPM	1070	713	535	357	267	178	134		
		Fr	0.0003	0.0004	0.0006	0.0008	0.0011	0.0017	0.0022		
		Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3		
<b>H</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250 Bhn or ≤ 24 HRc	35  (28-42)	RPM	1070	713	535	357	267	178	134	
			Fr	0.0003	0.0004	0.0006	0.0008	0.0011	0.0017	0.0022	
			Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
	≤ 375 Bhn or ≤ 40 HRc	25  (20-30)	RPM	764	509	382	255	191	127	96	
			Fr	0.0001	0.0002	0.0003	0.0004	0.0005	0.0008	0.0010	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	≤ 475 Bhn or ≤ 50 HRc	20  (16-24)	RPM	611	407	306	204	153	102	76	
			Fr	0.0002	0.0002	0.0003	0.0005	0.0007	0.0010	0.0013	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	<b>K</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	105  (84-126)	RPM	3209	2139	1604	1070	802	535	401
				Fr	0.0006	0.0009	0.0012	0.0018	0.0024	0.0036	0.0047
				Feed (ipm)	1.9	1.9	1.9	1.9	1.9	1.9	1.9
≤ 330 Bhn or ≤ 36 HRc		75  (60-90)	RPM	2292	1528	1146	764	573	382	287	
			Fr	0.0006	0.0009	0.0012	0.0018	0.0024	0.0037	0.0049	
			Feed (ipm)	1.4	1.4	1.4	1.4	1.4	1.4	1.4	
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F 440F	≤ 250 Bhn or ≤ 24 HRc	53  (42-64)	RPM	1620	1080	810	540	405	270	202	
			Fr	0.0003	0.0005	0.0006	0.0009	0.0012	0.0019	0.0025	
			Feed (ipm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
	≤ 330 Bhn or ≤ 36 HRc	46  (37-55)	RPM	1406	937	703	469	351	234	176	
			Fr	0.0002	0.0003	0.0004	0.0006	0.0009	0.0013	0.0017	
			Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
≤ 275 Bhn or ≤ 28 HRc	28  (22-34)	RPM	856	570	428	285	214	143	107		
		Fr	0.0004	0.0005	0.0007	0.0011	0.0014	0.0021	0.0028		
		Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3		
≤ 375 Bhn or ≤ 40 HRc	21  (17-25)	RPM	642	428	321	214	160	107	80		
		Fr	0.0002	0.0002	0.0003	0.0005	0.0006	0.0009	0.0012		
		Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1		

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# Single Flute Countersink

Series 601 Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/8	3/16	1/4	3/8	1/2	3/4	1		
<b>S</b>  <b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy</b>	≤ 220 Bhn or ≤ 19 HRc	18 (14-22)	RPM	550	367	275	183	138	92	69	
			Fr	0.0002	0.0003	0.0004	0.0005	0.0007	0.0011	0.0015	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	≤ 320 Bhn or ≤ 34 HRc	14 (11-17)	RPM	428	285	214	143	107	71	53	
			Fr	0.0002	0.0004	0.0005	0.0007	0.0009	0.0014	0.0019	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	≤ 425 Bhn or ≤ 45 HRc	12 (10-14)	RPM	367	244	183	122	92	61	46	
			Fr	0.0003	0.0004	0.0005	0.0008	0.0011	0.0016	0.0022	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	<b>TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V</b>	≤ 275 Bhn or ≤ 28 HRc	36 (29-43)	RPM	1100	733	550	367	275	183	138
				Fr	0.0005	0.0007	0.0009	0.0014	0.0018	0.0027	0.0036
				Feed (ipm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
≤ 350 Bhn or ≤ 38 HRc		28 (22-34)	RPM	856	570	428	285	214	143	107	
			Fr	0.0004	0.0005	0.0007	0.0011	0.0014	0.0021	0.0028	
			Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
≤ 440 Bhn or ≤ 47 HRc		21 (17-25)	RPM	642	428	321	214	160	107	80	
			Fr	0.0002	0.0002	0.0003	0.0005	0.0006	0.0009	0.0012	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
<b>N</b>  <b>ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075</b>		≤ 80 Bhn or ≤ 47 HRb	225 (180-270)	RPM	6876	4584	3438	2292	1719	1146	860
				Fr	0.0008	0.0011	0.0015	0.0023	0.0030	0.0045	0.0061
				Feed (ipm)	5.2	5.2	5.2	5.2	5.2	5.2	5.2
	≤ 150 Bhn or ≤ 7 HRc	190 (152-228)	RPM	5806	3871	2903	1935	1452	968	726	
			Fr	0.0008	0.0011	0.0015	0.0023	0.0030	0.0045	0.0061	
			Feed (ipm)	4.4	4.4	4.4	4.4	4.4	4.4	4.4	
	≤ 140 Bhn or ≤ 3 HRc	95 (76-114)	RPM	2903	1935	1452	968	726	484	363	
			Fr	0.0004	0.0006	0.0008	0.0011	0.0015	0.0023	0.0030	
			Feed (ipm)	1.1	1.1	1.1	1.1	1.1	1.1	1.1	
	≤ 200 Bhn or ≤ 23 HRc	80 (64-96)	RPM	2445	1630	1222	815	611	407	306	
			Fr	0.0004	0.0006	0.0008	0.0012	0.0016	0.0025	0.0033	
			Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
<b>COPPER ALLOYS Alum Bronze, C110, Muntz Brass</b>	≤ 140 Bhn or ≤ 3 HRc	95 (76-114)	RPM	2903	1935	1452	968	726	484	363	
			Fr	0.0004	0.0006	0.0008	0.0011	0.0015	0.0023	0.0030	
			Feed (ipm)	1.1	1.1	1.1	1.1	1.1	1.1	1.1	
≤ 200 Bhn or ≤ 23 HRc	80 (64-96)	RPM	2445	1630	1222	815	611	407	306		
		Fr	0.0004	0.0006	0.0008	0.0012	0.0016	0.0025	0.0033		
		Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0		

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

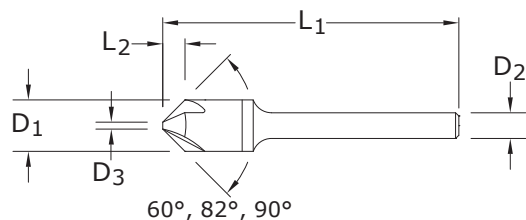
rpm = Vc x 3.82 / D<sub>1</sub>

ipm = Fr x rpm

reduce speed and feed for materials harder than listed

refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# 3 Flute Countersink



**603**  
FRACTIONAL SERIES

**TOLERANCES (inch)**

**1/8–1/4 DIAMETER**

D<sub>1</sub> = +.0000/-.0005

**3/8–1 DIAMETER**

D<sub>1</sub> = +.003/-.000

Included Angle

+1°/-1°

STEELS

STAINLESS STEELS

CAST IRON

HIGH TEMP ALLOYS

TITANIUM

HARDENED STEELS

NON-FERROUS

PLASTICS/COMPOSITES

● U.S. Stock Standard

■ NOT STOCKED—  
Call for Delivery

inch				EDP NO.			STOCK
CUTTING DIAMETER D <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	TIP DIAMETER D <sub>3</sub>	UNCOATED 60°	UNCOATED 82°	UNCOATED 90°	
1/8	1/8	1-1/2	.040	—	—	74225	●
1/8	1/8	1-1/2	.040	—	74125	—	●
1/8	1/8	1-1/2	.035	74025	—	—	●
3/16	3/16	2	.060	—	—	74228	●
3/16	3/16	2	.060	—	74128	—	●
3/16	3/16	2	.045	74028	—	—	●
1/4	1/4	2	.100	—	—	74231	●
1/4	1/4	2	.100	—	74131	—	●
1/4	1/4	2	.070	74031	—	—	●
3/8*	1/4	2-13/16	.108	—	—	74234	●
3/8*	1/4	2-13/16	.108	—	74134	—	●
3/8*	1/4	2-13/16	.100	74034	—	—	●
1/2*	1/4	2-7/8	.122	—	—	74237	●
1/2*	1/4	2-7/8	.122	—	74137	—	●
1/2*	1/4	2-7/8	.113	74037	—	—	●
5/8*	3/8	3	.138	—	—	74240	●
5/8*	3/8	3	.138	—	74140	—	●
5/8*	3/8	3	.128	74040	—	—	●
3/4*	1/2	3	.153	—	—	74243	●
5/8*	3/8	3	.153	—	74143	—	●
5/8*	3/8	3	.153	74043	—	—	●
1*	1/2	3-1/4	.168	—	—	74246	●
1*	1/2	3-1/4	.168	—	74146	—	●
1*	1/2	3-1/4	.158	74046	—	—	●

\*Steel Shank / Con mango de acero / Avec queue en acier

NOTE: D3 dimension varies based on angle. Contact KSPT representative or consult Tool Wizard for dimension information.

# 3 Flute Countersink

Series 603 Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/8	3/16	1/4	3/8	1/2	3/4	1		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	125	RPM	3820	2547	1910	1273	955	637	478	
		(100-150)	Fr	0.0008	0.0012	0.0016	0.0024	0.0031	0.0047	0.0063	
			Feed (ipm)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
	≤ 300 Bhn or ≤ 32 HRc	60	RPM	1834	1222	917	611	458	306	229	
		(48-72)	Fr	0.0007	0.0011	0.0014	0.0021	0.0028	0.0043	0.0057	
			Feed (ipm)	1.3	1.3	1.3	1.3	1.3	1.3	1.3	
	≤ 425 Bhn or ≤ 45 HRc	45	RPM	1375	917	688	458	344	229	172	
		(36-54)	Fz	0.0004	0.0007	0.0009	0.0013	0.0017	0.0026	0.0035	
			Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
	<b>H</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	95	RPM	2903	1935	1452	968	726	484	363
			(76-114)	Fz	0.0007	0.0010	0.0014	0.0021	0.0028	0.0041	0.0055
				Feed (ipm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
≤ 375 Bhn or ≤ 40 HRc		60	RPM	1834	1222	917	611	458	306	229	
		(48-72)	Fr	0.0007	0.0010	0.0013	0.0020	0.0026	0.0039	0.0052	
			Feed (ipm)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
≤ 450 Bhn or ≤ 48 HRc		35	RPM	1070	713	535	357	267	178	134	
		(28-42)	Fr	0.0004	0.0006	0.0007	0.0011	0.0015	0.0022	0.0030	
			Feed (ipm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	
<b>K</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 250 Bhn or ≤ 24 HRc	35	RPM	1070	713	535	357	267	178	134
			(28-42)	Fr	0.0004	0.0006	0.0007	0.0011	0.0015	0.0022	0.0030
				Feed (ipm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	≤ 375 Bhn or ≤ 40 HRc	25	RPM	764	509	382	255	191	127	96	
		(20-30)	Fr	0.0003	0.0004	0.0005	0.0008	0.0010	0.0016	0.0021	
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
	≤ 475 Bhn or ≤ 50 HRc	20	RPM	611	407	306	204	153	102	76	
		(16-24)	Fr	0.0002	0.0002	0.0003	0.0005	0.0007	0.0010	0.0013	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	<b>M</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	105	RPM	3209	2139	1604	1070	802	535	401
			(84-126)	Fr	0.0009	0.0014	0.0018	0.0027	0.0036	0.0054	0.0072
				Feed (ipm)	2.9	2.9	2.9	2.9	2.9	2.9	2.9
≤ 330 Bhn or ≤ 36 HRc		75	RPM	2292	1528	1146	764	573	382	287	
		(60-90)	Fr	0.0009	0.0014	0.0018	0.0027	0.0037	0.0055	0.0073	
			Feed (ipm)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	
<b>M</b>  <b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F 440F		≤ 250 Bhn or ≤ 24 HRc	53	RPM	1620	1080	810	540	405	270	202
			(42-64)	Fr	0.0004	0.0006	0.0009	0.0013	0.0017	0.0026	0.0035
				Feed (ipm)	0.7	0.7	0.7	0.7	0.7	0.7	0.7
		≤ 330 Bhn or ≤ 36 HRc	46	RPM	1406	937	703	469	351	234	176
			(37-55)	Fr	0.0004	0.0005	0.0007	0.0011	0.0014	0.0021	0.0028
				Feed (ipm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	<b>M</b>  <b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	28	RPM	856	570	428	285	214	143	107
			(22-34)	Fr	0.0005	0.0007	0.0009	0.0014	0.0019	0.0028	0.0037
				Feed (ipm)	0.4	0.4	0.4	0.4	0.4	0.4	0.4
		≤ 375 Bhn or ≤ 40 HRc	21	RPM	642	428	321	214	160	107	80
			(17-25)	Fr	0.0002	0.0002	0.0003	0.0005	0.0006	0.0009	0.0012
				Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1

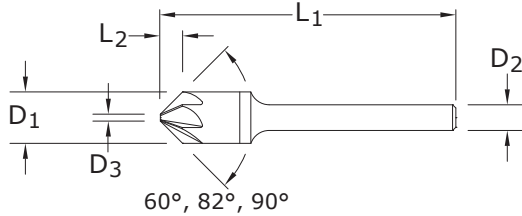
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# 3 Flute Countersink

Series 603 Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/8	3/16	1/4	3/8	1/2	3/4	1		
<b>S</b>  <b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy</b>	≤ 220 Bhn or ≤ 19 HRc	18 (14-22)	RPM	550	367	275	183	138	92	69	
			Fr	0.0004	0.0005	0.0007	0.0011	0.0015	0.0022	0.0029	
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
	≤ 320 Bhn or ≤ 34 HRc	14 (11-17)	RPM	428	285	214	143	107	71	53	
			Fr	0.0002	0.0004	0.0005	0.0007	0.0009	0.0014	0.0019	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	≤ 425 Bhn or ≤ 45 HRc	12 (10-14)	RPM	367	244	183	122	92	61	46	
			Fr	0.0003	0.0004	0.0005	0.0008	0.0011	0.0016	0.0022	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	<b>TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V</b>	≤ 275 Bhn or ≤ 28 HRc	36 (29-43)	RPM	1100	733	550	367	275	183	138
				Fr	0.0007	0.0011	0.0015	0.0022	0.0029	0.0044	0.0058
				Feed (ipm)	0.8	0.8	0.8	0.8	0.8	0.8	0.8
≤ 350 Bhn or ≤ 38 HRc		28 (22-34)	RPM	856	570	428	285	214	143	107	
			Fr	0.0006	0.0009	0.0012	0.0018	0.0023	0.0035	0.0047	
			Feed (ipm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
≤ 440 Bhn or ≤ 47 HRc		21 (17-25)	RPM	642	428	321	214	160	107	80	
			Fr	0.0002	0.0002	0.0003	0.0005	0.0006	0.0009	0.0012	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
<b>N</b>  <b>ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075</b>	≤ 80 Bhn or ≤ 47 HRb	225 (180-270)	RPM	6876	4584	3438	2292	1719	1146	860	
			Fr	0.0011	0.0017	0.0023	0.0034	0.0045	0.0068	0.0091	
			Feed (ipm)	7.8	7.8	7.8	7.8	7.8	7.8	7.8	
	≤ 150 Bhn or ≤ 7 HRc	190 (152-228)	RPM	5806	3871	2903	1935	1452	968	726	
			Fr	0.0011	0.0017	0.0022	0.0034	0.0045	0.0067	0.0090	
			Feed (ipm)	6.5	6.5	6.5	6.5	6.5	6.5	6.5	
	≤ 140 Bhn or ≤ 3 HRc	95 (76-114)	RPM	2903	1935	1452	968	726	484	363	
			Fr	0.0006	0.0009	0.0012	0.0018	0.0023	0.0035	0.0047	
			Feed (ipm)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	
	≤ 200 Bhn or ≤ 23 HRc	80 (64-96)	RPM	2445	1630	1222	815	611	407	306	
			Fr	0.0006	0.0009	0.0011	0.0017	0.0023	0.0034	0.0046	
			Feed (ipm)	1.4	1.4	1.4	1.4	1.4	1.4	1.4	
<b>COPPER ALLOYS Alum Bronze, C110, Muntz Brass</b>											

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 rpm = Vc x 3.82 / D<sub>1</sub>  
 ipm = Fr x rpm  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstoool.com](http://www.kyocera-sgstoool.com))

# 6 Flute Countersink



**606**

FRACTIONAL SERIES

CUTTING DIAMETER D <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	inch		EDP NO.			STOCK
		OVERALL LENGTH L <sub>1</sub>	TIP DIAMETER D <sub>3</sub>	UNCOATED 60°	UNCOATED 82°	UNCOATED 90°	
1/8	1/8	1-1/2	.035	—	—	74249	●
1/8	1/8	1-1/2	.035	—	74149	—	●
1/8	1/8	1-1/2	.035	74049	—	—	●
3/16	3/16	2	.045	—	—	74252	●
3/16	3/16	2	.045	—	74152	—	●
3/16	3/16	2	.045	74052	—	—	●
1/4	1/4	2	.070	—	—	74255	●
1/4	1/4	2	.070	—	74155	—	●
1/4	1/4	2	.070	74055	—	—	●
3/8*	1/4	2-13/16	.100	—	—	74258	●
3/8*	1/4	2-13/16	.100	—	74158	—	●
3/8*	1/4	2-13/16	.100	74058	—	—	●
1/2*	1/4	2-7/8	.160	—	—	74261	●
1/2*	1/4	2-7/8	.160	—	74161	—	●
1/2*	1/4	2-7/8	.160	74061	—	—	●
5/8*	3/8	3	.190	—	—	74264	●
5/8*	3/8	3	.190	—	74164	—	●
5/8*	3/8	3	.190	74064	—	—	●
3/4*	1/2	3	.220	—	—	74267	●
3/4*	1/2	3	.220	—	74167	—	●
3/4*	1/2	3	.220	74067	—	—	●
1*	1/2	3-1/4	.260	—	—	74270	●
1*	1/2	3-1/4	.260	—	74170	—	●
1*	1/2	3-1/4	.260	74070	—	—	●

\*Steel Shank / Con mango de acero / Avec queue en acier

NOTE: D<sub>3</sub> dimension varies based on angle. Contact KSPT representative or consult Tool Wizard for dimension information.

