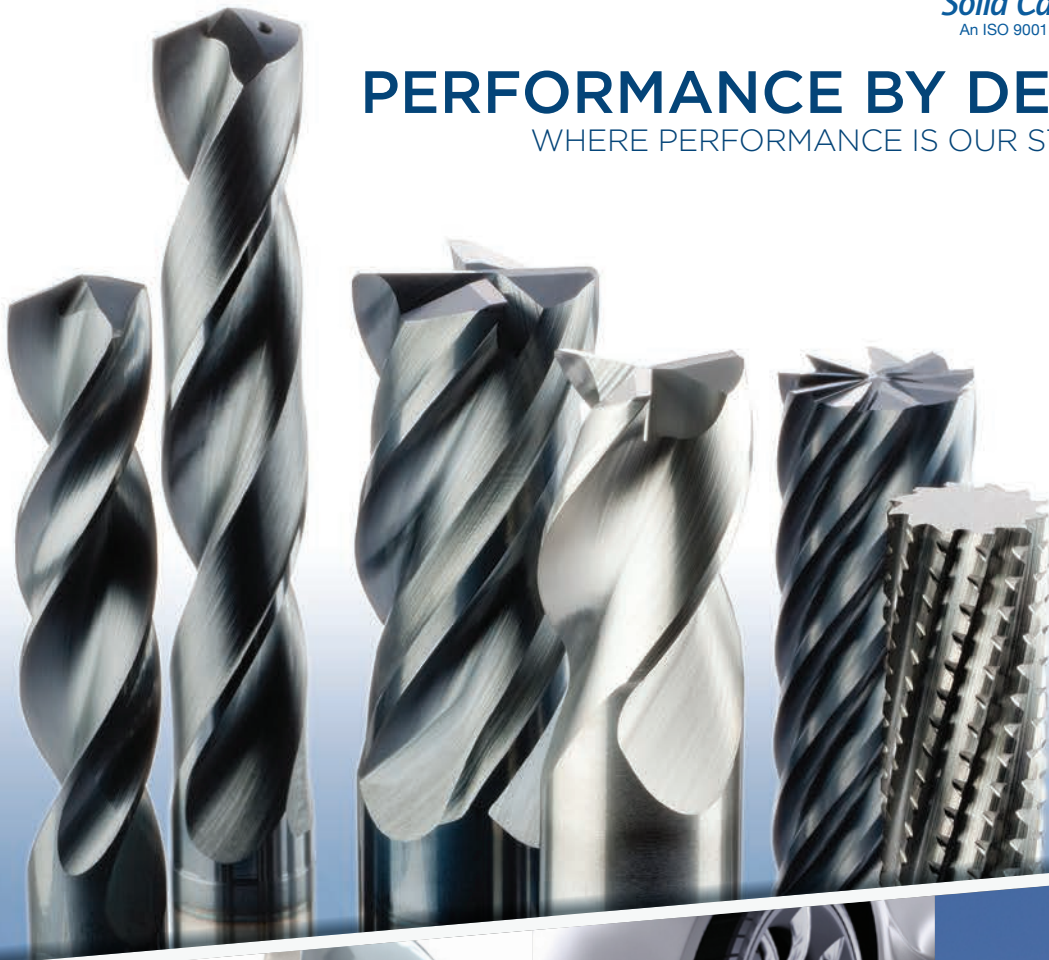


**PERFORMANCE BY DESIGN**  
WHERE PERFORMANCE IS OUR STANDARD





## **SOLUTIONS AROUND THE GLOBE**

SGS Tool Company is a privately-held, ISO-certified leader of round solid carbide cutting tool technology for the aerospace, medical, power generation, 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.

## **LEADERS IN SOLID CARBIDE TOOL TECHNOLOGY**

Brand names such as Z-Carb, S-Carb, V-Carb, Hi-PerCarb, Multi-Carb have become synonymous with high performance tooling in the machining and metalworking industry.