**TOLERANCES (inch)**

**1/8–1/4 DIAMETER**

D<sub>1</sub> = +.0000/–.0005

**3/8–1 DIAMETER**

D<sub>1</sub> = +.003/–.000

Included Angle

+1°/–1°

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# 6 Flute Countersink

Series 606 Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/8	3/16	1/4	3/8	1/2	3/4	1		
<b>P</b>  <b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	125	RPM	3820	2547	1910	1273	955	637	478	
		(100-150)	Fr	0.0010	0.0016	0.0021	0.0031	0.0042	0.0063	0.0084	
			Feed (ipm)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
	≤ 300 Bhn or ≤ 32 HRc	60	RPM	1834	1222	917	611	458	306	229	
		(48-72)	Fr	0.0010	0.0015	0.0020	0.0029	0.0039	0.0059	0.0079	
			Feed (ipm)	1.8	1.8	1.8	1.8	1.8	1.8	1.8	
	≤ 425 Bhn or ≤ 45 HRc	45	RPM	1375	917	688	458	344	229	172	
		(36-54)	Fz	0.0006	0.0009	0.0012	0.0017	0.0023	0.0035	0.0047	
			Feed (ipm)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	
	<b>H</b>  <b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	95	RPM	2903	1935	1452	968	726	484	363
			(76-114)	Fz	0.0009	0.0013	0.0018	0.0027	0.0036	0.0054	0.0072
				Feed (ipm)	2.6	2.6	2.6	2.6	2.6	2.6	2.6
≤ 375 Bhn or ≤ 40 HRc		60	RPM	1834	1222	917	611	458	306	229	
		(48-72)	Fr	0.0009	0.0014	0.0019	0.0028	0.0037	0.0056	0.0074	
			Feed (ipm)	1.7	1.7	1.7	1.7	1.7	1.7	1.7	
≤ 450 Bhn or ≤ 48 HRc		35	RPM	1070	713	535	357	267	178	134	
		(28-42)	Fr	0.0006	0.0008	0.0011	0.0017	0.0022	0.0034	0.0045	
			Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
<b>K</b>  <b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2		≤ 250 Bhn or ≤ 24 HRc	35	RPM	1070	713	535	357	267	178	134
			(28-42)	Fr	0.0006	0.0008	0.0011	0.0017	0.0022	0.0034	0.0045
				Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	≤ 375 Bhn or ≤ 40 HRc	25	RPM	764	509	382	255	191	127	96	
		(20-30)	Fr	0.0003	0.0004	0.0005	0.0008	0.0010	0.0016	0.0021	
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
	≤ 475 Bhn or ≤ 50 HRc	20	RPM	611	407	306	204	153	102	76	
		(16-24)	Fr	0.0003	0.0005	0.0007	0.0010	0.0013	0.0020	0.0026	
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
	<b>K</b>  <b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	105	RPM	3209	2139	1604	1070	802	535	401
			(84-126)	Fr	0.0012	0.0018	0.0024	0.0036	0.0049	0.0073	0.0097
				Feed (ipm)	3.9	3.9	3.9	3.9	3.9	3.9	3.9
≤ 330 Bhn or ≤ 36 HRc		75	RPM	2292	1528	1146	764	573	382	287	
		(60-90)	Fr	0.0012	0.0018	0.0024	0.0037	0.0049	0.0073	0.0098	
			Feed (ipm)	2.8	2.8	2.8	2.8	2.8	2.8	2.8	

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# 6 Flute Countersink

Series 606 Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/8	3/16	1/4	3/8	1/2	3/4	1		
<b>M</b>  <b>STAINLESS STEELS (FREE MACHINING)</b> 303, 416, 420F, 430F 440F	≤ 250 Bhn or ≤ 24 HRc	53	RPM	1620	1080	810	540	405	270	202	
		(42-64)	Fr	0.0006	0.0009	0.0012	0.0019	0.0025	0.0037	0.0049	
			Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
	≤ 330 Bhn or ≤ 36 HRc	46	RPM	1406	937	703	469	351	234	176	
		(37-55)	Fr	0.0005	0.0007	0.0010	0.0015	0.0020	0.0030	0.0040	
			Feed (ipm)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	
	<b>S</b>  <b>STAINLESS STEELS (DIFFICULT)</b> 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	28	RPM	856	570	428	285	214	143	107
			(22-34)	Fr	0.0007	0.0011	0.0014	0.0021	0.0028	0.0042	0.0056
				Feed (IPM)	0.6	0.6	0.6	0.6	0.6	0.6	0.6
		≤ 375 Bhn or ≤ 40 HRc	21	RPM	642	428	321	214	160	107	80
			(17-25)	Fr	0.0003	0.0005	0.0006	0.0009	0.0012	0.0019	0.0025
				Feed (IPM)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
<b>S</b>  <b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE)</b> Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy		≤ 220 Bhn or ≤ 19 HRc	18	RPM	550	367	275	183	138	92	69
			(14-22)	Fr	0.0005	0.0008	0.0011	0.0016	0.0022	0.0033	0.0044
				Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3
		≤ 320 Bhn or ≤ 34 HRc	14	RPM	428	285	214	143	107	71	53
			(11-17)	Fr	0.0005	0.0007	0.0009	0.0014	0.0019	0.0028	0.0037
				Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
	≤ 425 Bhn or ≤ 45 HRc	12	RPM	367	244	183	122	92	61	46	
		(10-14)	Fr	0.0003	0.0004	0.0005	0.0008	0.0011	0.0016	0.0022	
			Feed (ipm)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	<b>S</b>  <b>TITANIUM ALLOYS</b> Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	36	RPM	1100	733	550	367	275	183	138
			(29-43)	Fr	0.0009	0.0014	0.0018	0.0027	0.0036	0.0055	0.0073
				Feed (ipm)	1.0	1.0	1.0	1.0	1.0	1.0	1.0
≤ 350 Bhn or ≤ 38 HRc		28	RPM	856	570	428	285	214	143	107	
		(22-34)	Fr	0.0007	0.0011	0.0014	0.0021	0.0028	0.0042	0.0056	
			Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
≤ 440 Bhn or ≤ 47 HRc		21	RPM	642	428	321	214	160	107	80	
		(17-25)	Fr	0.0003	0.0005	0.0006	0.0009	0.0012	0.0019	0.0025	
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	

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# 6 Flute Countersink

Series 606 Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)							
			1/8	3/16	1/4	3/8	1/2	3/4	1	
<b>ALUMINUM ALLOYS</b> 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	225	RPM	6876	4584	3438	2292	1719	1146	860
		(180-270)	Fr	0.0015	0.0022	0.0030	0.0045	0.0060	0.0090	0.0120
			Feed (ipm)	10.3	10.3	10.3	10.3	10.3	10.3	10.3
	≤ 150 Bhn or ≤ 7 HRc	190	RPM	5806	3871	2903	1935	1452	968	726
		(152-228)	Fr	0.0015	0.0022	0.0030	0.0045	0.0060	0.0090	0.0120
			Feed (ipm)	8.7	8.7	8.7	8.7	8.7	8.7	8.7
<b>COPPER ALLOYS</b> Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	95	RPM	2903	1935	1452	968	726	484	363
		(76-114)	Fr	0.0008	0.0011	0.0015	0.0023	0.0030	0.0045	0.0061
			Feed (ipm)	2.2	2.2	2.2	2.2	2.2	2.2	2.2
	≤ 200 Bhn or ≤ 23 HRc	80	RPM	2445	1630	1222	815	611	407	306
		(64-96)	Fr	0.0008	0.0012	0.0016	0.0023	0.0031	0.0047	0.0062
			Feed (ipm)	1.9	1.9	1.9	1.9	1.9	1.9	1.9

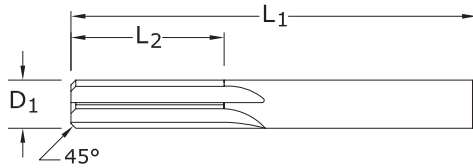
Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fr \times rpm$   
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

METRIC

# Straight Flute Reamer



**201M**  
METRIC SERIES



CUTTING DIAMETER D <sub>1</sub>	mm		NO. OF FLUTES	EDP NO.	STOCK
	MAXIMUM REAM LENGTH L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>		UNCOATED	
1,0	6,0	32,0	4	81001	●
1,5	9,5	38,0	4	81003	●
2,0	12,7	44,0	4	81005	●
2,5	12,7	50,0	4	81007	●
3,0	16,0	57,0	4	81009	●
3,5	19,0	63,0	4	81011	●
4,0	19,0	63,0	4	81013	●
4,5	22,0	70,0	4	81015	●
5,0	25,0	75,0	4	81017	●
5,5	25,0	75,0	4	81019	●
6,0	25,0	75,0	4	81021	●
7,0	28,0	82,0	6	81023	●
8,0	28,0	82,0	6	81025	●
9,0	31,0	89,0	6	81027	●
10,0	31,0	89,0	6	81029	●

**TOLERANCES (mm)**

**1-6 DIAMETER**

D<sub>1</sub> = +0,008/-0,000

**>6-10 DIAMETER**

D<sub>1</sub> = +0,011/-0,000

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- NON-FERROUS
- HARDENED STEELS

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# Straight Flute Reamer

Series 201M Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
			1	2	3	4	6	8	10		
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	46	RPM	14541	7271	4847	3635	2424	1818	1454
			(37-55)	Fr	0.028	0.056	0.085	0.113	0.169	0.226	0.282
			Feed (mm/min)	410	410	410	410	410	410	410	
		≤ 300 Bhn or ≤ 32 HRc	23	RPM	7271	3635	2424	1818	1212	909	727
			(18-27)	Fr	0.025	0.050	0.074	0.099	0.149	0.198	0.248
			Feed (mm/min)	180	180	180	180	180	180	180	
	≤ 425 Bhn or ≤ 45 HRc	17	RPM	5332	2666	1777	1333	889	666	533	
		(13-20)	Fz	0.015	0.030	0.044	0.059	0.089	0.119	0.148	
		Feed (mm/min)	79	79	79	79	79	79	79		
	<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	35	RPM	11148	5574	3716	2787	1858	1394	1115
			(28-42)	Fz	0.024	0.048	0.072	0.096	0.144	0.192	0.240
			Feed (mm/min)	268	268	268	268	268	268	268	
≤ 375 Bhn or ≤ 40 HRc		21	RPM	6786	3393	2262	1696	1131	848	679	
		(17-26)	Fr	0.024	0.048	0.072	0.096	0.144	0.192	0.240	
		Feed (mm/min)	163	163	163	163	163	163	163		
≤ 450 Bhn or ≤ 48 HRc	14	RPM	4362	2181	1454	1091	727	545	436		
	(11-16)	Fr	0.015	0.030	0.045	0.060	0.089	0.119	0.149		
	Feed (mm/min)	65	65	65	65	65	65	65			
<b>H</b>	<b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250 Bhn or ≤ 24 HRc	12	RPM	3878	1939	1293	969	646	485	388
			(10-15)	Fr	0.015	0.031	0.046	0.062	0.093	0.124	0.155
			Feed (mm/min)	60	60	60	60	60	60	60	
		≤ 375 Bhn or ≤ 40 HRc	8	RPM	2424	1212	808	606	404	303	242
			(6-9)	Fr	0.010	0.020	0.030	0.040	0.059	0.079	0.099
			Feed (mm/min)	24	24	24	24	24	24	24	
	≤ 475 Bhn or ≤ 50 HRc	6	RPM	1939	969	646	485	323	242	194	
		(5-7)	Fr	0.006	0.012	0.019	0.025	0.037	0.050	0.062	
		Feed (mm/min)	12	12	12	12	12	12	12		
	≤ 655 Bhn or ≤ 60 HRc	4	RPM	1272	636	424	318	212	159	127	
		(3-5)	Fr	0.006	0.013	0.019	0.025	0.038	0.050	0.063	
		Feed (mm/min)	8	8	8	8	8	8	8		
<b>K</b>	<b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	38	RPM	12118	6059	4039	3029	2020	1515	1212
			(30-46)	Fr	0.032	0.064	0.097	0.129	0.193	0.257	0.322
			Feed (mm/min)	390	390	390	390	390	390	390	
		≤ 330 Bhn or ≤ 36 HRc	29	RPM	9209	4605	3070	2302	1535	1151	921
			(23-35)	Fr	0.032	0.064	0.096	0.128	0.192	0.256	0.320
			Feed (mm/min)	295	295	295	295	295	295	295	

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# Straight Flute Reamer

Series 201M Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)									
			1	2	3	4	6	8	10			
<b>M</b>	<b>STAINLESS STEELS (FREE MACHINING)</b> 303, 416, 420F, 430F 440F	≤ 250 Bhn or ≤ 24 HRc	23	RPM	7271	3635	2424	1818	1212	909	727	
			(18-27)	Fr	0.015	0.030	0.045	0.059	0.089	0.119	0.149	
				Feed (mm/min)	108	108	108	108	108	108	108	
		≤ 330 Bhn or ≤ 36 HRc	(13-20)	17	RPM	5332	2666	1777	1333	889	666	533
				Fr	0.012	0.024	0.036	0.048	0.072	0.096	0.120	
				Feed (mm/min)	64	64	64	64	64	64	64	
	<b>STAINLESS STEELS (DIFFICULT)</b> 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	(9-13)	11	RPM	3393	1696	1131	848	565	424	339
				Fr	0.015	0.029	0.044	0.059	0.088	0.118	0.147	
				Feed (mm/min)	50	50	50	50	50	50	50	
		≤ 375 Bhn or ≤ 40 HRc	(6-9)	8	RPM	2424	1212	808	606	404	303	242
				Fr	0.010	0.020	0.030	0.040	0.059	0.079	0.099	
				Feed (mm/min)	24	24	24	24	24	24	24	
<b>S</b>	<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE)</b> Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy	≤ 220 Bhn or ≤ 19 HRc	(5-7)	6	RPM	1939	969	646	485	323	242	194
				Fr	0.012	0.024	0.036	0.047	0.071	0.095	0.119	
				Feed (mm/min)	23	23	23	23	23	23	23	
		≤ 320 Bhn or ≤ 34 HRc	(4-5)	5	RPM	1454	727	485	364	242	182	145
				Fr	0.010	0.021	0.031	0.041	0.062	0.083	0.103	
				Feed (mm/min)	15	15	15	15	15	15	15	
	≤ 425 Bhn or ≤ 45 HRc	(2-4)	3	RPM	969	485	323	242	162	121	97	
			Fr	0.006	0.012	0.019	0.025	0.037	0.050	0.062		
			Feed (mm/min)	6	6	6	6	6	6	6		
	<b>TITANIUM ALLOYS</b> Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V	≤ 275 Bhn or ≤ 28 HRc	(11-16)	14	RPM	4362	2181	1454	1091	727	545	436
				Fr	0.024	0.048	0.072	0.096	0.144	0.193	0.241	
				Feed (mm/min)	105	105	105	105	105	105	105	
≤ 350 Bhn or ≤ 38 HRc		(9-13)	11	RPM	3393	1696	1131	848	565	424	339	
			Fr	0.015	0.029	0.044	0.059	0.088	0.118	0.147		
			Feed (mm/min)	50	50	50	50	50	50	50		
≤ 440 Bhn or ≤ 47 HRc	(6-9)	8	RPM	2424	1212	808	606	404	303	242		
		Fr	0.010	0.020	0.030	0.040	0.059	0.079	0.099			
		Feed (mm/min)	24	24	24	24	24	24	24			

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# Straight Flute Reamer

Series 201M Metric	Hardness	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)								
			1	2	3	4	6	8	10		
<b>N</b>  <b>ALUMINUM ALLOYS</b> 2017, 2024, 356, 6061, 7075	≤ 80 Bhn or ≤ 47 HRb	82	RPM	26174	13087	8725	6544	4362	3272	2617	
		(66-99)	Fr	0.040	0.080	0.120	0.160	0.240	0.320	0.400	
			Feed (mm/min)	1047	1047	1047	1047	1047	1047	1047	
	≤ 150 Bhn or ≤ 7 HRc	70	RPM	22297	11148	7432	5574	3716	2787	2230	
		(56-84)	Fr	0.040	0.080	0.120	0.160	0.240	0.320	0.400	
			Feed (mm/min)	892	892	892	892	892	892	892	
	<b>COPPER ALLOYS</b> Alum Bronze, C110, Muntz Brass	≤ 140 Bhn or ≤ 3 HRc	35	RPM	11148	5574	3716	2787	1858	1394	1115
			(28-42)	Fr	0.020	0.041	0.061	0.081	0.122	0.163	0.204
				Feed (mm/min)	227	227	227	227	227	227	227
≤ 200 Bhn or ≤ 23 HRc		29	RPM	9209	4605	3070	2302	1535	1151	921	
		(23-35)	Fr	0.020	0.041	0.061	0.082	0.122	0.163	0.204	
			Feed (mm/min)	188	188	188	188	188	188	188	

Bhn (Brinell)    HRc (Rockwell C)    HRb (Rockwell B)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fr \times rpm$   
 increase speed and feed 30 percent when using coated reamers  
 reduce speed and feed for materials harder than listed  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# Straight Flute Accu-Reamer

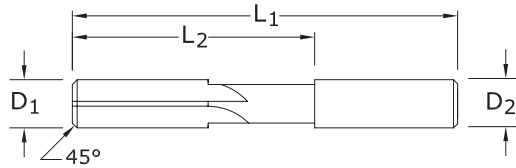


5xD



**200**

FRACTIONAL SERIES



inch					EDP NO.	
CUTTING DIAMETER D <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	MAXIMUM REAM LENGTH L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	NO. OF FLUTES	UNCOATED	STOCK
3/64	3/64	3/4	1-1/2	4	70003	●
1/16	1/16	3/4	1-1/2	4	70004	●
5/64	5/64	1	2	4	70005	●
3/32	3/32	1-1/4	2-1/4	4	70006	●
7/64	7/64	1-1/4	2-1/4	4	70007	●
1/8	1/8	1-1/4	2-1/4	4	70008	●
9/64	9/64	1-1/2	2-1/2	4	70009	●
5/32	5/32	1-1/2	2-1/2	4	70010	●
11/64	11/64	1-3/4	2-3/4	4	70011	●
3/16	3/16	1-3/4	2-3/4	4	70012	●
13/64	13/64	2	3	4	70013	●
7/32	7/32	2	3	4	70014	●
15/64	15/64	2	3	4	70015	●
1/4	1/4	2	3	4	70016	●
17/64	17/64	2-1/4	3-1/4	6	70017	●
9/32	9/32	2-1/4	3-1/4	6	70018	●
19/64	19/64	2-1/4	3-1/4	6	70019	●
5/16	5/16	2-1/4	3-1/4	6	70020	●
21/64	21/64	2-3/8	3-1/2	6	70021	●
11/32	11/32	2-3/8	3-1/2	6	70022	●
23/64	23/64	2-3/8	3-1/2	6	70023	●
3/8	3/8	2-3/8	3-1/2	6	70024	●
25/64	25/64	2-7/8	4	6	70025	●
13/32	13/32	2-7/8	4	6	70026	●
27/64	27/64	2-7/8	4	6	70027	●
7/16	7/16	2-7/8	4	6	70028	●
29/64	29/64	2-7/8	4	6	70029	●
15/32	15/32	2-7/8	4	6	70030	●
31/64	31/64	2-7/8	4	6	70031	●
1/2	1/2	2-7/8	4	6	70032	●

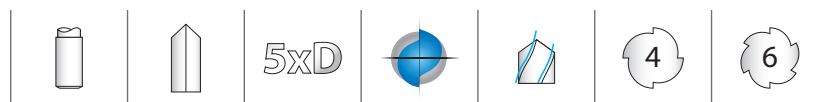
**TOLERANCES (inch)**

D<sub>1</sub> = +.0002/-0.0000  
D<sub>2</sub> = +.0002/-0.0000

- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- NON-FERROUS
- PLASTICS/COMPOSITES
- HARDENED STEELS

● U.S. Stock Standard  
■ NOT STOCKED—  
Call for Delivery

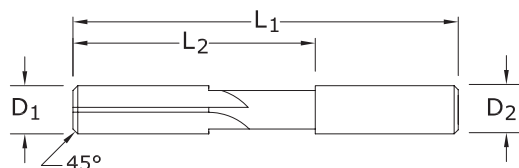
# Straight Flute Accu-Reamer



**TOLERANCES (inch)**

D<sub>1</sub> = +.0002/-0.0000

D<sub>2</sub> = +.0002/-0.0000



**200**  
FRACTIONAL SERIES

inch				NO. OF FLUTES
CUTTING DIAMETER D <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	MAXIMUM REAM LENGTH L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	
.0470 – .0625	1/16	3/4	1-1/2	4
.0626 – .0781	5/64	1	2	4
.0782 – .0938	3/32	1-1/4	2-1/4	4
.0939 – .1094	7/64	1-1/4	2-1/4	4
.1095 – .1250	1/8	1-1/4	2-1/4	4
.1251 – .1406	9/64	1-1/2	2-1/2	4
.1407 – .1563	5/32	1-1/2	2-1/2	4
.1564 – .1719	11/64	1-3/4	2-3/4	4
.1720 – .1875	3/16	1-3/4	2-3/4	4
.1876 – .2031	13/64	2	3	4
.2032 – .2188	7/32	2	3	4
.2189 – .2344	15/64	2	3	4
.2345 – .2500	1/4	2	3	4
.2501 – .2656	17/64	2-1/4	3-1/4	6
.2657 – .2813	9/32	2-1/4	3-1/4	6
.2814 – .2969	19/64	2-1/4	3-1/4	6
.2970 – .3125	5/16	2-1/4	3-1/4	6
.3126 – .3281	21/64	2-3/8	3-1/2	6
.3282 – .3438	11/32	2-3/8	3-1/2	6
.3439 – .3594	23/64	2-3/8	3-1/2	6
.3595 – .3750	3/8	2-3/8	3-1/2	6
.3751 – .3906	25/64	2-7/8	4	6
.3907 – .4063	13/32	2-7/8	4	6
.4064 – .4219	27/64	2-7/8	4	6
.4220 – .4375	7/16	2-7/8	4	6
.4376 – .4531	29/64	2-7/8	4	6
.4532 – .4688	15/32	2-7/8	4	6
.4689 – .4844	31/64	2-7/8	4	6
.4845 – .5000	1/2	2-7/8	4	6

SER 200 Fractional reamers can be ordered to specific diameters according to the size range of Cutting Diameter D<sub>1</sub>. Please order as:

- 200. Then the size of the cut diameter in fractional format.
  - i.e. 200.0492
  - Description: Series 200 size 0.0492
  - For Metric sizes convert to fractional inches (i.e. ÷ 25.4)
  - The above sample would be a 1.25mm size (1.25 ÷ 25.4 = 0.0492")
- All other dimensions are fractional as per table including the Shank



# Straight Flute Accu-Reamer

Series 200 Fractional	Hardness	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)								
			1/16	1/8	3/16	1/4	5/16	3/8	1/2		
<b>P</b>	<b>CARBON STEELS</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175 Bhn or ≤ 7 HRc	150	RPM	9168	4584	3056	2292	1834	1528	1146
			(120-180)	Fr	0.0018	0.0035	0.0053	0.0071	0.0088	0.0106	0.0141
				Feed (ipm)	16.5	16.0	16.2	16.3	16.1	16.2	16.2
		≤ 300 Bhn or ≤ 32 HRc	75	RPM	4584	2292	1528	1146	917	764	573
			(60-90)	Fr	0.0016	0.0031	0.0047	0.0062	0.0078	0.0093	0.0124
				Feed (ipm)	7.3	7.1	7.2	7.1	7.2	7.1	7.1
	≤ 425 Bhn or ≤ 45 HRc	55	RPM	3362	1681	1121	840	672	560	420	
		(44-66)	Fz	0.0009	0.0019	0.0028	0.0037	0.0046	0.0056	0.0074	
			Feed (ipm)	3.0	3.2	3.1	3.1	3.1	3.1	3.1	
	<b>ALLOY STEELS</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275 Bhn or ≤ 28 HRc	115	RPM	7029	3514	2343	1757	1406	1171	879
			(92-138)	Fz	0.0015	0.0030	0.0045	0.0060	0.0075	0.0090	0.0120
				Feed (ipm)	10.5	10.5	10.5	10.5	10.5	10.5	10.5
≤ 375 Bhn or ≤ 40 HRc		70	RPM	4278	2139	1426	1070	856	713	535	
		(56-84)	Fr	0.0015	0.0030	0.0045	0.0060	0.0075	0.0090	0.0120	
			Feed (ipm)	6.4	6.4	6.4	6.4	6.4	6.4	6.4	
≤ 450 Bhn or ≤ 48 HRc	45	RPM	2750	1375	917	688	550	458	344		
	(36-54)	Fr	0.0009	0.0019	0.0028	0.0037	0.0046	0.0056	0.0074		
		Feed (ipm)	2.5	2.6	2.6	2.5	2.5	2.6	2.5		
<b>H</b>	<b>TOOL STEELS</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250 Bhn or ≤ 24 HRc	40	RPM	2445	1222	815	611	489	407	306
			(32-48)	Fr	0.0010	0.0020	0.0029	0.0039	0.0049	0.0059	0.0078
				Feed (ipm)	2.4	2.4	2.4	2.4	2.4	2.4	2.4
		≤ 375 Bhn or ≤ 40 HRc	25	RPM	1528	764	509	382	306	255	191
			(20-30)	Fr	0.0006	0.0013	0.0019	0.0025	0.0031	0.0038	0.0050
				Feed (ipm)	0.9	1.0	1.0	1.0	0.9	1.0	1.0
	≤ 475 Bhn or ≤ 50 HRc	20	RPM	1222	611	407	306	244	204	153	
		(16-24)	Fr	0.0004	0.0008	0.0012	0.0016	0.0019	0.0023	0.0031	
			Feed (ipm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
	≤ 655 Bhn or ≤ 60 HRc	14	RPM	856	428	285	214	171	143	107	
		(11-17)	Fr	0.0003	0.0007	0.0011	0.0014	0.0018	0.0021	0.0028	
			Feed (ipm)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
<b>K</b>	<b>CAST IRONS</b> Gray, Malleable, Ductile	≤ 220 Bhn or ≤ 19 HRc	125	RPM	7640	3820	2547	1910	1528	1273	955
			(100-150)	Fr	0.0020	0.0040	0.0060	0.0081	0.0101	0.0121	0.0161
				Feed (ipm)	15.3	15.3	15.3	15.5	15.4	15.4	15.4
		≤ 330 Bhn or ≤ 36 HRc	95	RPM	5806	2903	1935	1452	1161	968	726
			(76-114)	Fr	0.0020	0.0040	0.0060	0.0081	0.0101	0.0121	0.0161
				Feed (ipm)	11.6	11.6	11.6	11.8	11.7	11.7	11.7
<b>M</b>	<b>STAINLESS STEELS</b> (FREE MACHINING) 303, 416, 420F, 430F 440F	≤ 250 Bhn or ≤ 24 HRc	75	RPM	4584	2292	1528	1146	917	764	573
			(60-90)	Fr	0.0010	0.0020	0.0029	0.0039	0.0049	0.0059	0.0078
				Feed (ipm)	4.6	4.6	4.4	4.5	4.5	4.5	4.5
		≤ 330 Bhn or ≤ 36 HRc	55	RPM	3362	1681	1121	840	672	560	420
			(44-66)	Fr	0.0008	0.0015	0.0023	0.0030	0.0038	0.0045	0.0060
				Feed (ipm)	2.7	2.5	2.6	2.5	2.6	2.5	2.5
	<b>STAINLESS STEELS</b> (DIFFICULT) 304, 316, 321, 13-8 PH, 15-5PH, 17-4 PH, Custom 450	≤ 275 Bhn or ≤ 28 HRc	35	RPM	2139	1070	713	535	428	357	267
			(28-42)	Fr	0.0010	0.0020	0.0029	0.0039	0.0049	0.0059	0.0078
				Feed (ipm)	2.1	2.1	2.1	2.1	2.1	2.1	2.1
		≤ 375 Bhn or ≤ 40 HRc	25	RPM	1528	764	509	382	306	255	191
			(20-30)	Fr	0.0006	0.0013	0.0019	0.0025	0.0031	0.0038	0.0050
				Feed (ipm)	0.9	1.0	1.0	1.0	0.9	1.0	1.0

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# Straight Flute Accu-Reamer

Series 200 Fractional	Hardness	Vc (sfm)		Diameter (D <sub>1</sub> ) (inch)							
				1/16	1/8	3/16	1/4	5/16	3/8	1/2	
<b>SUPER ALLOYS (NICKEL, COBALT, IRON BASE) Inconel 601, 617, 625, Incoloy 800, Monel 400, Rene, Waspaloy</b>	≤ 220 Bhn or ≤ 19 HRc	20 (16-24)	RPM	1222	611	407	306	244	204	153	
			Fr	0.0008	0.0015	0.0023	0.0030	0.0038	0.0045	0.0060	
			Feed (ipm)	1.0	0.9	0.9	0.9	0.9	0.9	0.9	
	≤ 320 Bhn or ≤ 34 HRc	15 (12-18)	RPM	917	458	306	229	183	153	115	
			Fr	0.0006	0.0013	0.0019	0.0025	0.0031	0.0038	0.0050	
			Feed (ipm)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	
	≤ 425 Bhn or ≤ 45 HRc	10 (8-12)	RPM	611	306	204	153	122	102	76	
			Fr	0.0004	0.0007	0.0011	0.0015	0.0018	0.0022	0.0029	
			Feed (ipm)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	
	<b>TITANIUM ALLOYS Pure Titanium, Ti6Al4V, Ti6Al2Sn4Zr2Mo, Ti4Al4Mo2Sn0.5Si, Ti-6Al4V</b>	≤ 275 Bhn or ≤ 28 HRc	45 (36-54)	RPM	2750	1375	917	688	550	458	344
				Fr	0.0015	0.0030	0.0045	0.0060	0.0075	0.0090	0.0120
				Feed (ipm)	4.1	4.1	4.1	4.1	4.1	4.1	4.1
≤ 350 Bhn or ≤ 38 HRc		35 (28-42)	RPM	2139	1070	713	535	428	357	267	
			Fr	0.0010	0.0020	0.0029	0.0039	0.0049	0.0059	0.0078	
			Feed (ipm)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	
≤ 440 Bhn or ≤ 47 HRc		25 (20-30)	RPM	1528	764	509	382	306	255	191	
			Fr	0.0006	0.0013	0.0019	0.0025	0.0031	0.0038	0.0050	
			Feed (ipm)	0.9	1.0	1.0	1.0	0.9	1.0	1.0	
<b>ALUMINUM ALLOYS 2017, 2024, 356, 6061, 7075</b>		≤ 80 Bhn or ≤ 47 HRb	270 (216-324)	RPM	16502	8251	5501	4126	3300	2750	2063
				Fr	0.0025	0.0050	0.0075	0.0100	0.0125	0.0150	0.0200
				Feed (ipm)	41.3	41.3	41.3	41.3	41.3	41.3	41.3
	≤ 150 Bhn or ≤ 7 HRc	230 (184-276)	RPM	14058	7029	4686	3514	2812	2343	1757	
			Fr	0.0025	0.0050	0.0075	0.0100	0.0125	0.0150	0.0200	
			Feed (ipm)	35.1	35.1	35.1	35.1	35.1	35.1	35.1	
	<b>COPPER ALLOYS Alum Bronze, C110, Muntz Brass</b>	≤ 140 Bhn or ≤ 3 HRc	115 (92-138)	RPM	7029	3514	2343	1757	1406	1171	879
				Fr	0.0013	0.0026	0.0038	0.0051	0.0064	0.0077	0.0102
				Feed (ipm)	9.1	9.1	8.9	9.0	9.0	9.0	9.0
		≤ 200 Bhn or ≤ 23 HRc	95 (76-114)	RPM	5806	2903	1935	1452	1161	968	726
				Fr	0.0013	0.0026	0.0038	0.0051	0.0064	0.0077	0.0102
				Feed (ipm)	7.5	7.5	7.4	7.4	7.4	7.5	7.4

Bhn (Brinell) HRc (Rockwell C) HRb (Rockwell B)

rpm = Vc x 3.82 / D<sub>1</sub>

ipm = Fr x rpm

increase speed and feed 30 percent when using coated reamers

reduce speed and feed for materials harder than listed

refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

## Routers



## Routing

<b>HIGH PERFORMANCE ROUTERS</b>	<b>SERIES</b>	<b>DESCRIPTION</b>	<b>PAGE</b>
Plastic Composite	29	Multi-Flute Plastic Composite Fractional	322
	29M	Multi-Flute Plastic Composite Metric	324
Carbon Composite	20-CCR	Multi-Flute Carbon Composite Fractional	326
	20M-CCR	Multi-Flute Carbon Composite Metric	328
Coarse Cut Carbon Composite	31-CCR	Multi-Flute Coarse Composite Fractional	330
	31M-CCR	Multi-Flute Coarse Composite Metric	332
Compression	25	Multi-Flute Compression Fractional	334
	25-M	Multi-Flute Compression Metric	336
<b>GENERAL PURPOSE ROUTERS</b>	<b>SERIES</b>	<b>DESCRIPTION</b>	<b>PAGE</b>
Up Cut	21	2 Flute Up Cut Fractional	338
	21M	2 Flute Up Cut Metric	341
Down Cut	22	2 Flute Down Cut Fractional	339
	22M	2 Flute Down Cut Metric	342

*Speed & Feed Recommendations listed after each series*

## Ranurado

<b>RANURADORES DE ALTO RENDIMIENTO</b>			
	<b>SERIE</b>	<b>DESCRIPCIÓN</b>	<b>PÁGINA</b>
Compuesto de plástico	29	Filo múltiple, compuesto plástico, fraccional	322
	29M	Filo múltiple, compuesto plástico, métrico	324
Compuesto de carbono	20-CCR	Filo múltiple, compuesto de carbono, fraccional	326
	20M-CCR	Filo múltiple, compuesto de carbono, métrico	328
Compuesto de carbono de corte áspero	31-CCR	Filo múltiple, compuesto áspero, fraccional	330
	31M-CCR	Filo múltiple, compuesto áspero, métrico	332
Compresión	25	Filo múltiple, compresión, fraccional	334
	25-M	Filo múltiple, compresión, métrico	336
<b>RANURADORES DE USO GENERAL</b>			
	<b>SERIE</b>	<b>DESCRIPCIÓN</b>	<b>PÁGINA</b>
Corte ascendente	21	2 fillos, corte ascendente, fraccional	338
	21M	2 fillos, corte ascendente, métrico	341
Corte descendente	22	2 fillos, corte descendente, fraccional	339
	22M	2 fillos, corte descendente, métrico	342

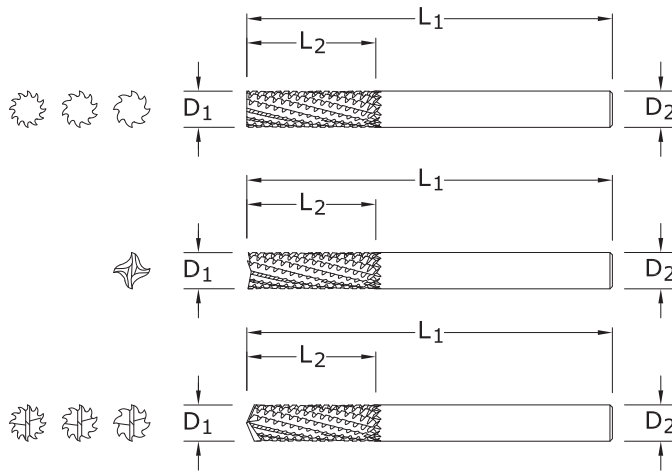
*Recomendaciones de velocidades y avances mostradas tras cada serie*

FRAISES A DETOURER HAUTE PERFORMANCE	SERIES	DESCRIPTION	PAGE
Composites plastique	29	Multi-dents pour composites plastique (fractionnel)	322
	29M	Multi-dents pour composites plastique (métrique)	324
Composites carbone	20-CCR	Multi-dents pour composites carbone (fractionnel)	326
	20M-CCR	Multi-dents pour composites carbone (métrique)	328
Pour composites carbone coupe grossière	31-CCR	Multi-dents pour composites grossiers (fractionnel)	330
	31M-CCR	Multi-dents pour composites grossiers (métrique)	332
Compression	25	Multi-dents de compression (fractionnel)	334
	25-M	Multi-dents de compression (métrique)	336

FRAISES À DÉTOURER UNIVERSELLES	SERIES	DESCRIPTION	PAGE
Coupe ascendante	21	2 dents coupe ascendante (fractionnel)	338
	21M	2 dents coupe ascendante (métrique)	341
Coupe descendante	22	2 dents coupe descendante (fractionnel)	339
	22M	2 dents coupe descendante (métrique)	342

*Recommandations de vitesse et avance indiquées après chaque série*

# Plastic Composite



## 29

### FRACTIONAL SERIES

- Radial chisel edge design provides smoother cuts and enhanced tool life
- Eccentric relief and neutral rake for strength
- Excels at trimming and profiling non-filled plastics as well as glass-filled plastics

inch						EDP NO.		STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	NO. OF FLUTES	END STYLE	UNCOATED	Di-NAMITE (Diamond)	
1/8	1/2	1-1/2	1/8	8	No End Cut	74280	75080	●
1/8	1/2	1-1/2	1/8	8	End Mill	74281	75081	●
1/8	1/2	1-1/2	1/8	8	Drill	74282	75082	●
1/4	1	2-1/2	1/4	10	No End Cut	74283	75083	●
1/4	1	2-1/2	1/4	10	End Mill	74284	75084	●
1/4	1	2-1/2	1/4	10	Drill	74285	75085	●
5/16	1	2-1/2	5/16	12	No End Cut	74286	75086	●
5/16	1	2-1/2	5/16	12	End Mill	74287	75087	●
5/16	1	2-1/2	5/16	12	Drill	74288	75088	●
3/8	1-1/8	2-1/2	3/8	12	No End Cut	74289	75089	●
3/8	1-1/8	2-1/2	3/8	12	End Mill	74290	75090	●
3/8	1-1/8	2-1/2	3/8	12	Drill	74291	75091	●

### TOLERANCES (inch)

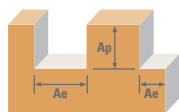
D<sub>1</sub> = +.000/- .005

D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# Plastic Composite



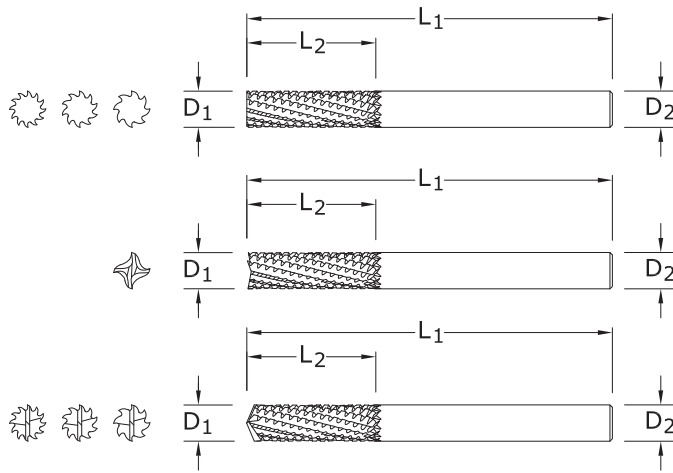
Series 29 Fractional	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)					
				1/8	1/4	5/16	3/8		
CFRP, AFRP (CARBON FIBER, ARAMID FIBER)	Slot 	1	≤ 1	400	RPM	12224	6112	4890	4075
				(320-480)	Fr	0.0024	0.0048	0.0060	0.0072
					Feed (ipm)	29	29	29	29
	Profile 	≤ 0.5	≤ 1.5	500	RPM	15280	7640	6112	5093
				(400-600)	Fr	0.0024	0.0048	0.0060	0.0072
					Feed (ipm)	37	37	37	37
	HSM 	≤ 0.5	≤ 2	825	RPM	25212	12606	10085	8404
				(660-990)	Fr	0.0055	0.0110	0.0138	0.0165
					Feed (ipm)	139	139	139	139
GFRP (FIBERGLASS)	Slot 	1	≤ 1	320	RPM	9779	4890	3912	3260
				(256-384)	Fr	0.0024	0.0048	0.0060	0.0072
					Feed (ipm)	23	23	23	23
	Profile 	≤ 0.5	≤ 1.5	400	RPM	12224	6112	4890	4075
				(320-480)	Fr	0.0024	0.0048	0.0060	0.0072
					Feed (ipm)	29	29	29	29
	HSM 	≤ 0.05	≤ 2	660	RPM	20170	10085	8068	6723
				(528-792)	Fr	0.0055	0.0110	0.0138	0.0165
					Feed (ipm)	111	111	111	111
CARBON, GRAPHITE	Slot 	1	≤ 1	480	RPM	14669	7334	5868	4890
				(384-576)	Fr	0.0037	0.0075	0.0094	0.0112
					Feed (ipm)	55	55	55	55
	Profile 	≤ 0.5	≤ 1.5	600	RPM	18336	9168	7334	6112
				(480-720)	Fr	0.0037	0.0075	0.0094	0.0112
					Feed (ipm)	69	69	69	69
	HSM 	≤ 0.05	≤ 2	990	RPM	30254	15127	12102	10085
				(792-1188)	Fr	0.0086	0.0172	0.0215	0.0258
					Feed (ipm)	260	260	260	260
PLASTICS	Slot 	1	≤ 1	800	RPM	24448	12224	9779	8149
				(640-690)	Fr	0.0038	0.0075	0.0094	0.0113
					Feed (ipm)	92	92	92	92
	Profile 	≤ 0.5	≤ 1.5	1000	RPM	30560	15280	12224	10187
				(800-1200)	Fr	0.0038	0.0075	0.0094	0.0113
					Feed (ipm)	115	115	115	115
	HSM 	≤ 0.05	≤ 2	1650	RPM	50424	25212	20170	16808
				(1320-1980)	Fr	0.0035	0.0069	0.0086	0.0104
					Feed (ipm)	174	174	174	174

HSM (high speed machining)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fr \times rpm$   
 adjust parameters based on resin type and fiber structure  
 reduce speed when overheating causes melting or damage to resin  
 reduce feed if delamination or fraying occur

finish cuts typically required reduced feed and cutting depths  
 rates shown are for use without coolant; rates may be increased with coolant  
 dust collection is vital when machining dry  
 diamond coating will increase tool life in graphite and composite materials  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))



# Plastic Composite



## 29M METRIC SERIES

- Radial chisel edge design provides smoother cuts and enhanced tool life
- Eccentric relief and neutral rake for strength
- Excels at trimming and profiling non-filled plastics as well as glass-filled plastics

mm						EDP NO.		STOCK
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	NO. OF FLUTES	END STYLE	UNCOATED	Di-NAMITE (Diamond)	
3,0	12,0	38,0	3,0	8	No End Cut	84280	85080	●
3,0	12,0	38,0	3,0	8	End Mill	84281	85081	●
3,0	12,0	38,0	3,0	8	Drill	84282	85082	●
6,0	25,0	63,0	6,0	10	No End Cut	84283	85083	●
6,0	25,0	63,0	6,0	10	End Mill	84284	85084	●
6,0	25,0	63,0	6,0	10	Drill	84285	85085	●
8,0	25,0	63,0	8,0	12	No End Cut	84286	85086	●
8,0	25,0	63,0	8,0	12	End Mill	84287	85087	●
8,0	25,0	63,0	8,0	12	Drill	84288	85088	●
10,0	25,0	63,0	10,0	12	No End Cut	84289	85089	●
10,0	25,0	63,0	10,0	12	End Mill	84290	85090	●
10,0	25,0	63,0	10,0	12	Drill	84291	85091	●

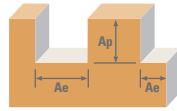
### TOLERANCES (mm)

D<sub>1</sub> = +0,00/-0,13  
D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# Plastic Composite



Series	Fractional	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)					
					3	6	8	10		
N	CFRP, AFRP (CARBON FIBER, ARAMID FIBER)	Slot 	1	≤ 1	120	RPM	12722	6361	4771	3817
					(96-164)	Fr	0.061	0.122	0.163	0.203
						Feed (mm/min)	776	776	776	776
		Profile 	≤ 0.5	≤ 1.5	150	RPM	15903	7951	5963	4771
					(120-180)	Fr	0.061	0.122	0.163	0.203
						Feed (mm/min)	970	970	970	970
	HSM 	≤ 0.5	≤ 2	250	RPM	26504	13252	9939	7951	
				(200-300)	Fr	0.140	0.280	0.373	0.467	
					Feed (mm/min)	3710	3710	3710	3710	
	GFRP (FIBERGLASS)	Slot 	1	≤ 1	100	RPM	10602	5301	3976	3181
					(80-120)	Fr	0.061	0.122	0.162	0.203
						Feed (mm/min)	646	646	646	646
Profile 		≤ 0.5	≤ 1.5	120	RPM	12722	6361	4771	3817	
				(96-164)	Fr	0.061	0.122	0.163	0.203	
					Feed (mm/min)	776	776	776	776	
HSM 	≤ 0.05	≤ 2	200	RPM	21203	10602	7951	6361		
			(160-240)	Fr	0.140	0.280	0.374	0.467		
				Feed (mm/min)	2970	2970	2970	2970		
CARBON, GRAPHITE	Slot 	1	≤ 1	145	RPM	15372	7686	5765	4612	
				(116-174)	Fr	0.095	0.190	0.253	0.317	
					Feed (mm/min)	1460	1460	1460	1460	
	Profile 	≤ 0.5	≤ 1.5	185	RPM	19613	9807	7355	5884	
				(148-222)	Fr	0.095	0.190	0.253	0.317	
					Feed (mm/min)	1863	1863	1863	1863	
HSM 	≤ 0.05	≤ 2	300	RPM	31805	15903	11927	9542		
			(240-360)	Fr	0.219	0.437	0.583	0.729		
				Feed (mm/min)	6957	6957	6957	6957		
PLASTICS	Slot 	1	≤ 1	245	RPM	25974	12987	9740	7792	
				(196-294)	Fr	0.037	0.075	0.100	0.125	
					Feed (mm/min)	974	974	974	974	
	Profile 	≤ 0.5	≤ 1.5	305	RPM	32335	16168	12126	9701	
				(244-366)	Fr	0.038	0.075	0.100	0.125	
					Feed (mm/min)	1213	1213	1213	1213	
HSM 	≤ 0.05	≤ 2	505	RPM	53538	26769	20077	16062		
			(404-606)	Fr	0.088	0.175	0.233	0.292		
				Feed (mm/min)	4685	4685	4685	4685		

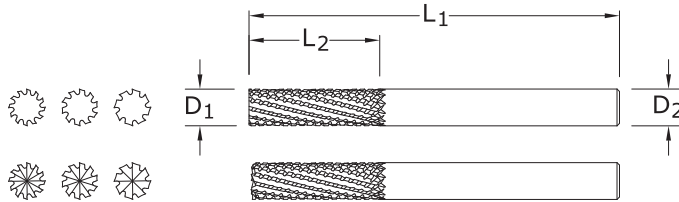
HSM (high speed machining)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fr \times rpm$   
 adjust parameters based on resin type and fiber structure  
 reduce speed when overheating causes melting or damage to resin  
 reduce feed if delamination or fraying occur

finish cuts typically required reduced feed and cutting depths  
 rates shown are for use without coolant; rates may be increased with coolant  
 dust collection is vital when machining dry  
 diamond coating will increase tool life in graphite and composite materials  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# Carbon Composite



## 20-CCR FRACTIONAL SERIES



- Multi-flute design and positive geometry to shear with minimal pressure and delamination
- Unique clearance grind minimizes contact between tool diameter and workpiece eliminating friction
- Left hand flutes engineered to control the fibers within CFRP, preventing excessive fiber breakout
- Excels at trimming and profiling difficult and abrasive fiber filled plastics

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	NO. OF FLUTES	END STYLE	EDP NO.		STOCK
						UNCOATED	Di-NAMITE (Diamond)	
1/4	1	2-1/2	1/4	8	No End Cutting	72930	73013	●
1/4	1	2-1/2	1/4	8	End Cutting	72947	73012	●
5/16	1	2-1/2	5/16	10	No End Cutting	72948	73026	●
5/16	1	2-1/2	5/16	10	End Cutting	72949	73014	●
3/8	1-1/8	2-1/2	3/8	12	No End Cutting	72950	73028	●
3/8	1-1/8	2-1/2	3/8	12	End Cutting	72951	73027	●
1/2	1-1/2	3-1/2	1/2	12	No End Cutting	72952	73041	●
1/2	1-1/2	3-1/2	1/2	12	End Cutting	72953	73029	●

### TOLERANCES (inch)

D<sub>1</sub> = +.000/- .005

D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED— Call for Delivery

## 20-CCR-LHC FRACTIONAL SERIES



- Multi-flute design and positive geometry to shear with minimal pressure and delamination
- Unique clearance grind minimizes contact between tool diameter and workpiece eliminating friction
- Left hand flutes engineered to control the fibers within CFRP, preventing excessive fiber breakout
- Excels at trimming and profiling difficult and abrasive fiber filled plastics

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	NO. OF FLUTES	END STYLE	EDP NO.		STOCK
						UNCOATED	Di-NAMITE (Diamond)	
1/4	1	2-1/2	1/4	8	No End Cutting	73070	73078	●
1/4	1	2-1/2	1/4	8	End Cutting	73071	73079	●
5/16	1	2-1/2	5/16	10	No End Cutting	73072	73080	●
5/16	1	2-1/2	5/16	10	End Cutting	73073	73081	●
3/8	1-1/8	2-1/2	3/8	12	No End Cutting	73074	73082	●
3/8	1-1/8	2-1/2	3/8	12	End Cutting	73075	73083	●

### TOLERANCES (inch)

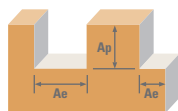
D<sub>1</sub> = +.000/- .005













D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED— Call for Delivery

# Carbon Composite



Series 20 Fractional	Ae x D1	Ap x D1	Vc (sfm)	Diameter (D1) (inch)					
				1/4	5/16	3/8	1/2		
CFRP, AFRP (CARBON FIBER, ARAMID FIBER)	Slot 	1	≤ 1	400	RPM	6112	4890	4075	3056
				(320-480)	Fr	0.0049	0.0094	0.0135	0.0180
					Feed (ipm)	30	46	55	55
	Profile 	≤ 0.5	≤ 1.5	500	RPM	7640	6112	5093	3820
				(400-600)	Fr	0.0049	0.0094	0.0135	0.0180
					Feed (ipm)	38	58	69	69
	HSM 	≤ 0.5	≤ 2	825	RPM	12606	10085	8404	6303
				(660-990)	Fr	0.0111	0.0215	0.0309	0.0413
					Feed (ipm)	140	217	260	260
GFRP (FIBERGLASS)	Slot 	1	≤ 1	320	RPM	4890	3912	3260	2445
				(256-384)	Fr	0.0049	0.0095	0.0135	0.0180
					Feed (ipm)	24	37	44	44
	Profile 	≤ 0.5	≤ 1.5	400	RPM	6112	4890	4075	3056
				(320-480)	Fr	0.0049	0.0095	0.0135	0.0180
					Feed (ipm)	30	46	55	55
	HSM 	≤ 0.05	≤ 2	660	RPM	10085	8068	6723	5042
				(528-792)	Fr	0.0110	0.0214	0.0311	0.0414
					Feed (ipm)	111	173	209	209
CARBON, GRAPHITE	Slot 	1	≤ 1	480	RPM	7334	5868	4890	3667
				(384-576)	Fr	0.0064	0.0124	0.0180	0.0240
					Feed (ipm)	47	73	88	88
	Profile 	≤ 0.5	≤ 1.5	600	RPM	9168	7334	6112	4584
				(480-720)	Fr	0.0064	0.0124	0.0180	0.0240
					Feed (ipm)	59	91	110	110
	HSM 	≤ 0.05	≤ 2	990	RPM	15127	12102	10085	7564
				(792-1188)	Fr	0.0147	0.0287	0.0412	0.0549
					Feed (ipm)	223	347	415	415
PLASTICS	Slot 	1	≤ 1	800	RPM	12224	9779	8149	6112
				(640-690)	Fr	0.0064	0.0125	0.0180	0.0241
					Feed (ipm)	78	122	147	147
	Profile 	≤ 0.5	≤ 1.5	1000	RPM	15280	12224	10187	7640
				(800-1200)	Fr	0.0064	0.0125	0.0180	0.0241
					Feed (ipm)	98	153	184	184
	HSM 	≤ 0.05	≤ 2	1650	RPM	25212	20170	16808	12606
				(1320-1980)	Fr	0.0147	0.0287	0.0413	0.0551
					Feed (ipm)	370	579	694	694

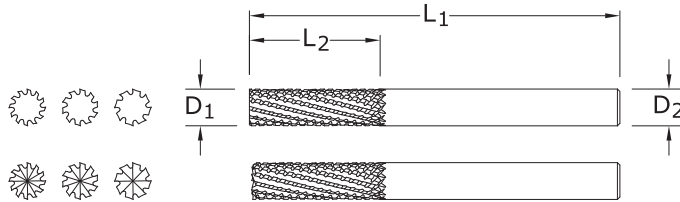
HSM (high speed machining)  
 rpm =  $Vc \times 3.82 / D_1$   
 ipm =  $Fr \times rpm$   
 adjust parameters based on resin type and fiber structure  
 reduce speed when overheating causes melting or damage to resin  
 reduce feed if delamination or fraying occur

finish cuts typically required reduced feed and cutting depths  
 rates shown are for use without coolant; rates may be increased with coolant  
 dust collection is vital when machining dry  
 diamond coating will increase tool life in graphite and composite materials  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# Carbon Composite



## 20M-CCR METRIC SERIES



- Multi-flute design and positive geometry to shear with minimal pressure and delamination
- Unique clearance grind minimizes contact between tool diameter and workpiece eliminating friction
- Left hand flutes engineered to control the fibers within CFRP, preventing excessive fiber breakout
- Excels at trimming and profiling difficult and abrasive fiber filled plastics

mm						EDP NO.					
CUTTING DIA. D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIA. D <sub>2</sub>	NO. OF FLUTES	END STYLE	UNCOATED STOCK	Ti-NAMITE-B (TiB <sub>2</sub> ) STOCK	DiNAMITE (Diamond) STOCK			
2,0	6,0	38,0	3,0	5	End Cutting	82930	■	83100	■	83070	■
3,0	10,0	38,0	3,0	5	End Cutting	82931	■	83101	■	83071	■
4,0	12,0	50,0	4,0	5	End Cutting	82932	■	83102	■	83072	■
5,0	15,0	50,0	6,0	5	End Cutting	82933	■	83103	■	83073	■
6,0	25,0	63,0	6,0	8	No End Cutting	82966	●	83104	■	83027	●
6,0	25,0	63,0	6,0	8	End Cutting	82967	●	83105	■	83026	●
8,0	25,0	63,0	8,0	10	No End Cutting	82968	●	83106	■	83029	●
8,0	25,0	63,0	8,0	10	End Cutting	82969	●	83107	■	83028	●
10,0	28,0	63,0	10,0	12	No End Cutting	82970	●	83108	■	83042	●
10,0	28,0	63,0	10,0	12	End Cutting	82971	●	83109	■	83041	●
12,0	38,0	89,0	12,0	12	No End Cutting	82972	●	83110	■	83044	●
12,0	38,0	89,0	12,0	12	End Cutting	82973	●	83111	■	83043	●

### TOLERANCES (mm)

D<sub>1</sub> = +0,00/-0,13  
D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED— Call for Delivery

## 20M-CCR-LHC METRIC SERIES



- Multi-flute design and positive geometry to shear with minimal pressure and delamination
- Unique clearance grind minimizes contact between tool diameter and workpiece eliminating friction
- Left hand flutes engineered to control the fibers within CFRP, preventing excessive fiber breakout
- Excels at trimming and profiling difficult and abrasive fiber filled plastics

mm						EDP NO.		
CUTTING DIA. D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIA. D <sub>2</sub>	NO. OF FLUTES	END STYLE	UNCOATED	DiNAMITE (Diamond)	STOCK
6,0	25,0	63,0	6,0	8	No End Cutting	83220	83230	●
6,0	25,0	63,0	6,0	8	End Cutting	83221	83231	●
8,0	25,0	63,0	8,0	10	No End Cutting	83222	83232	●
8,0	25,0	63,0	8,0	10	End Cutting	83223	83233	●
10,0	28,0	63,0	10,0	12	No End Cutting	83224	83234	●
10,0	28,0	63,0	10,0	12	End Cutting	83225	83235	●

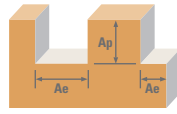
### TOLERANCES (mm)

D<sub>1</sub> = +0,00/-0,13  
D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED— Call for Delivery

# Carbon Composite



Series 20 Metric	Ae x D1	Ap x D1	Vc (m/min)	Diameter (D1) (mm)						
				3	6	8	10	12		
CFRP, AFRP (CARBON FIBER, ARAMID FIBER)	Slot	1	≤ 1	120	RPM	12722	6361	4771	3817	3181
				(96-164)	Fr	0.055	0.113	0.243	0.366	0.439
					Feed (mm/min)	700	720	1160	1395	1395
	Profile	≤ 0.5	≤ 1.5	150	RPM	15903	7951	5963	4771	3976
				(120-180)	Fr	0.055	0.113	0.243	0.366	0.439
					Feed (mm/min)	875	900	1450	1744	1744
	HSM	≤ 0.05	≤ 2	250	RPM	26504	13252	9939	7951	6626
				(200-300)	Fr	0.126	0.260	0.556	0.833	1.000
					Feed (mm/min)	3350	3450	5527	6625	6625
GFRP (FIBERGLASS)	Slot	1	≤ 1	100	RPM	10602	5301	3976	3181	2650
				(80-120)	Fr	0.054	0.111	0.236	0.357	0.428
					Feed (mm/min)	570	587	940	1135	1135
	Profile	≤ 0.5	≤ 1.5	120	RPM	12722	6361	4771	3817	3181
				(96-164)	Fr	0.054	0.111	0.236	0.357	0.428
					Feed (mm/min)	684	704	1128	1362	1362
	HSM	≤ 0.05	≤ 2	200	RPM	21203	10602	7951	6361	5301
				(160-240)	Fr	0.124	0.261	0.557	1.011	1.213
					Feed (mm/min)	2629	2765	4430	6430	6430
CARBON, GRAPHITE	Slot	1	≤ 1	145	RPM	15372	7686	5765	4612	3843
				(116-174)	Fr	0.069	0.152	0.323	0.482	0.579
					Feed (mm/min)	1061	1165	1860	2224	2224
	Profile	≤ 0.5	≤ 1.5	185	RPM	19613	9807	7355	5884	4903
				(148-222)	Fr	0.069	0.152	0.323	0.482	0.579
					Feed (mm/min)	1353	1486	2373	2838	2838
	HSM	≤ 0.05	≤ 2	300	RPM	31805	15903	11927	9542	7951
				(240-360)	Fr	0.159	0.348	0.740	1.109	1.331
					Feed (mm/min)	5057	5535	8820	10580	10580
PLASTICS	Slot	1	≤ 1	245	RPM	25974	12987	9740	7792	6494
				(196-294)	Fr	0.069	0.150	0.319	0.477	0.572
					Feed (mm/min)	1792	1945	3107	3717	3717
	Profile	≤ 0.5	≤ 1.5	305	RPM	32335	16168	12126	9701	8084
				(244-366)	Fr	0.069	0.150	0.319	0.477	0.572
					Feed (mm/min)	2231	2421	3868	4627	4627
	HSM	≤ 0.05	≤ 2	505	RPM	53538	26769	20077	16062	13385
				(404-606)	Fr	0.159	0.344	0.732	1.097	1.316
					Feed (mm/min)	8513	9220	14690	17617	17617

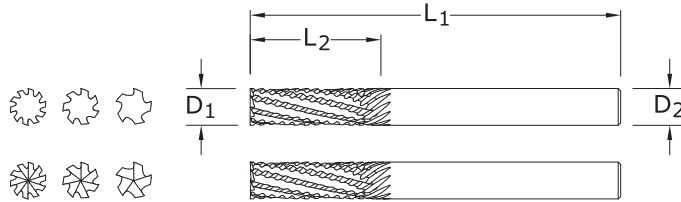
HSM (high speed machining)  
 $rpm = (Vc \times 1000) / (D1 \times 3.14)$   
 $mm/min = Fr \times rpm$   
 adjust parameters based on resin type and fiber structure  
 reduce speed when overheating causes melting or damage to resin  
 reduce feed if delamination or fraying occur

finish cuts typically required reduced feed and cutting depths  
 rates shown are for use without coolant; rates may be increased with coolant  
 dust collection is vital when machining dry  
 diamond coating will increase tool life in graphite and composite materials  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# Coarse Cut Carbon Composite



## 31-CCR FRACTIONAL SERIES



- Fewer, deeper flutes to prevent clogging in heavy routing
- Unique clearance grind minimizes contact between tool diameter and workpiece eliminating friction
- Left hand flutes engineered to control the fibers within CFRP, preventing excessive fiber breakout
- Excels at trimming and profiling difficult and abrasive fiber filled plastics

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch				END STYLE	EDP NO.		STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	NO. OF FLUTES	UNCOATED		Di-NAMITE (Diamond)		
1/4	1	2-1/2	1/4	5	End Cutting	72954	72955	●	
1/4	1	2-1/2	1/4	5	No End Cutting	72956	72957	●	
5/16	1	2-1/2	5/16	7	End Cutting	72958	72959	●	
5/16	1	2-1/2	5/16	7	No End Cutting	72960	72961	●	
3/8	1-1/8	2-1/2	3/8	8	End Cutting	72962	72963	●	
3/8	1-1/8	2-1/2	3/8	8	No End Cutting	72964	72965	●	
1/2	1-1/2	3-1/2	1/2	10	End Cutting	72966	72967	●	
1/2	1-1/2	3-1/2	1/2	10	No End Cutting	72968	72969	●	

**TOLERANCES (inch)**

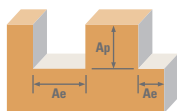
D<sub>1</sub> = +.000/- .005

D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED— Call for Delivery

# Coarse Cut Carbon Composite



Series 31 Fractional	Material	Ae x D1	Ap x D1	Vc (sfm)	Diameter (D1) (inch)				
					1/4	5/16	3/8	1/2	
CFRP, AFRP (CARBON FIBER, ARAMID FIBER)	Slot 	1	≤ 1	400	RPM	6112	4890	4075	3056
				(320-480)	Fr	0.0029	0.0065	0.0088	0.0147
					Feed (ipm)	18	32	36	45
	Profile 	≤ 0.5	≤ 1.5	500	RPM	7640	6112	5093	3820
				(400-600)	Fr	0.0029	0.0065	0.0088	0.0147
					Feed (ipm)	23	40	45	56
	HSM 	≤ 0.5	≤ 2	825	RPM	12606	10085	8404	6303
				(660-990)	Fr	0.0069	0.0151	0.0206	0.0344
					Feed (ipm)	87	152	173	217
GFRP (FIBERGLASS)	Slot 	1	≤ 1	320	RPM	4890	3912	3260	2445
				(256-384)	Fr	0.0031	0.0066	0.0089	0.0147
					Feed (ipm)	15	26	29	36
	Profile 	≤ 0.5	≤ 1.5	400	RPM	6112	4890	4075	3056
				(320-480)	Fr	0.0031	0.0066	0.0089	0.0147
					Feed (ipm)	19	33	36	45
	HSM 	≤ 0.05	≤ 2	660	RPM	10085	8068	6723	5042
				(528-792)	Fr	0.0069	0.0150	0.0205	0.0343
					Feed (ipm)	70	121	138	173
CARBON, GRAPHITE	Slot 	1	≤ 1	480	RPM	7334	5868	4890	3667
				(384-576)	Fr	0.0040	0.0087	0.0119	0.0199
					Feed (ipm)	29	51	58	73
	Profile 	≤ 0.5	≤ 1.5	600	RPM	9168	7334	6112	4584
				(480-720)	Fr	0.0040	0.0087	0.0119	0.0199
					Feed (ipm)	36	64	73	91
	HSM 	≤ 0.05	≤ 2	990	RPM	15127	12102	10085	7564
				(792-1188)	Fr	0.0092	0.0201	0.0275	0.0459
					Feed (ipm)	139	243	277	347
PLASTICS	Slot 	1	≤ 1	800	RPM	12224	9779	8149	6112
				(640-690)	Fr	0.0040	0.0087	0.0119	0.0200
					Feed (ipm)	49	85	97	122
	Profile 	≤ 0.5	≤ 1.5	1000	RPM	15280	12224	10187	7640
				(800-1200)	Fr	0.0040	0.0087	0.0119	0.0200
					Feed (ipm)	61	106	121	153
	HSM 	≤ 0.05	≤ 2	1650	RPM	25212	20170	16808	12606
				(1320-1980)	Fr	0.0092	0.0201	0.0275	0.0459
					Feed (ipm)	232	405	462	578

HSM (high speed machining)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fr \times rpm$   
 adjust parameters based on resin type and fiber structure  
 reduce speed when overheating causes melting or damage to resin  
 reduce feed if delamination or fraying occur

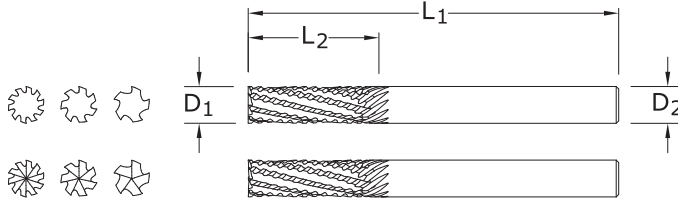
finish cuts typically required reduced feed and cutting depths  
 rates shown are for use without coolant; rates may be increased with coolant  
 dust collection is vital when machining dry  
 diamond coating will increase tool life in graphite and composite materials  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgtool.com](http://www.kyocera-sgtool.com))



# Coarse Cut Carbon Composite



## 31M-CCR METRIC SERIES



- Fewer, deeper flutes to prevent clogging in heavy routing
- Unique clearance grind minimizes contact between tool diameter and workpiece eliminating friction
- Left hand flutes engineered to control the fibers within CFRP, preventing excessive fiber breakout
- Excels at trimming and profiling difficult and abrasive fiber filled plastics

mm						EDP NO.					
CUTTING DIA. D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIA. D <sub>2</sub>	NO. OF FLUTES	END STYLE	UNCOATED STOCK	Ti-NAMITE-B (TiB <sub>2</sub> ) STOCK	DiNAMITE (Diamond) STOCK	UNCOATED STOCK	Ti-NAMITE-B (TiB <sub>2</sub> ) STOCK	DiNAMITE (Diamond) STOCK
6,0	25,0	63,0	6,0	5	End Cutting	82974 ●	83200 ■	82982 ●	82974 ●	83200 ■	82982 ●
6,0	25,0	63,0	6,0	5	No End Cutting	82975 ●	83201 ■	82983 ●	82975 ●	83201 ■	82983 ●
8,0	25,0	63,0	8,0	7	End Cutting	82976 ●	83202 ■	82984 ●	82976 ●	83202 ■	82984 ●
8,0	25,0	63,0	8,0	7	No End Cutting	82977 ●	83203 ■	82985 ●	82977 ●	83203 ■	82985 ●
10,0	28,0	63,0	10,0	8	End Cutting	82978 ●	83204 ■	82986 ●	82978 ●	83204 ■	82986 ●
10,0	28,0	63,0	10,0	8	No End Cutting	82979 ●	83205 ■	82987 ●	82979 ●	83205 ■	82987 ●
12,0	38,0	89,0	12,0	10	End Cutting	82980 ●	83206 ■	82988 ●	82980 ●	83206 ■	82988 ●
12,0	38,0	89,0	12,0	10	No End Cutting	82981 ●	83207 ■	82989 ●	82981 ●	83207 ■	82989 ●

### TOLERANCES (mm)

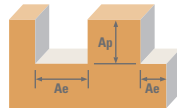
D<sub>1</sub> = +0,00/-0,13

D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED— Call for Delivery

# Coarse Cut Carbon Composite



Series 31 Metric	Ae x D1	Ap x D1	Vc (m/min)	Diameter (D1) (mm)					
				6	8	10	12		
CFRP, AFRP (CARBON FIBER, ARAMID FIBER)	Slot	1	≤ 1	120	RPM	6361	4771	3817	3181
				(96-164)	Fr	0.071	0.170	0.244	0.366
					Feed (mm/min)	450	810	930	1165
	Profile	≤ 0.5	≤ 1.5	150	RPM	7951	5963	4771	3976
				(120-180)	Fr	0.071	0.170	0.244	0.366
					Feed (mm/min)	563	1013	1163	1456
	HSM	≤ 0.05	≤ 2	250	RPM	13252	9939	7951	6626
				(200-300)	Fr	0.162	0.388	0.555	0.832
					Feed (mm/min)	2150	3860	4415	5515
GFRP (FIBERGLASS)	Slot	1	≤ 1	100	RPM	5301	3976	3181	2650
				(80-120)	Fr	0.069	0.165	0.237	0.357
					Feed (mm/min)	365	655	755	945
	Profile	≤ 0.5	≤ 1.5	120	RPM	6361	4771	3817	3181
				(96-164)	Fr	0.069	0.165	0.237	0.357
					Feed (mm/min)	438	786	906	1134
	HSM	≤ 0.05	≤ 2	200	RPM	10602	7951	6361	5301
				(160-240)	Fr	0.163	0.390	0.557	0.834
					Feed (mm/min)	1725	3100	3540	4420
CARBON, GRAPHITE	Slot	1	≤ 1	145	RPM	7686	5765	4612	3843
				(116-174)	Fr	0.095	0.226	0.321	0.483
					Feed (mm/min)	728	1300	1480	1855
	Profile	≤ 0.5	≤ 1.5	185	RPM	9807	7355	5884	4903
				(148-222)	Fr	0.095	0.226	0.321	0.483
					Feed (mm/min)	929	1659	1888	2367
	HSM	≤ 0.05	≤ 2	300	RPM	15903	11927	9542	7951
				(240-360)	Fr	0.217	0.517	0.739	1.111
					Feed (mm/min)	3450	6170	7050	8830
PLASTICS	Slot	1	≤ 1	245	RPM	12987	9740	7792	6494
				(196-294)	Fr	0.094	0.223	0.318	0.477
					Feed (mm/min)	1215	2175	2475	3100
	Profile	≤ 0.5	≤ 1.5	305	RPM	16168	12126	9701	8084
				(244-366)	Fr	0.094	0.223	0.318	0.477
					Feed (mm/min)	1513	2708	3081	3859
	HSM	≤ 0.05	≤ 2	505	RPM	26769	20077	16062	13385
				(404-606)	Fr	0.215	0.512	0.731	1.098
					Feed (mm/min)	5760	10280	11745	14700

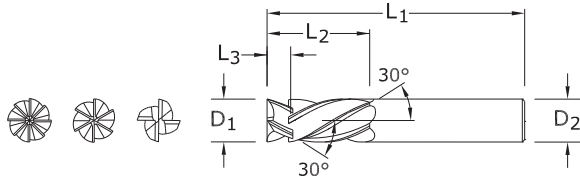
HSM (high speed machining)  
 $rpm = (Vc \times 1000) / (D1 \times 3.14)$   
 $mm/min = Fr \times rpm$   
 adjust parameters based on resin type and fiber structure  
 reduce speed when overheating causes melting or damage to resin  
 reduce feed if delamination or fraying occur

finish cuts typically required reduced feed and cutting depths  
 rates shown are for use without coolant; rates may be increased with coolant  
 dust collection is vital when machining dry  
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# Compression



## 25 FRACTIONAL SERIES



- Compression-style helixes direct cutting forces inward, eliminating fiber breakout and delamination
- Primary/secondary relief grind for reduced friction and pressure
- Rigid, heavy core

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch				NO. OF FLUTES	EDP NO.		STOCK
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	INTERSECT LENGTH L <sub>3</sub>	UNCOATED		Di-NAMITE (Diamond)		
1/4	1	2-1/2	1/4	11/64	4	72970	72971	●	
5/16	1	2-1/2	5/16	7/32	4	72972	72973	●	
3/8	1-1/8	2-1/2	3/8	17/64	6	72974	72975	●	
1/2	1-1/2	3-1/2	1/2	23/64	8	72976	72977	●	

### TOLERANCES (inch)

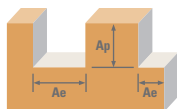
D<sub>1</sub> = +.000/- .003

D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# Compression



Series 25 Fractional	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)					
				1/4	5/16	3/8	1/2		
CFRP, AFRP (CARBON FIBER, ARAMID FIBER)	Profile 	≤ 0.5	≤ 1.5	500	RPM	7640	6112	5093	3820
				(400-600)	Fz	0.0016	0.0030	0.0040	0.0048
				Feed (ipm)	49	73	122	147	
	HSM 	≤ 0.05	≤ 2	825	RPM	12606	10085	8404	6303
				(660-990)	Fz	0.0037	0.0069	0.0092	0.0110
				Feed (ipm)	187	278	464	555	
GFRP (FIBERGLASS)	Profile 	≤ 0.5	≤ 1.5	400	RPM	6112	4890	4075	3056
				(320-480)	Fz	0.0016	0.0030	0.0040	0.0048
				Feed (ipm)	39	59	98	117	
	HSM 	≤ 0.05	≤ 2	660	RPM	10085	8068	6723	5042
				(528-792)	Fz	0.0037	0.0069	0.0092	0.0110
				Feed (ipm)	149	223	371	444	
N CARBON, GRAPHITE	Profile 	≤ 0.5	≤ 1.5	600	RPM	9168	7334	6112	4584
				(480-720)	Fz	0.0020	0.0038	0.0050	0.0060
				Feed (ipm)	73	111	183	220	
	HSM 	≤ 0.05	≤ 2	990	RPM	15127	12102	10085	7564
				(792-1188)	Fz	0.0046	0.0086	0.0115	0.0138
				Feed (ipm)	278	416	696	835	
PLASTICS	Profile 	≤ 0.5	≤ 1.5	1000	RPM	15280	12224	10187	7640
				(800-1200)	Fz	0.0020	0.0038	0.0050	0.0060
				Feed (ipm)	122	186	306	367	
	HSM 	≤ 0.05	≤ 2	1650	RPM	25212	20170	16808	12606
				(1320-1980)	Fz	0.0046	0.0086	0.0115	0.0138
				Feed (ipm)	464	694	1160	1392	
MACHINABLE CERAMICS MACHINABLE GLASS	Profile 	≤ 0.5	≤ 1.5	50	RPM	764	611	509	382
				(40-60)	Fz	0.0008	0.0015	0.0020	0.0024
				Feed (ipm)	2.4	3.7	6.1	7.3	
	HSM 	≤ 0.05	≤ 2	85	RPM	1299	1039	866	649
				(68-102)	Fz	0.0018	0.0034	0.0046	0.0055
				Feed (ipm)	9.4	14.1	23.9	28.6	

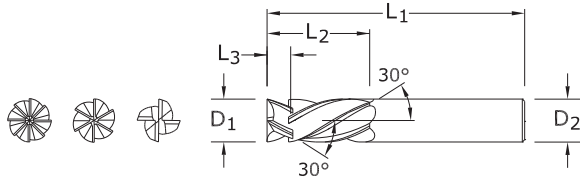
HSM (high speed machining)  
 $rpm = Vc \times 3.82 / D_1$   
 $ipm = Fz \times \text{number of flutes} \times rpm$   
 adjust parameters based on resin type and fiber structure  
 reduce speed when overheating causes melting or damage to resin  
 reduce feed if delamination or fraying occur

finish cuts typically required reduced feed and cutting depths  
 rates shown are for use without coolant; rates may be increased with coolant  
 dust collection is vital when machining dry  
 diamond coating will increase tool life in graphite and composite materials  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

# Compression



## 25M METRIC SERIES



- Compression-style helixes direct cutting forces inward, eliminating fiber breakout and delamination
- Primary/secondary relief grind for reduced friction and pressure
- Rigid, heavy core

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	INTERSECT LENGTH L <sub>3</sub>	NO. OF FLUTES	EDP NO.		STOCK
						UNCOATED	Di-NAMITE (Diamond)	
6,0	25,0	63,0	6,0	4,10	4	82990	82991	●
8,0	25,0	63,0	8,0	5,58	4	82992	82993	●
10,0	28,0	63,0	10,0	7,05	6	82994	82995	●
12,0	38,0	89,0	12,0	8,60	8	82996	82997	●

### TOLERANCES (mm)

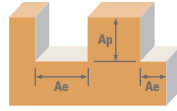
D<sub>1</sub> = +0,00/-0,08

D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

# Compression



Series 25 Metric	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (m/min)	Diameter (D <sub>1</sub> ) (mm)					
				6	8	10	12		
CFRP, AFRP (CARBON FIBER, ARAMID FIBER)	Profile 	≤ 0.5	≤ 1.5	150	RPM	7951	5963	4771	3976
				(96-164)	Fz	0.040	0.065	0.075	0.100
				Feed (mm/min)	1272	1550	2147	3181	
	HSM 	≤ 0.05	≤ 2	250	RPM	13252	9939	7951	6626
				(200-300)	Fz	0.095	0.145	0.175	0.235
				Feed (mm/min)	5036	5765	8349	12457	
GFRP (FIBERGLASS)	Profile 	≤ 0.5	≤ 1.5	120	RPM	6361	4771	3817	3181
				(96-164)	Fz	0.040	0.065	0.075	0.100
				Feed (mm/min)	1018	1240	1717	2544	
	HSM 	≤ 0.05	≤ 2	200	RPM	10602	7951	6361	5301
				(160-240)	Fz	0.095	0.145	0.175	0.235
				Feed (mm/min)	4029	4612	6679	9966	
N CARBON, GRAPHITE	Profile 	≤ 0.5	≤ 1.5	185	RPM	9807	7355	5884	4903
				(148-222)	Fz	0.050	0.080	0.095	0.125
				Feed (mm/min)	1961	2354	3354	4903	
	HSM 	≤ 0.05	≤ 2	300	RPM	15903	11927	9542	7951
				(240-360)	Fz	0.115	0.185	0.220	0.290
				Feed (mm/min)	7315	8826	12595	18447	
PLASTICS	Profile 	≤ 0.5	≤ 1.5	305	RPM	16168	12126	9701	8084
				(244-366)	Fz	0.050	0.080	0.095	0.125
				Feed (mm/min)	3234	3880	5529	8084	
	HSM 	≤ 0.05	≤ 2	505	RPM	26769	20077	16062	13385
				(404-606)	Fz	0.115	0.185	0.220	0.290
				Feed (mm/min)	12314	14857	21201	31052	
MACHINABLE CERAMICS MACHINABLE GLASS	Profile 	≤ 0.5	≤ 1.5	15	RPM	795	596	477	398
				(12-18)	Fz	0.020	0.035	0.045	0.050
				Feed (mm/min)	64	83	129	159	
	HSM 	≤ 0.05	≤ 2	25	RPM	1325	994	795	663
				(20-30)	Fz	0.045	0.075	0.085	0.115
				Feed (mm/min)	239	298	406	610	

HSM (high speed machining)  
 $rpm = (Vc \times 1000) / (D_1 \times 3.14)$   
 $mm/min = Fz \times \text{number of flutes} \times rpm$   
 adjust parameters based on resin type and fiber structure  
 reduce speed when overheating causes melting or damage to resin  
 reduce feed if delamination or fraying occur

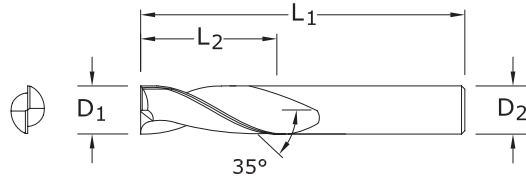
finish cuts typically required reduced feed and cutting depths  
 rates shown are for use without coolant; rates may be increased with coolant  
 dust collection is vital when machining dry  
 diamond coating will increase tool life in graphite and composite materials  
 refer to the SGS Tool Wizard for complete technical information ([www.kyocera-sgstool.com](http://www.kyocera-sgstool.com))

FRACTIONAL  
**Up Cut**



**21**

FRACTIONAL SERIES



**TOLERANCES (inch)**

$D_1 = +.000/-0.003$

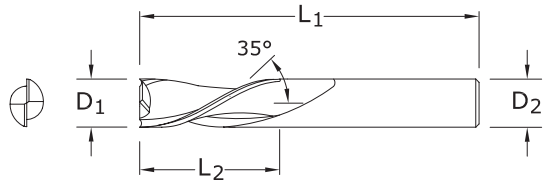
$D_2 = h_6$

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.	STOCK
				UNCOATED	
1/8	1/2	2	1/4	90001	●
5/32	5/8	2-1/2	1/4	90005	●
3/16	3/4	2-1/2	1/4	90009	●
1/4	3/4	2-1/2	1/4	90013	●
1/4	1	2-1/2	1/4	90017	●
5/16	1	2-1/2	5/16	90021	●
5/16	1	3	1/2	90025	●
3/8	1	2-1/2	3/8	90029	●
3/8	1-1/4	3	1/2	90033	●
1/2	1-1/4	3	1/2	90037	●
1/2	1-1/2	3-1/2	1/2	90041	●
1/2	2	4	1/2	90045	●
5/8	2	4-1/2	5/8	90049	●
3/4	2	4-1/2	3/4	90053	●

# FRACTIONAL Down Cut



### TOLERANCES (inch)

$D_1 = +.000/-0.003$

$D_2 = h_6$

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

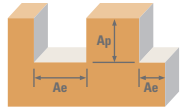
**22**  
FRACTIONAL SERIES









CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.	STOCK
				UNCOATED	
1/8	1/2	2	1/4	91001	●
5/32	5/8	2-1/2	1/4	91005	●
3/16	3/4	2-1/2	1/4	91009	●
1/4	3/4	2-1/2	1/4	91013	●
1/4	1	2-1/2	1/4	91017	●
5/16	1	2-1/2	5/16	91021	●
5/16	1	3	1/2	91025	●
3/8	1	2-1/2	3/8	91029	●
3/8	1-1/4	3	1/2	91033	●
1/2	1-1/4	3	1/2	91037	●
1/2	1-1/2	3-1/2	1/2	91041	●
1/2	2	4	1/2	91045	●
5/8	2	4-1/2	5/8	91049	●
3/4	2	4-1/2	3/4	91053	●

Cannot be supplied with Corner Radius Modifications

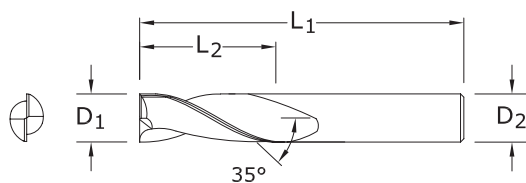
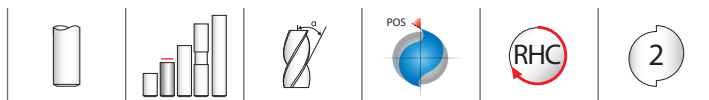


# Up Cut Down Cut



Series 21, 22 Fractional	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	Vc (sfm)	Diameter (D <sub>1</sub> ) (inch)						
				1/8	1/4	3/8	1/2	3/4		
<b>HARDWOODS</b>	Slot 	1	≤ 1	1550	RPM	47368	23684	15789	11842	7895
				(1240-1860)	Fz	0.0008	0.0015	0.0025	0.0030	0.0045
				Feed (ipm)	76	71	79	71	71	
	Profile 	≤ 0.5	≤ 1.5	1550	RPM	47368	23684	15789	11842	7895
				(1240-1860)	Fz	0.0008	0.0015	0.0025	0.0030	0.0045
				Feed (ipm)	76	71	79	71	71	
<b>SOFTWOODS</b>	Slot 	1	≤ 1	1950	RPM	59592	29796	19864	14898	9932
				(1560-2340)	Fz	0.0010	0.0020	0.0030	0.0035	0.0055
				Feed (ipm)	119	119	119	104	109	
	Profile 	≤ 0.5	≤ 1.5	1950	RPM	59592	29796	19864	14898	9932
				(1560-2340)	Fz	0.0010	0.0020	0.0030	0.0035	0.0055
				Feed (ipm)	119	119	119	104	109	
<b>PLYWOODS</b>	Slot 	1	≤ 1	1950	RPM	59592	29796	19864	14898	9932
				(1560-2340)	Fz	0.0013	0.0025	0.0040	0.0050	0.0075
				Feed (ipm)	155	149	159	149	149	
	Profile 	≤ 0.5	≤ 1.5	1950	RPM	59592	29796	19864	14898	9932
				(1560-2340)	Fz	0.0013	0.0025	0.0040	0.0050	0.0075
				Feed (ipm)	155	149	159	149	149	
<b>N PLASTICS</b>	Slot 	1	≤ 1	1950	RPM	59592	29796	19864	14898	9932
				(1560-2340)	Fz	0.0008	0.0017	0.0025	0.0035	0.0050
				Feed (ipm)	95	101	99	104	99	
	Profile 	≤ 0.5	≤ 1.5	1950	RPM	59592	29796	19864	14898	9932
				(1560-2340)	Fz	0.0008	0.0017	0.0025	0.0035	0.0050
				Feed (ipm)	95	101	99	104	99	

rpm = Vc x 3.82 / D<sub>1</sub>  
ipm = Fz x 2 x rpm



**21M**  
METRIC SERIES

**TOLERANCES (mm)**

$D_1 = +0,00/-0,08$

$D_2 = h_6$

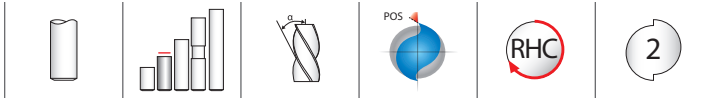
PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery

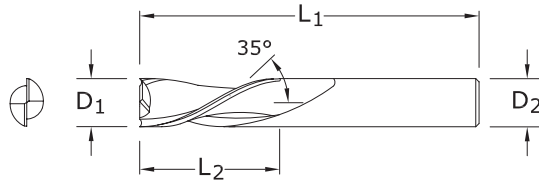
mm				EDP NO.	STOCK
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	
3,0	13,0	50,0	6,0	90101	●
4,0	16,0	63,0	6,0	90107	●
5,0	19,0	63,0	6,0	90109	●
6,0	25,0	63,0	6,0	90113	●
8,0	25,0	63,0	8,0	90121	●
10,0	31,0	75,0	10,0	90129	●
12,0	31,0	75,0	12,0	90137	●

METRIC

# Down Cut



**22M**  
METRIC SERIES



CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	EDP NO.	STOCK
				UNCOATED	
3,0	13,0	50,0	6,0	91101	●
4,0	16,0	63,0	6,0	91107	●
5,0	19,0	63,0	6,0	91109	●
6,0	25,0	63,0	6,0	91113	●
8,0	25,0	63,0	8,0	91121	●
10,0	31,0	75,0	10,0	91129	●
12,0	31,0	75,0	12,0	91137	●

Cannot be supplied with Corner Radius Modifications

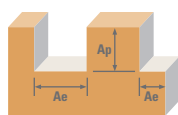
**TOLERANCES (mm)**









D<sub>1</sub> = +0,00/-0,08

D<sub>2</sub> = h<sub>6</sub>

PLASTICS/COMPOSITES

- U.S. Stock Standard
- NOT STOCKED—  
Call for Delivery



Series 21M, 22M Metric	Ae x D <sub>1</sub>	Ap x D <sub>1</sub>	V <sub>c</sub> (m/min)	Diameter (D <sub>1</sub> ) (mm)						
				3	6	10	12	20		
HARDWOODS	Slot 	1	≤ 1	470	RPM	49828	24914	14948	12457	7474
				(376-564)	Fz	0.020	0.040	0.065	0.075	0.115
				Feed (mm/min)	1993	1993	1943	1869	1719	
	Profile 	≤ 0.5	≤ 1.5	470	RPM	49828	24914	8155	4241	1509
				(376-564)	Fz	0.020	0.040	0.065	0.075	0.115
				Feed (mm/min)	1993	1993	1060	636	347	
SOFTWOODS	Slot 	1	≤ 1	600	RPM	63610	31805	19083	15903	9542
				(480-720)	Fz	0.025	0.050	0.075	0.090	0.140
				Feed (mm/min)	3181	3181	2862	2862	2672	
	Profile 	≤ 0.5	≤ 1.5	600	RPM	63610	31805	19083	15903	303467
				(480-720)	Fz	0.025	0.050	0.075	0.090	0.140
				Feed (mm/min)	3181	3181	2862	2862	84971	
PLYWOODS	Slot 	1	≤ 1	600	RPM	63610	31805	19083	15903	9542
				(480-720)	Fz	0.030	0.065	0.100	0.125	0.190
				Feed (mm/min)	3817	4135	3817	3976	3626	
	Profile 	≤ 0.5	≤ 1.5	600	RPM	63610	31805	19083	15903	303467
				(480-720)	Fz	0.030	0.065	0.100	0.125	0.190
				Feed (mm/min)	3817	4135	3817	3976	115318	
N PLASTICS	Slot 	1	≤ 1	600	RPM	63610	31805	19083	15903	9542
				(480-720)	Fz	0.020	0.040	0.065	0.090	0.125
				Feed (mm/min)	2544	2544	2481	2862	2385	
	Profile 	≤ 0.5	≤ 1.5	600	RPM	63610	31805	19083	15903	9542
				(480-720)	Fz	0.020	0.040	0.065	0.090	0.125
				Feed (mm/min)	2544	2544	2481	2862	2385	

rpm = (V<sub>c</sub> x 1000) / (D<sub>1</sub> x 3.14)  
mm/min = Fz x 2 x rpm

# EDP Number Index

EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE
30000	181	30103	181	30179	182	30353	168	30466	168	30540	177	30787	176
30001	181	30104	186	30180	182	30354	173	30467	168	30541	176	30788	176
30002	181	30105	181	30181	182	30355	168	30468	168	30542	177	30789	176
30003	181	30106	186	30182	182	30356	173	30469	167	30543	176	30790	176
30004	181	30107	181	30183	182	30357	168	30470	168	30544	177	30791	176
30005	181	30108	186	30184	187	30358	173	30470	199	30545	176	30792	176
30006	181	30109	181	30185	187	30359	168	30471	172	30546	177	30793	176
30007	181	30110	186	30186	187	30360	173	30472	172	30547	176	30794	176
30008	181	30111	181	30187	187	30361	168	30473	172	30548	177	30795	176
30009	181	30112	186	30188	187	30362	173	30474	172	30549	176	30796	176
30010	181	30113	181	30189	182	30363	168	30475	172	30550	177	30797	176
30011	181	30114	186	30189	199	30364	173	30476	172	30551	176	30798	176
30012	182	30115	181	30190	187	30365	168	30477	172	30552	177	30799	176
30013	182	30116	186	30190	200	30366	173	30478	172	30553	176	30800	176
30014	182	30117	181	30191	181	30367	168	30479	172	30554	177	30801	176
30015	182	30118	186	30192	181	30368	173	30480	172	30555	176	30802	176
30016	182	30119	181	30193	181	30369	168	30481	172	30556	177	30803	176
30017	182	30120	186	30194	181	30370	173	30482	172	30557	176	30804	176
30018	182	30121	181	30195	181	30371	168	30483	172	30558	177	30805	176
30019	182	30122	186	30196	181	30372	173	30484	172	30559	176	30806	176
30020	182	30123	181	30197	181	30373	168	30485	172	30560	177	30807	176
30021	182	30124	186	30198	181	30374	173	30486	172	30561	176	30808	176
30022	182	30125	181	30199	181	30375	168	30487	172	30562	177	30809	176
30023	182	30126	186	30301	167	30376	173	30488	172	30563	176	30810	199
30024	182	30127	181	30302	172	30377	167	30489	172	30564	177	30811	176
30025	182	30128	186	30303	167	30378	172	30490	172	30565	176	30812	176
30026	182	30129	181	30304	172	30379	182	30491	172	30566	177	30813	176
30027	182	30130	186	30305	167	30380	182	30492	173	30567	176	30814	176
30028	182	30131	181	30306	172	30381	182	30493	173	30568	177	30815	176
30029	181	30132	186	30307	167	30382	182	30494	173	30569	176	30816	176
30030	182	30133	181	30308	172	30383	182	30495	173	30570	177	30817	176
30030	199	30134	186	30309	167	30384	187	30496	173	30571	176	30818	176
30031	186	30135	181	30310	172	30385	187	30497	173	30572	177	30819	176
30032	186	30136	186	30311	167	30386	187	30498	173	30573	176	30820	176
30033	186	30137	181	30312	172	30387	187	30499	173	30574	177	30821	176
30034	186	30138	186	30313	167	30388	187	30500	173	30575	176	30822	176
30035	186	30139	181	30314	172	30389	168	30501	176	30576	177	30823	176
30036	186	30140	186	30315	167	30389	199	30502	177	30577	176	30824	176
30037	186	30141	181	30316	172	30390	173	30503	176	30578	177	30825	176
30038	186	30142	186	30317	167	30390	200	30504	177	30579	199	30826	176
30039	186	30143	182	30318	172	30397	167	30505	176	30590	177	30827	176
30040	186	30144	186	30319	167	30398	167	30506	177	30590	200	30828	176
30041	186	30145	182	30320	172	30399	167	30507	176	30591	173	30829	176
30042	186	30146	186	30321	167	30400	167	30508	177	30592	173	30830	176
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30102	186	30177	181	30352	173	30465	168	30539	176	30786	176	30861	177

# EDP Number Index

EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE
30862	177	31140	177	31238	180	31351	175	31455	185	31542	175	31705	166
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31139	177	31237	188	31349	175	31453	185	31540	175	31701	166	31789	187
				31350	175	31454	188	31541	171	31703	166	31790	186

# EDP Number Index

EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE
31791	186	31876	182	31959	167	32202	174	32330	178	32426	179	32588	61
31792	186	31877	182	31960	167	32203	174	32333	178	32427	179	32589	61
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								32411	179	32510	179		
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								32422	179	32521	179		
								32423	179	32522	179		
								32424	179	32523	179		
								32425	179	32524	179		

# EDP Number Index

EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE
32698	128	32782	129	32861	130	33324	172	33466	134	34013	116	34633	148
32699	128	32783	129	32862	130	33325	167	33467	134	34014	116	34634	148
32700	128	32784	129	32863	130	33326	172	33468	134	34015	116	34635	148
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32702	128	32786	130	32865	130	33328	173	33470	134	34017	118	34637	148
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32704	128	32788	130	32867	130	33330	173	33472	134	34019	118	34640	147
32705	128	32789	130	32868	130	33331	168	33473	134	34020	118	34641	147
32706	128	32790	130	32869	130	33332	173	33475	134	34021	118	34642	147
32707	128	32791	130	32870	130	33333	168	33476	134	34022	118	34643	147
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32711	128	32795	130	32874	130	33337	168	33480	134	34026	118	34647	147
32712	128	32796	130	33101	181	33338	173	33481	134	34027	118	34650	148
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32715	128	32799	130	33104	186	33343	167	33484	134	34030	118	34653	148
32716	128	32800	130	33105	181	33344	172	33500	135	34031	118	34654	148
32717	128	32801	130	33106	186	33345	88	33501	135	34030	134	34655	148
32718	128	32802	130	33107	182	33346	88	33502	135	34301	134	34656	148
32719	128	32803	130	33108	187	33347	88	33503	135	34302	134	34657	148
32720	128	32804	130	33109	182	33348	88	33504	135	34303	134	34660	147
32725	128	32805	130	33110	187	33349	88	33507	135	34304	134	34661	147
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32727	128	32807	130	33112	187	33351	88	33511	135	34306	134	34663	147
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32733	128	32817	129	33118	187	33392	134	33517	135	34503	154	34669	148
32734	128	32818	129	33121	181	33393	134	33518	135	34504	154	34670	148
32735	128	32819	129	33122	186	33394	134	33519	135	34505	154	34671	148
32736	128	32820	129	33123	181	33395	134	33520	135	34506	154	34672	148
32737	128	32821	129	33124	186	33396	134	33521	135	34507	154	34673	148
32738	128	32822	129	33125	181	33397	134	33522	135	34508	154	34674	148
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32757	129	32836	129	33141	181	33413	134	33554	135	34522	154	34688	148
32758	129	32837	129	33142	186	33415	134	33555	135	34523	154	34689	148
32759	129	32838	129	33143	181	33416	134	33556	135	34524	154	34690	148
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32761	125	32840	129	33301	167	33418	134	33558	135	34526	154	34692	148
32762	129	32841	129	33302	172	33419	134	33559	135	34527	154	34693	148
32763	129	32842	129	33303	167	33420	134	33560	135	34528	154	34701	124
32764	129	32843	129	33304	172	33421	134	33561	135	34529	154	34702	124
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32766	126	32845	129	33306	172	33423	134	33563	135	34531	154	34704	124
32767	129	32846	129	33307	167	33424	134	33564	135	34532	154	34705	124
32768	129	32847	129	33308	173	33450	134	33565	135	34533	154	34706	124
32769	129	32848	129	33309	168	33451	134	34000	116	34534	154	34707	124
32770	129	32849	130	33310	173	33452	134	34001	116	34620	147	34708	124
32771	129	32850	130	33311	168	33453	134	34002	116	34621	147	34709	124
32772	129	32851	130	33312	173	33454	134	34003	116	34622	147	34710	124
32773	129	32852	130	33313	168	33455	134	34004	116	34623	147	34711	124
32774	129	32853	130	33314	173	33456	134	34005	116	34624	147	34712	124
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32778	129	32857	130	33318	173	33461	134	34009	116	34628	147	34716	124
32779	129	32858	130	33321	167	33462	134	34010	116	34630	148	34717	124
32780	129	32859	130	33322	172	33463	134	34011	116	34631	148	34718	124
32781	129	32860	130	33323	167	33464	134	34012	116	34632	148	34719	124



# EDP Number Index

EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE
34720	124	34815	127	34978	132	35280	196	35591	125	35676	125	35793	131
34721	124	34816	127	34979	132	35281	196	35592	125	35677	125	35794	131
34722	124	34817	127	34980	132	35282	196	35593	125	35678	125	35795	129
34723	124	34818	127	34981	132	35283	196	35594	125	35679	125	35796	129
34724	124	34822	124	34982	132	35285	196	35595	125	35680	125	35797	131
34725	124	34823	124	34983	132	35287	196	35596	125	35681	125	35798	131
34726	124	34824	124	34984	132	35289	196	35597	125	35682	125	35799	131
34727	124	34825	124	34985	132	35291	196	35598	125	35683	125	35800	131
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34729	124	34827	124	34987	132	35295	196	35600	125	35685	125	35802	131
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34737	124	34857	124	35009	133	35306	196	35608	126	35693	126	35812	130
34738	124	34858	124	35010	133	35307	196	35609	126	35694	126	35813	131
34739	124	34859	124	35011	133	35308	196	35610	126	35695	126	35814	131
34740	124	34860	124	35012	133	35309	196	35611	126	35696	126	35815	131
34741	124	34861	124	35013	133	35310	196	35612	126	35697	126	35816	131
34742	124	34862	124	35014	133	35311	196	35613	126	35698	126	35817	131
34743	124	34863	124	35015	133	35312	196	35614	126	35699	126	35818	131
34744	124	34865	124	35016	133	35313	196	35615	126	35700	126	36106	194
34745	124	34866	124	35018	133	35314	196	35616	126	35701	126	36107	194
34746	124	34867	124	35019	133	35315	196	35617	126	35702	126	36108	194
34747	124	34868	124	35020	133	35473	197	35618	126	35703	126	36109	194
34748	124	34869	124	35100	71	35475	197	35619	126	35704	126	36110	194
34749	124	34870	124	35101	71	35477	197	35620	126	35705	126	36111	194
34750	124	34888	128	35102	71	35478	197	35621	126	35706	126	36112	194
34751	124	34889	128	35103	71	35479	197	35622	126	35707	126	36113	194
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34753	124	34895	128	35105	71	35481	197	35624	126	35709	126	36116	194
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34797	125	34946	133	35131	73	35575	125	35650	127	35735	127	36218	192
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34802	126	34951	133	35136	73	35580	125	35665	125	35740	127	36224	192
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34804	126	34954	133	35138	73	35582	125	35667	125	35742	127	36226	192
34805	126	34955	133	35139	73	35583	125	35668	125	35743	127	36228	192
34806	126	34956	133	35140	73	35584	125	35669	125	35744	127	36229	192
34807	127	34972	132	35141	73	35585	125	35670	125	35787	129	36230	192
34808	127	34973	132	35273	196	35586	125	35671	125	35788	129	36235	129
34809	127	34974	132	35275	196	35587	125	35672	125	35789	131	36236	129
34811	127	34975	132	35277	196	35588	125	35673	125	35790	131	36237	131
34812	127	34976	132	35278	196	35589	125	35674	125	35791	129	36238	131
34813	127	34977	132	35279	196	35590	125	35675	125	35792	129	36239	129

# EDP Number Index

EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE
36240	129	36432	43	36577	52	36780	56	37001	25	37076	26	37151	24
36241	131	36436	43	36578	52	36781	56	37002	24	37077	26	37152	26
36242	131	36440	43	36590	45	36782	56	37003	25	37078	26	37153	26
36243	129	36442	43	36591	45	36783	56	37004	24	37079	26	37154	26
36244	129	36444	43	36592	45	36784	56	37005	25	37080	26	37155	26
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36251	130	36454	34	36602	33	36791	56	37012	25	37087	26	37163	25
36252	130	36456	34	36603	33	36792	56	37013	25	37088	24	37164	25
36253	131	36457	34	36604	33	36793	56	37014	24	37089	26	37165	25
36254	131	36458	34	36605	33	36804	33	37015	25	37090	26	37166	25
36257	130	36460	34	36610	33	36805	33	37016	24	37091	26	37167	25
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36387	33	36543	45	36714	33	36861	33	37057	25	37132	26	37217	26
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36428	43	36575	52	36742	33	36878	32	37074	24	37149	26	37272	26
36430	43	36576	52	36744	33	37000	24	37075	26	37150	26	37273	26



# EDP Number Index

EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE
39168	187	39362	173	39555	168	39654	175	39769	176	40305	202	40570	209
39169	182	39363	168	39556	173	39655	171	39771	176	40306	205	40573	208
39170	187	39364	173	39557	168	39656	175	39773	176	40309	202	40574	209
39171	182	39365	168	39558	173	39657	171	39775	176	40310	205	40577	208
39172	187	39366	173	39559	168	39658	175	39777	176	40313	202	40578	209
39173	182	39367	168	39560	173	39659	171	39789	199	40314	205	40581	208
39174	187	39368	173	39561	168	39660	175	40000	212	40317	202	40582	209
39175	182	39369	168	39562	173	39661	171	40001	212	40318	205	40585	208
39176	187	39370	173	39563	168	39662	175	40003	212	40321	202	40586	209
39177	181	39371	168	39564	173	39663	171	40004	212	40322	205	41405	213
39178	186	39372	173	39565	168	39664	175	40005	212	40325	202	41406	215
39189	182	39373	168	39566	173	39665	171	40007	212	40326	205	41409	213
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39190	187	39375	168	39568	173	39667	171	40010	212	40330	205	41413	213
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39304	172	39389	168	39572	173	39672	175	40016	212	40338	205	41421	213
39305	167	39389	199	39573	168	39673	171	40017	212	40341	202	41422	215
39306	172	39390	173	39574	173	39674	175	40019	212	40342	205	41425	213
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39312	172	39505	167	39589	199	39680	175	40028	212	40354	205	41437	213
39313	167	39506	172	39590	173	39681	171	40030	212	40357	202	41438	215
39314	172	39507	167	39590	200	39682	175	40031	212	40358	205	41441	213
39315	167	39508	172	39601	185	39683	171	40032	212	40361	202	41442	215
39316	172	39509	167	39602	188	39684	175	40035	212	40362	205	41445	213
39317	167	39510	172	39603	185	39685	171	40037	212	40365	202	41446	215
39318	172	39511	167	39604	188	39686	175	40038	212	40366	205	41449	213
39319	167	39512	172	39605	185	39687	171	40039	212	40369	202	41450	215
39320	172	39513	167	39606	188	39688	175	40105	211	40370	205	41453	213
39321	167	39514	172	39607	185	39689	171	40106	214	40373	202	41454	215
39322	172	39515	167	39608	188	39690	175	40109	211	40374	205	41457	213
39323	167	39516	172	39609	185	39691	171	40110	214	40377	202	41458	215
39324	172	39517	167	39610	188	39691	199	40113	211	40378	205	41461	213
39325	167	39518	172	39611	185	39692	175	40114	214	40381	202	41462	215
39326	172	39519	167	39612	188	39692	200	40117	211	40382	205	41465	213
39327	167	39520	172	39613	185	39701	176	40118	214	40385	202	41466	215
39328	172	39521	167	39614	188	39703	176	40121	211	40386	205	41505	204
39329	167	39522	172	39615	185	39705	176	40122	214	40505	208	41506	207
39330	172	39523	167	39616	188	39707	176	40125	211	40506	209	41509	204
39331	167	39524	172	39617	185	39709	176	40126	214	40509	208	41510	207
39332	172	39525	167	39618	188	39711	176	40129	211	40510	209	41513	204
39333	167	39526	172	39619	185	39713	176	40130	214	40513	208	41514	207
39334	172	39527	167	39620	188	39715	176	40133	211	40514	209	41517	204
39335	167	39528	172	39621	185	39717	176	40134	214	40517	208	41518	207
39336	172	39529	167	39622	188	39719	176	40137	211	40518	209	41521	204
39337	167	39530	172	39623	185	39721	176	40138	214	40521	208	41522	207
39338	172	39531	167	39624	188	39723	176	40141	211	40522	209	41525	204
39339	167	39532	172	39625	185	39725	176	40142	214	40525	208	41526	207
39340	172	39533	167	39626	188	39727	176	40145	211	40526	209	41529	204
39341	167	39534	172	39627	185	39729	176	40146	214	40529	208	41530	207
39342	172	39535	167	39628	188	39731	176	40149	211	40530	209	41533	204
39343	167	39536	172	39629	185	39733	176	40150	214	40533	208	41534	207
39344	173	39537	167	39630	188	39735	176	40153	211	40534	209	41537	204
39345	167	39538	172	39631	185	39737	176	40154	214	40537	208	41538	207
39346	173	39539	167	39632	188	39739	176	40157	211	40538	209	41541	204
39347	167	39540	172	39633	185	39741	176	40158	214	40541	208	41542	207
39348	173	39541	167	39634	188	39743	176	40161	211	40542	209	41545	204
39349	168	39542	172	39635	185	39745	176	40162	214	40545	208	41546	207
39350	173	39543	167	39636	188	39747	176	40165	210	40546	209	41549	204
39351	168	39544	173	39637	185	39749	176	40166	214	40549	208	41550	207
39352	173	39545	167	39638	188	39751	176	40169	211	40550	209	41553	204
39353	168	39546	173	39639	185	39753	176	40170	214	40553	208	41554	207
39354	173	39547	167	39640	188	39755	176	40173	211	40554	209	41557	204
39355	168	39548	173	39641	185	39757	176	40174	214	40557	208	41558	207
39356	173	39549	168	39642	199	39759	176	40177	211	40558	209	41561	204
39357	168	39550	173	39642	188	39760	175	40178	214	40561	208	41562	207
39358	173	39551	168	39642	200	39761	176	40181	211	40562	209	41565	204
39359	168	39552	173	39651	171	39763	176	40182	214	40565	208	41566	207
39360	173	39553	168	39652	175	39765	176	40185	211	40566	209	41605	210
39361	168	39554	173	39653	171	39767	176	40186	214	40569	208	41609	210

# EDP Number Index

EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE
41613.....	210	42666.....	65	43104.....	214	43487.....	91	43938.....	203	44583.....	152	44703.....	137
41617.....	210	42667.....	65	43105.....	211	43488.....	91	43939.....	203	44584.....	152	44705.....	137
41621.....	210	42668.....	65	43106.....	214	43489.....	91	43950.....	203	44585.....	152	44708.....	137
41625.....	210	42669.....	65	43107.....	211	43490.....	91	43951.....	203	44586.....	152	44711.....	137
41629.....	210	42670.....	65	43108.....	214	43491.....	91	43952.....	203	44587.....	150	44714.....	137
41633.....	210	42671.....	65	43115.....	211	43492.....	91	43953.....	203	44588.....	150	44715.....	137
41637.....	210	42672.....	65	43116.....	214	43493.....	91	43954.....	203	44589.....	150	44716.....	137
41641.....	210	42673.....	65	43125.....	211	43494.....	91	43955.....	203	44590.....	150	44717.....	137
41645.....	210	42674.....	65	43126.....	214	43495.....	91	43956.....	203	44591.....	150	44719.....	137
41649.....	210	42675.....	65	43135.....	211	43496.....	91	43957.....	203	44592.....	150	44722.....	137
41653.....	210	42676.....	65	43136.....	214	43497.....	91	43958.....	203	44593.....	150	44725.....	137
41657.....	210	42677.....	65	43145.....	211	43501.....	208	43959.....	203	44594.....	150	44728.....	137
41661.....	210	42678.....	65	43146.....	214	43502.....	209	44299.....	145	44595.....	150	44731.....	137
41665.....	211	42679.....	65	43155.....	211	43503.....	208	44300.....	145	44596.....	150	44732.....	137
41705.....	201	42680.....	65	43156.....	214	43504.....	209	44301.....	145	44597.....	150	44733.....	137
41709.....	201	42681.....	65	43165.....	211	43505.....	208	44302.....	145	44598.....	152	44734.....	137
41713.....	201	42682.....	65	43166.....	214	43506.....	209	44303.....	145	44599.....	152	44735.....	137
41717.....	201	42683.....	65	43175.....	211	43507.....	208	44304.....	145	44600.....	152	44736.....	137
41721.....	201	42684.....	65	43176.....	214	43508.....	209	44305.....	145	44601.....	152	44737.....	137
41725.....	201	42685.....	65	43185.....	211	43515.....	208	44306.....	145	44602.....	152	44738.....	141
41729.....	201	42686.....	65	43186.....	214	43516.....	209	44307.....	145	44603.....	152	44739.....	141
41733.....	201	42687.....	65	43195.....	211	43525.....	208	44308.....	145	44604.....	152	44740.....	141
41737.....	201	42688.....	65	43196.....	214	43526.....	209	44309.....	145	44605.....	152	44741.....	141
41741.....	201	42689.....	65	43301.....	202	43535.....	208	44505.....	156	44606.....	152	44745.....	122
41745.....	201	42690.....	66	43302.....	205	43536.....	209	44506.....	156	44607.....	152	44746.....	122
41749.....	201	42691.....	66	43303.....	202	43545.....	208	44509.....	156	44608.....	152	44747.....	122
41753.....	201	42692.....	66	43304.....	205	43546.....	209	44510.....	156	44609.....	151	44748.....	122
41757.....	201	42693.....	66	43305.....	202	43555.....	208	44513.....	156	44610.....	151	44749.....	122
41761.....	201	42694.....	66	43306.....	205	43556.....	209	44514.....	156	44611.....	151	44750.....	122
41765.....	201	42695.....	66	43307.....	202	43565.....	208	44517.....	156	44612.....	151	44751.....	122
42606.....	64	42696.....	66	43308.....	205	43566.....	209	44518.....	156	44613.....	151	44752.....	122
42607.....	64	42697.....	66	43315.....	202	43575.....	208	44521.....	156	44614.....	151	44753.....	122
42608.....	64	42698.....	66	43316.....	205	43576.....	209	44522.....	156	44615.....	152	44754.....	122
42609.....	64	42699.....	66	43325.....	202	43585.....	208	44525.....	156	44616.....	152	44755.....	122
42610.....	64	42700.....	66	43326.....	205	43586.....	209	44526.....	156	44617.....	152	44756.....	122
42611.....	64	42701.....	66	43335.....	202	43595.....	208	44529.....	156	44618.....	152	44757.....	122
42612.....	64	42702.....	66	43336.....	205	43596.....	209	44530.....	156	44619.....	152	44758.....	122
42613.....	64	42703.....	66	43345.....	202	43900.....	206	44533.....	156	44620.....	152	44759.....	122
42614.....	64	42704.....	66	43346.....	205	43901.....	206	44534.....	156	44627.....	122	44760.....	122
42615.....	64	42705.....	66	43355.....	202	43902.....	206	44537.....	156	44628.....	122	44761.....	122
42616.....	64	42706.....	140	43356.....	205	43903.....	206	44538.....	156	44629.....	122	44762.....	122
42617.....	64	42707.....	140	43365.....	202	43904.....	206	44541.....	156	44630.....	122	44763.....	122
42618.....	64	42708.....	140	43366.....	205	43905.....	206	44542.....	156	44631.....	122	44764.....	122
42619.....	64	42709.....	140	43375.....	202	43906.....	206	44545.....	156	44634.....	122	44765.....	122
42620.....	64	42710.....	140	43376.....	205	43907.....	206	44546.....	156	44635.....	122	44766.....	122
42621.....	64	42711.....	140	43385.....	202	43908.....	206	44550.....	150	44636.....	122	44767.....	122
42622.....	64	42712.....	54	43386.....	205	43909.....	206	44551.....	150	44637.....	122	44768.....	122
42623.....	64	42713.....	54	43395.....	202	43910.....	203	44552.....	150	44638.....	122	44769.....	141
42624.....	64	42714.....	54	43396.....	205	43911.....	203	44553.....	150	44639.....	122	44770.....	141
42625.....	64	42715.....	54	43445.....	91	43912.....	203	44554.....	150	44641.....	122	44771.....	141
42626.....	64	42716.....	54	43446.....	91	43913.....	203	44555.....	150	44642.....	122	44772.....	141
42627.....	64	42717.....	54	43447.....	91	43914.....	203	44556.....	150	44643.....	122	44773.....	141
42628.....	66	42718.....	38	43448.....	91	43915.....	203	44557.....	150	44645.....	120	44774.....	141
42630.....	65	42719.....	38	43449.....	91	43916.....	203	44558.....	150	44646.....	120	44775.....	141
42631.....	65	42721.....	38	43450.....	91	43917.....	203	44559.....	150	44647.....	120	44776.....	141
42632.....	66	42722.....	38	43451.....	91	43918.....	203	44560.....	150	44648.....	120	44777.....	141
42633.....	66	42723.....	38	43452.....	91	43919.....	203	44561.....	151	44649.....	120	44778.....	141
42648.....	66	42731.....	39	43453.....	91	43920.....	203	44562.....	151	44650.....	120	44779.....	141
42649.....	66	42732.....	39	43470.....	91	43921.....	203	44563.....	151	44652.....	120	44780.....	141
42650.....	66	42733.....	39	43471.....	91	43922.....	203	44564.....	151	44653.....	120	44781.....	141
42651.....	66	42734.....	39	43472.....	91	43923.....	203	44565.....	151	44654.....	120	44782.....	141
42652.....	66	42735.....	39	43473.....	91	43924.....	203	44566.....	151	44685.....	120	44783.....	141
42653.....	66	42736.....	39	43474.....	91	43925.....	203	44570.....	152	44686.....	120	44784.....	141
42654.....	66	42737.....	39	43475.....	91	43926.....	203	44571.....	152	44687.....	120	44785.....	141
42655.....	66	42738.....	39	43476.....	91	43927.....	203	44572.....	152	44688.....	120	44786.....	141
42656.....	66	42739.....	39	43477.....	91	43928.....	203	44573.....	152	44689.....	120	44787.....	141
42657.....	66	42750.....	67	43478.....	91	43929.....	203	44574.....	152	44690.....	120	44788.....	141
42658.....	66	42751.....	67	43479.....	91	43930.....	203	44575.....	152	44691.....	120	44789.....	141
42659.....	66	42752.....	67	43480.....	91	43931.....	203	44576.....	152	44692.....	120	44790.....	141
42660.....	65	42753.....	67	43481.....	91	43932.....	203	44577.....	152	44693.....	120	44791.....	141
42661.....	65	42754.....	67	43482.....	91	43933.....	203	44578.....	152	44694.....	120	44792.....	141
42662.....	65	42755.....	67	43483.....	91	43934.....	203	44579.....	152	44695.....	120	44793.....	141
42663.....	65	43101.....	211	43484.....	91	43935.....	203	44580.....	152	44696.....	120	44794.....	141
42664.....	65	43102.....	214	43485.....	91	43936.....	203	44581.....	152	44701.....	137	44795.....	141
42665.....	65	43103.....	211	43486.....	91	43937.....	203	44582.....	152	44702.....	137	44796.....	141



# EDP Number Index

EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE
44797	141	44875	139	44970	142	45492	223	46366	48	46633	84	46884	38
44798	141	44876	139	44971	142	45493	223	46368	48	46634	84	46886	38
44799	141	44877	139	44972	142	45494	223	46370	48	46635	84	46887	38
44800	141	44878	139	44973	142	45495	223	46372	48	46636	84	46889	38
44801	141	44879	138	44974	142	45496	223	46374	48	46637	84	46890	38
44802	141	44880	139	45100	76	45497	223	46376	48	46638	84	46891	38
44803	141	44881	139	45101	76	45498	223	46450	54	46639	84	46893	38
44804	141	44882	139	45102	76	45499	223	46451	54	46640	84	46894	38
44805	141	44883	139	45103	76	45500	223	46452	54	46641	84	46895	38
44806	141	44884	139	45104	76	46106	220	46453	54	46642	84	46896	38
44807	141	44885	139	45105	76	46107	220	46454	54	46643	84	46898	38
44808	141	44886	139	45106	77	46108	220	46455	54	46644	84	46899	38
44809	120	44890	143	45107	77	46109	220	46456	54	46645	84	46900	38
44810	120	44891	143	45108	77	46110	220	46457	54	46646	84	46903	38
44811	120	44892	143	45109	77	46111	220	46458	54	46647	85	46904	38
44814	137	44893	143	45110	77	46112	220	46459	54	46648	85	46905	38
44815	137	44894	138	45111	77	46113	220	46460	54	46649	85	46909	38
44816	137	44895	143	45112	76	46114	220	46461	54	46650	85	46910	38
44817	137	44896	143	45113	76	46116	220	46462	54	46651	85	46911	38
44818	137	44897	143	45114	76	46117	220	46463	54	46652	85	46912	38
44819	137	44898	143	45115	76	46118	220	46464	54	46653	85	46913	38
44820	137	44899	143	45116	76	46120	220	46465	54	46654	85	46914	38
44821	137	44900	143	45117	76	46121	220	46466	54	46655	85	46915	38
44822	137	44901	143	45118	76	46122	220	46467	54	46656	85	46916	38
44823	137	44902	138	45119	76	46128	220	46468	54	46657	85	46917	38
44824	137	44916	144	45120	76	46129	220	46469	54	46658	85	46918	38
44826	137	44917	144	45121	76	46130	220	46470	54	46659	85	46919	38
44827	137	44918	144	45122	76	46131	220	46471	54	46660	85	46920	38
44828	137	44919	144	45123	76	46132	220	46472	54	46737	40	46921	38
44829	137	44920	144	45124	76	46133	220	46473	54	46821	40	46922	38
44830	137	44921	144	45125	76	46140	106	46474	54	46822	40	46923	38
44831	137	44922	144	45126	76	46141	106	46475	54	46823	40	46924	38
44832	141	44923	144	45127	77	46142	106	46476	54	46824	40	46925	38
44833	141	44924	144	45128	77	46143	106	46477	54	46825	40	46926	38
44834	141	44925	144	45129	77	46145	106	46478	54	46826	40	46927	38
44835	141	44926	144	45130	77	46147	106	46479	54	46827	40	46928	40
44836	141	44927	144	45131	77	46206	218	46480	54	46828	40	46929	40
44837	141	44928	144	45132	77	46207	218	46481	54	46829	40	46930	40
44838	141	44929	144	45133	77	46208	218	46493	38	46830	40	46931	40
44839	141	44930	144	45134	77	46209	218	46494	38	46831	40	46932	40
44840	141	44931	144	45135	77	46210	218	46495	38	46832	40	46933	40
44841	141	44932	144	45136	77	46211	218	46497	38	46833	40	46934	40
44842	138	44933	144	45137	77	46212	218	46498	38	46834	40	46935	40
44843	138	44934	144	45138	77	46213	218	46506	48	46835	40	46936	40
44844	139	44935	144	45139	77	46214	218	46507	48	46836	40	46937	40
44845	139	44936	144	45140	77	46216	218	46508	48	46838	40	46938	40
44846	138	44937	144	45141	77	46217	218	46509	48	46839	40	46939	40
44847	138	44938	144	45150	76	46218	218	46510	48	46840	40	46940	40
44848	138	44939	144	45277	222	46343	49	46518	49	46841	40	46941	40
44849	138	44940	144	45279	222	46344	49	46519	49	46849	38	46942	40
44850	139	44941	144	45281	222	46345	49	46520	49	46850	38	46943	40
44851	139	44942	144	45283	222	46346	49	46521	49	46851	38	46944	38
44852	139	44943	144	45285	222	46347	49	46522	49	46852	38	46945	38
44853	139	44944	144	45287	222	46348	49	46560	57	46853	38	46946	38
44854	138	44945	144	45289	222	46349	49	46561	57	46854	38	47000	29
44855	138	44950	142	45291	222	46350	49	46562	57	46855	38	47001	29
44856	138	44951	142	45293	222	46351	49	46563	57	46856	38	47002	29
44857	138	44952	142	45295	222	46354	49	46564	57	46857	38	47003	29
44858	139	44953	142	45297	222	46355	49	46565	57	46858	38	47004	29
44859	139	44954	142	45299	222	46356	49	46566	57	46859	38	47005	29
44860	139	44955	142	45477	223	46220	218	46567	57	46860	38	47006	29
44861	139	44956	142	45478	223	46221	218	46568	57	46861	38	47007	29
44862	139	44957	142	45479	223	46222	218	46620	83	46862	38	47008	29
44863	139	44958	142	45480	223	46228	218	46621	83	46863	38	47009	29
44864	139	44959	142	45481	223	46229	218	46622	83	46864	38	47010	29
44865	139	44960	142	45482	223	46230	218	46623	83	46865	38	47011	29
44866	139	44961	142	45483	223	46231	218	46624	83	46866	38	47012	29
44867	139	44962	142	45484	223	46232	218	46625	83	46867	38	47013	29
44868	138	44963	142	45485	223	46233	218	46626	83	46868	38	47014	29
44869	138	44964	142	45486	223	46357	48	46627	84	46869	38	47015	29
44870	138	44965	142	45487	223	46358	48	46628	84	46873	38	47016	29
44871	138	44966	142	45488	223	46359	48	46629	84	46874	38	47017	29
44872	139	44967	142	45489	223	46360	48	46630	84	46880	38	47018	29
44873	139	44968	142	45490	223	46362	48	46631	84	46881	38	47019	29
44874	139	44969	142	45491	223	46364	48	46632	84	46882	38	47020	29

# EDP Number Index

EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE
47021	29	47096	29	48542	211	48618	214	48694	205	48770	208	48847	209
47022	29	47097	29	48543	211	48619	214	48695	205	48771	208	48848	209
47023	29	47120	29	48544	211	48620	214	48696	205	48772	208	48849	209
47024	29	47121	29	48545	211	48621	214	48697	205	48773	208	48850	209
47025	29	47122	29	48546	211	48622	214	48698	205	48774	208	48851	209
47026	29	47123	29	48547	211	48623	214	48699	205	48775	208	48852	209
47027	29	47124	29	48548	211	48624	214	48700	205	48776	208	48853	209
47028	29	47125	29	48549	211	48625	214	48701	205	48778	208	48854	209
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47095	29	48541	211	48617	214	48693	205	48769	208	48846	209	48931	213

# EDP Number Index

EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE
48932	213	49032	204	49127	207	49290	201	49438	202	49513	214	49588	209
48933	213	49033	204	49128	207	49291	201	49439	202	49514	214	49589	209
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49031	204	49126	207	49289	201	49437	202	49512	214	49587	209	49673	156









# EDP Number Index

EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE
63949	251	64122	241	64197	244	66028	286	68304	273	68644	277	68743	279
63950	251	64123	241	64198	244	66029	286	68305	273	68645	277	68748	279
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64117	241	64192	244	66023	286	68299	272	68612	279	68718	279	69026	291
64118	241	64193	244	66024	286	68300	273	68613	279	68723	279	69027	291
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64120	241	64195	244	66026	286	68302	273	68616	279	68733	279	69029	291
64121	241	64196	244	66027	286	68303	273	68643	277	68738	279	69030	291

# EDP Number Index

EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE	EDP NO.	PAGE
69031	291	70469	95	72974	334	74158	306	82969	328	83231	328	91239	158
69032	291	70470	94	72975	334	74161	306	82970	328	83232	328	91240	158
69033	291	70471	94	72976	334	74164	306	82971	328	83233	328	91241	158
69034	291	70472	94	72977	334	74167	306	82972	328	83234	328	91242	158
69035	291	70473	94	72978	108	74170	306	82973	328	83235	328	91243	158
69036	291	70474	94	72979	108	74201	300	82974	332	84280	324	91244	158
69037	291	70475	94	72980	108	74204	300	82975	332	84281	324	91245	158
69038	291	70476	94	72981	108	74207	300	82976	332	84282	324	91246	158
69039	291	70477	94	72982	108	74210	300	82977	332	84283	324	91247	158
69040	291	70478	94	72983	108	74213	300	82978	332	84284	324	91248	158
69041	291	70479	94	72984	108	74216	300	82979	332	84285	324	91250	158
69042	291	70480	94	72985	108	74219	300	82980	332	84286	324	91251	158
69043	291	70481	94	73012	326	74222	300	82981	332	84287	324	91252	158
69044	291	70482	94	73013	326	74225	303	82982	332	84288	324	91253	158
69045	291	70483	94	73014	326	74228	303	82983	332	84289	324	91254	158
69046	291	70484	94	73026	326	74231	303	82984	332	84290	324	91255	158
69047	291	70485	94	73027	326	74234	303	82985	332	84291	324	91256	158
69048	291	70486	94	73028	326	74237	303	82986	332	85080	324	91257	158
69049	291	70487	94	73029	326	74240	303	82987	332	85081	324	91258	158
69050	291	70488	94	73041	326	74243	303	82988	332	85082	324	91259	158
69051	291	70489	94	73070	326	74246	303	82989	332	85083	324	91260	158
69052	291	70527	98	73071	326	74249	306	82990	336	85084	324	91261	158
69053	291	70529	98	73072	326	74252	306	82991	336	85085	324	91262	158
69054	291	70531	98	73073	326	74255	306	82992	336	85086	324	91263	158
69055	291	70533	98	73074	326	74258	306	82993	336	85087	324	91266	167
69056	291	70535	98	73075	326	74261	306	82994	336	85088	324	91268	181
70003	314	70537	98	73078	326	74264	306	82995	336	85089	324	91269	186
70004	314	70539	98	73079	326	74267	306	82996	336	85090	324	91270	167
70005	314	70540	98	73080	326	74270	306	82997	336	85091	324	91272	181
70006	314	70542	98	73081	326	74280	322	83026	328	90001	338	91273	186
70007	314	70544	98	73082	326	74281	322	83027	328	90005	338	91274	167
70008	314	70546	98	73083	326	74282	322	83028	328	90009	338	91276	181
70009	314	70548	98	74001	300	74283	322	83029	328	90013	338	91277	186
70010	314	70550	98	74004	300	74284	322	83041	328	90017	338	91278	167
70011	314	70551	97	74007	300	74285	322	83042	328	90021	338	91280	181
70012	314	70552	97	74010	300	74286	322	83043	328	90025	338	91281	186
70013	314	70553	97	74013	300	74287	322	83044	328	90029	338	91282	167
70014	314	70554	97	74016	300	74288	322	83056	110	90033	338	91284	181
70015	314	70555	97	74019	300	74289	322	83057	110	90037	338	91285	186
70016	314	70556	97	74022	300	74290	322	83058	110	90041	338	91286	167
70017	314	70557	97	74025	303	74291	322	83059	110	90045	338	91288	182
70018	314	70558	97	74028	303	75080	322	83060	110	90049	338	91289	187
70019	314	70559	97	74031	303	75081	322	83061	110	90053	338	91290	168
70020	314	70560	97	74034	303	75082	322	83062	110	90101	341	91292	182
70021	314	70561	97	74037	303	75083	322	83063	110	90107	341	91293	187
70022	314	70562	97	74040	303	75084	322	83064	110	90109	341	91349	102
70023	314	70563	97	74043	303	75085	322	83065	110	90113	341	91350	102
70024	314	72930	326	74046	303	75086	322	83070	328	90121	341	91351	102
70025	314	72947	326	74049	306	75087	322	83071	328	90129	341	91352	102
70026	314	72948	326	74052	306	75088	322	83072	328	90137	341	91353	102
70027	314	72949	326	74055	306	75089	322	83073	328	91001	339	91354	102
70028	314	72950	326	74058	306	75090	322	83100	328	91005	339	91355	102
70029	314	72951	326	74061	306	75091	322	83101	328	91009	339	91356	102
70030	314	72952	326	74064	306	81001	310	83102	328	91013	339	91357	102
70031	314	72953	326	74067	306	81003	310	83103	328	91017	339	91358	102
70032	314	72954	330	74070	306	81005	310	83104	328	91021	339	91359	102
70441	95	72955	330	74101	300	81007	310	83105	328	91025	339	91360	102
70442	95	72956	330	74104	300	81009	310	83106	328	91029	339	91361	102
70444	95	72957	330	74107	300	81011	310	83107	328	91033	339	93272	100
70445	95	72958	330	74110	300	81013	310	83108	328	91037	339	93273	100
70447	95	72959	330	74113	300	81015	310	83109	328	91041	339	93274	100
70448	95	72960	330	74116	300	81017	310	83110	328	91045	339	93275	100
70450	95	72961	330	74119	300	81019	310	83111	328	91049	339	93276	100
70451	95	72962	330	74122	300	81021	310	83200	332	91053	339	93277	100
70453	95	72963	330	74125	303	81023	310	83202	332	91101	342	93278	100
70454	95	72964	330	74128	303	81025	310	83203	332	91107	342	93279	100
70456	95	72965	330	74131	303	81027	310	83206	332	91109	342	93280	100
70457	95	72966	330	74134	303	81029	310	83207	332	91113	342	93281	100
70459	95	72967	330	74137	303	82930	328	83220	328	91121	342	93282	100
70460	95	72968	330	74140	303	82931	328	83221	328	91129	342		
70462	95	72969	330	74143	303	82932	328	83222	328	91137	342		
70463	95	72970	334	74146	303	82933	328	83223	328	91235	158		
70465	95	72971	334	74149	306	82966	328	83224	328	91236	158		
70466	95	72972	334	74152	306	82967	328	83225	328	91237	158		
70468	95	72973	334	74155	306	82968	328	83230	328	91238	158		



# KSPT Reference Information

ISO H6 SPECIFICATIONS					
DIAMETER	+	-	DIAMETER	+	-
≥ 1/8 - 3/16	0.00000	-0.00032	≤ 3	0,000	0,006
> 3/16 - 7/16	0.00000	-0.00035	> 3 - 6	0,000	0,008
> 7/16 - 5/8	0.00000	-0.00043	> 6 - 10	0,000	0,009
> 5/8 - 1	0.00000	-0.00051	> 10 - 18	0,000	0,011
> 1 - 1-1/4	0.00000	-0.00063	> 18 - 25	0,000	0,013

MACHINING FORMULAS	
INCH FORMULAS	METRIC FORMULAS
sfm = rpm x .262 x cutting diameter	m/min = (3.14 x cutting diameter x rpm) / 1000
rpm = sfm x 3.82 / cutting diameter	rpm = (1000 x m / min) / (3.14 x cutting diameter)
feed (inches per tooth) = ipm / ( number of teeth x rpm)	feed (mm per tooth) = millimeters per minute / (number of teeth x rpm)
feed (inches / minute) = inches per tooth x number of teeth x rpm	feed (mm/minute) = feed per tooth x number of teeth x rpm
feed (inches / minute) = ipr x rpm	feed (mm/minute) = mmr x rpm
feed (inches / revolution) = ipm / rpm	feed (mm per revolution) = mmr / rpm
cuspl height* = $(\text{tool diameter} / 2) - \sqrt{(\text{tool diameter}^2 - \text{pitch}^2) / 4}$	cuspl height* = $(\text{tool diameter} / 2) - \sqrt{(\text{tool diameter}^2 - \text{pitch}^2) / 4}$
pitch = $\sqrt{4 \times (\text{cuspl height} \times \text{tool diameter}) - 4 \times (\text{cuspl height}^2)}$	pitch = $\sqrt{4 \times (\text{cuspl height} \times \text{tool diameter}) - 4 \times (\text{cuspl height}^2)}$
mrr – milling – (in <sup>3</sup> /min) = width of cut x depth of cut x ipm	mrr – milling – (cm <sup>3</sup> /min) = (width of cut x depth of cut x mm/min) / 1000
cutting time – drilling – (minutes) = length / ipm	cutting time – drilling – (minutes) = length / mm/min

sfm	surface feet per minute
rpm	revolutions per minute
ipm	feed rate in inches per minutes
ipr	inches per revolution
mmr	millimeters per revolution
mm/min	feed rate in millimeters per minute
mrr	material removal rate
*	on flat surface

GENERAL FORMULAS
coolant pressure: 1 Bar = 14.5 Pounds per Square Inch (PSI)
calculation of coolant pressure: Pounds Per Square Inch (PSI) = (Horsepower of Pump x 1.460) / Gallons per Minute (GPM)
1 Liter = 0.254 Gallons
inch = millimeters / 25.4                      millimeters = inch x 25.4
inch tap drill sizes = major diameter – ((1.299 x % of thread) / threads per inch)
metric tap drill sizes = major diameter – (1.082 x pitch x % of thread)
inch thread forming drill size: maximum diameter = basic major diameter – (3/8 x number of threads per inch)
inch thread forming drill size: minimum diameter = basic major diameter – (1/2 x number of threads per inch)
metric thread forming drill size: maximum diameter = basic major diameter – (.375 x pitch)
metric thread forming drill size: minimum diameter = basic major diameter – (.500 x pitch)

# Decimal Equivalents

Fraction • Number • Letter • Metric Sizes

INCH	METRIC	DECIMAL EQUIVALENT	INCH	METRIC	DECIMAL EQUIVALENT	INCH	METRIC	DECIMAL EQUIVALENT	INCH	METRIC	DECIMAL EQUIVALENT	INCH	METRIC	DECIMAL EQUIVALENT	INCH	METRIC	DECIMAL EQUIVALENT
–	0,10	0.0039	–	1,60	0.0630	9/64	3,57	0.1406	#1	5,79	0.2280	R	8,61	0.3390	–	13,00	0.5118
–	0,20	0.0079	#52	1,61	0.0635	–	3,60	0.1417	–	5,80	0.2283	–	8,70	0.3425	33/64	13,10	0.5156
–	0,25	0.0098	–	1,65	0.0650	#27	3,66	0.1440	–	5,90	0.2323	11/32	8,73	0.3438	17/32	13,49	0.5312
–	0,30	0.0118	#51	1,70	0.0669	–	3,70	0.1457	A	5,94	0.2340	–	8,75	0.3445	–	13,50	0.5315
#80	0,34	0.0135	–	1,75	0.0689	#26	3,73	0.1470	15/64	5,95	0.2344	–	8,80	0.3465	35/64	13,89	0.5469
–	0,35	0.0138	#50	1,78	0.0700	–	3,75	0.1476	–	6,00	0.2362	S	8,84	0.3480	–	14,00	0.5512
#79	0,37	0.0145	–	1,80	0.0709	#25	3,80	0.1495	B	6,05	0.2380	–	8,90	0.3504	9/16	14,29	0.5625
1/64	0,40	0.0156	#49	1,85	0.0728	–	3,80	0.1496	–	6,10	0.2402	–	9,00	0.3543	–	14,50	0.5709
#78	0,41	0.0160	–	1,90	0.0748	#24	3,86	0.1520	C	6,15	0.2420	T	9,09	0.3580	37/64	14,68	0.5781
–	0,45	0.0177	#48	1,93	0.0760	–	3,90	0.1535	–	6,20	0.2441	–	9,10	0.3583	–	15,00	0.5906
#77	0,46	0.0180	–	1,95	0.0768	#23	3,91	0.1540	D	6,25	0.2461	23/64	9,13	0.3594	19/32	15,08	0.5938
–	0,50	0.0197	5/64	1,98	0.0781	5/32	3,97	0.1562	–	6,30	0.2480	–	9,20	0.3622	39/64	15,48	0.6094
#76	0,51	0.0200	#47	1,99	0.0785	#22	3,99	0.1570	E	6,35	0.2500	–	9,25	0.3642	–	15,50	0.6102
#75	0,53	0.0210	–	2,00	0.0787	–	4,00	0.1575	1/4	6,35	0.2500	–	9,30	0.3661	5/8	15,88	0.6250
–	0,55	0.0217	–	2,05	0.0807	#21	4,04	0.1590	–	6,40	0.2520	U	9,35	0.3680	–	16,00	0.6299
#74	0,57	0.0225	#46	2,06	0.0810	#20	4,09	0.1610	–	6,50	0.2559	–	9,40	0.3701	41/64	16,27	0.6406
–	0,60	0.0236	#45	2,08	0.0820	–	4,10	0.1614	F	6,53	0.2570	–	9,50	0.3740	–	16,50	0.6496
#73	0,61	0.0240	–	2,10	0.0827	–	4,20	0.1654	–	6,60	0.2598	3/8	9,53	0.3750	21/32	16,67	0.6562
#72	0,64	0.0250	–	2,15	0.0846	#19	4,22	0.1660	G	6,63	0.2610	V	9,56	0.3770	–	17,00	0.6693
–	0,65	0.0256	#44	2,18	0.0860	–	4,25	0.1673	–	6,70	0.2638	–	9,60	0.3780	43/64	17,07	0.6719
#71	0,66	0.0260	–	2,20	0.0866	–	4,30	0.1693	17/64	6,75	0.2656	–	9,70	0.3819	11/16	17,46	0.6875
–	0,70	0.0276	–	2,25	0.0886	#18	4,31	0.1695	H	6,76	0.2667	–	9,75	0.3839	–	17,50	0.6890
#70	0,71	0.0280	#43	2,26	0.0890	11/64	4,37	0.1719	–	6,80	0.2677	W	9,80	0.3858	45/64	17,86	0.7031
#69	0,74	0.0292	–	2,30	0.0906	#17	4,39	0.1730	–	6,90	0.2717	–	9,90	0.3898	–	18,00	0.7087
–	0,75	0.0295	–	2,35	0.0925	–	4,40	0.1732	I	6,91	0.2720	25/64	9,92	0.3906	23/32	18,26	0.7188
#68	0,79	0.0310	#42	2,37	0.0935	#16	4,50	0.1770	–	7,00	0.2756	–	10,00	0.3937	–	18,50	0.7283
1/32	0,79	0.0313	3/32	2,38	0.0938	–	4,50	0.1772	J	7,04	0.2770	X	10,08	0.3970	47/64	18,65	0.7344
–	0,80	0.0315	–	2,40	0.0945	#15	4,57	0.1800	–	7,10	0.2795	–	10,10	0.3976	–	19,00	0.7480
#67	0,81	0.0320	#41	2,44	0.0960	–	4,60	0.1811	K	7,14	0.2810	–	10,20	0.4016	3/4	19,05	0.7500
#66	0,84	0.0330	–	2,45	0.0965	#14	4,62	0.1820	9/32	7,14	0.2812	Y	10,26	0.4040	49/64	19,45	0.7656
–	0,85	0.0335	#40	2,50	0.0984	#13	4,70	0.1850	–	7,20	0.2835	–	10,30	0.4055	–	19,50	0.7677
#65	0,89	0.0350	#39	2,53	0.0995	–	4,75	0.1870	–	7,25	0.2854	13/32	10,32	0.4062	25/32	19,84	0.7812
–	0,90	0.0354	#38	2,58	0.1015	3/16	4,76	0.1875	–	7,30	0.2874	–	10,40	0.4094	–	20,00	0.7874
#64	0,91	0.0360	–	2,60	0.1024	#12	4,80	0.1890	L	7,37	0.2900	Z	10,49	0.4130	51/64	20,24	0.7969
#63	0,94	0.0370	#37	2,64	0.1040	#11	4,85	0.1910	–	7,40	0.2913	–	10,50	0.4134	–	20,50	0.8071
–	0,95	0.0374	–	2,70	0.1063	–	4,90	0.1929	M	7,49	0.2950	–	10,60	0.4173	13/16	20,64	0.8125
#62	0,97	0.0380	#36	2,71	0.1065	#10	4,91	0.1935	–	7,50	0.2953	–	10,70	0.4213	–	21,00	0.8268
#61	0,99	0.0390	–	2,75	0.1083	#9	4,98	0.1960	19/64	7,54	0.2969	27/64	10,72	0.4219	53/64	21,03	0.8281
–	1,00	0.0394	7/64	2,78	0.1094	–	5,00	0.1969	–	7,60	0.2992	–	10,80	0.4252	27/32	21,43	0.8438
#60	1,02	0.0400	#35	2,79	0.1100	#8	5,05	0.1990	N	7,67	0.3020	–	10,90	0.4291	–	21,50	0.8465
#59	1,04	0.0410	–	2,80	0.1102	–	5,10	0.2008	–	7,70	0.3031	–	11,00	0.4331	55/64	21,84	0.8594
–	1,05	0.0413	#34	2,82	0.1110	#7	5,11	0.2010	–	7,75	0.3051	–	11,10	0.4370	–	22,00	0.8661
#58	1,07	0.0420	#33	2,87	0.1130	13/64	5,16	0.2031	–	7,80	0.3071	7/16	11,11	0.4375	7/8	22,23	0.8750
#57	1,09	0.0430	–	2,90	0.1142	#6	5,18	0.2040	–	7,90	0.3110	–	11,20	0.4409	–	22,50	0.8858
–	1,10	0.0433	#32	2,95	0.1160	–	5,20	0.2047	5/16	7,94	0.3125	–	11,30	0.4449	57/64	22,62	0.8906
–	1,15	0.0453	–	3,00	0.1181	#5	5,22	0.2055	–	8,00	0.3150	–	11,40	0.4488	–	23,00	0.9055
#56	1,18	0.0465	#31	3,05	0.1200	–	5,25	0.2067	O	8,03	0.3160	–	11,50	0.4528	29/32	23,02	0.9062
3/64	1,19	0.0469	–	3,10	0.1220	–	5,3	0.2087	–	8,10	0.3189	29/64	11,51	0.4531	59/64	23,42	0.9219
–	1,20	0.0472	1/8	3,18	0.1250	#4	5,31	0.2090	–	8,20	0.3228	–	11,60	0.4567	–	23,50	0.9252
–	1,25	0.0492	–	3,20	0.1260	–	5,40	0.2126	P	8,20	0.3230	–	11,70	0.4606	15/16	23,81	0.9375
–	1,30	0.0512	–	3,25	0.1280	#3	5,41	0.2130	–	8,25	0.3248	–	11,80	0.4646	–	24,00	0.9449
#55	1,32	0.0520	#30	3,26	0.1285	–	5,50	0.2165	–	8,30	0.3268	–	11,90	0.4685	61/64	24,21	0.9531
–	1,35	0.0531	–	3,30	0.1299	7/32	5,56	0.2188	21/64	8,33	0.3281	15/32	11,91	0.4688	–	24,50	0.9646
#54	1,40	0.0550	–	3,40	0.1339	–	5,60	0.2205	–	8,40	0.3307	–	12,00	0.4724	31/32	24,61	0.9688
#53	1,51	0.0595	#29	3,45	0.1360	#2	5,61	0.2210	Q	8,43	0.3320	31/64	12,30	0.4844	–	25,00	0.9843
–	1,55	0.0610	–	3,50	0.1378	–	5,70	0.2244	–	8,50	0.3346	–	12,50	0.4921	63/64	25,00	0.9844
1/16	1,59	0.0625	#28	3,57	0.1405	–	5,75	0.2264	–	8,60	0.3386	1/2	12,70	0.5000	1	25,40	1.0000

# Hardness Conversion Chart

ROCKWELL HARDNESS (HRb)	ROCKWELL HARDNESS (HRc)	BRINELL HARDNESS (HB)	VICKERS HARDNESS (HV)	TENSILE STRENGTH (N/mm <sup>2</sup> )	PSI (1000lb/in <sup>2</sup> )
67	–	121	122	401	58
70	–	126	127	432	63
73	–	132	132	448	65
75	–	136	137	455	66
77	–	140	143	463	67
80	–	147	150	479	69
82	–	153	156	494	72
84	–	159	163	525	76
86	–	165	171	540	78
89	–	177	178	556	81
91	–	186	188	602	88
93	–	197	196	632	92
96	–	216	212	664	97
97	–	223	218	695	101
98	21	230	234	756	110
–	22	236	241	772	112
–	23	242	247	787	114
–	24	248	255	818	118
–	25	254	261	849	123
–	27	266	269	865	125
–	28	272	275	895	130
–	29	278	284	911	132
–	30	284	292	942	136
–	31	293	300	973	141
–	32	302	308	988	143
–	33	310	318	1019	147
–	34	319	327	1050	152
–	35	328	337	1096	159
–	37	345	349	1127	163
–	38	353	359	1158	168
–	39	362	370	1189	172
–	40	370	381	1235	179
–	41	381	395	1266	183
–	42	391	408	1312	190
–	44	411	422	1359	197
–	45	422	437	1420	206
–	46	433	452	1467	212
–	48	455	470	1513	219
–	50	479	497	1559	226
–	51	485	517	1621	235
–	52	497	532	1668	241
–	54	–	573	1729	250
–	56	–	609	1807	262
–	57	–	630	1884	273
–	59	–	670	1961	284
–	60	–	698	2039	295
–	61	–	725	–	–
–	62	–	740	–	–
–	63	–	780	–	–
–	64	–	812	–	–
–	65	–	847	–	–
–	66	–	885	–	–
–	67	–	926	–	–
–	68	–	971	–	–

Conversions from each scale are approximate



## SOLUTIONS AROUND THE GLOBE

KYOCERA SGS Precision Tools is an ISO-certified leader of round solid carbide cutting tool technology for the aerospace, metalworking, and automotive industries with manufacturing sites in the United States and United Kingdom. Our global network of Sales Representatives, Industrial Distributors, and Agents blanket the world selling into more than 60 countries.

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We're proud to have pioneered some of the world's most advanced cutting technology right here on our Northeast Ohio manufacturing campus. KSPT high performance end mills, drills and routers are increasing productivity and reducing cost around the world.

## EXCEEDING CUSTOMER EXPECTATIONS

In addition to our substantial R&D facilities, we offer a portfolio of products and services that have an unparalleled track record in manufacture, supply and value at the spindle.

- Incredible batch-to-batch consistency
- Metallurgical lab dedicated to testing and rigorous quality control
- ISO-certified quality procedures
- Patented geometries that extend tool life, reduce chatter, cut cycle times, and improve part quality—even at extreme parameters
- Specialists in extreme and demanding product applications
- Comprehensive tooling services
- Experienced Field Sales Engineers who work to optimize a tool for your particular application
- Dedicated multi-lingual customer service representatives

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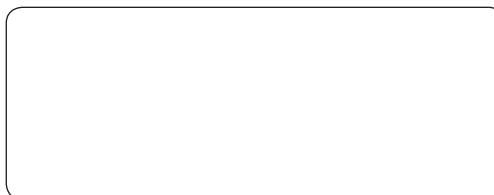
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