We're proud to have pioneered some of the world's most advanced cutting technology right here in our Northeast Ohio manufacturing campus. SGS 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
- Experienced Field Sales Engineers who work to optimize a tool for your particular application
- Dedicated multi-lingual customer service representatives

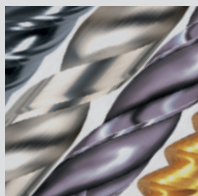


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Overview

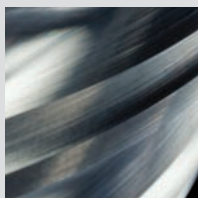
Common Legend	4
Tool Wizard	6
SGS Website	7

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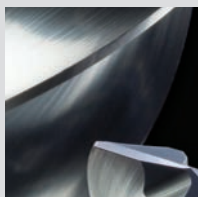
Coatings	8
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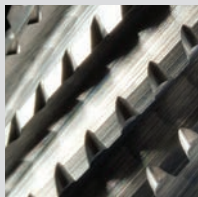
Milling	10
High Performance End Mills	12
General Purpose End Mills	74

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Hole Making	128
High Performance Drills	133
General Purpose Drills	158
Countersinks	183
Reamers	191

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Routing	196
High Performance Routers	200
General Purpose Routers	203

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EDP Number Index	210
------------------	-----

 **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 SÉCURITÉ DOIVENT ÊTRE IMPÉRATIVEMENT PORTÉES LORS D'UTILISATION D'OUTILS À GRANDE VITESSE**



**Z1PLB**

FRACTIONAL SERIES

TECH INFO 57

Refers to exact page where Speed and Feed Information can be found.

Hace referencia a la página exacta en la que puede encontrarse la información de velocidades y avances.

Indique la page exacte des informations de vitesse et avance.

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

These icons indicate for which industry applications SGS High Performance Products are best suited.

Estos íconos indican las aplicaciones industriales más adecuadas para los productos SGS de alto rendimiento.

Ces icônes indiquent les applications industrielles pour lesquelles les produits haute performance SGS sont les mieux adaptés.



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











# 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
	Medium   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

	Flutes - 2   2 filos   Goujures - 2
	Flutes - 3   3 filos   Goujures - 3
	Flutes - 4   4 filos   Goujures - 4
	Flutes - 5   5 filos   Goujures - 5
	Flutes - 6   6 filos   Goujures - 6
	Multi-Flute   Filo múltiple   Multi-goujures



# Tool Wizard

CALCULATE APPLICATION PARAMETERS

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SGS Tool Wizard is a web-based program that calculates application parameters to help you select the right tool for the job.

- Includes All High Performance and General Purpose End Mills and Drills
- Find a tool by application or search for EDP number.
- Calculate Speeds and Feeds

The Tool Wizard software is designed to assist in the selection and application of products manufactured by SGS Tool Company. To the best of our knowledge, this information is accurate. However, due to differences in machining conditions (coolant, rigidity, spindle condition, etc.), and their subsequent effects, these recommendations must be considered a starting point, with possible variations to achieve the desired result. Refer to the SGS Tool Wizard for more complete technical information. Available at [www.sgstool.com](http://www.sgstool.com).

SGS Tool Company introduced a new website featuring a variety of online tools and enhancements to our customers in finding products, technical data, and company news quickly.

Visit [www.sgstool.com](http://www.sgstool.com) to have access to technical tips, videos, case studies and a showcase of resources dedicated to SGS products, including the exclusive Tool Wizard application.

As an industry leader, it is our job to provide unsurpassed customer service using the latest technology and quick access to support tools, custom quote forms and digital calculators. Visit [www.sgstool.com](http://www.sgstool.com) for more.

- Stay Current on Industry Trends
- Download SGS Literature
- EDP Quick Product Search
- Find a Distributor Near You
- Contact an International Office
- Get Connected



- Square and Corner Radius End Mill Calculator
- Ball End Mill Calculator
- Drill Calculator
- Drilling Power Calculator
- Milling Power Calculator
- Cost Analysis Calculator

## COATINGS



**Ti-NANITE**



**Ti-NANITE-A**



**Ti-NANITE-S**

Coating	Titanium Nitride (TiN)	Aluminum Titanium Nitride (AlTiN)	Titanium DiBoride (TiB2)
Identifying Color	gold	violet-grey	light grey-silver
Layer Structure	monolayer	nano structure	monolayer
Thickness	1–4 microns	1–4 microns	1–2 microns
Hardness (HV)	2200	3300	4000
Coefficient of Friction (Fetting)	0.4–0.65	0.45	0.45
Thermal Stability	600°C / 1112°F	800°C / 1472°F	850°C / 1562°F
General Information	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 coating offers a very smooth surface and a low affinity to cold welding or built up edge, which makes it optimal for Titanium, Aluminum (>10%) and copper applications. It has high toughness and high hardness.





Titanium Carbonitride  
(TiCN)

Proprietary  
(TX)

Crystalline Diamond  
(Diamond)

pink-red

violet-grey

light grey-silver

gradient

nano structure

monolayer

1–4 microns

1–4 microns

6–20 microns

3000

3000

>8000

0.3–0.45

0.50

0.15–0.2

400°C / 752°F

900°C / 1562°F

800°C / 1470°F

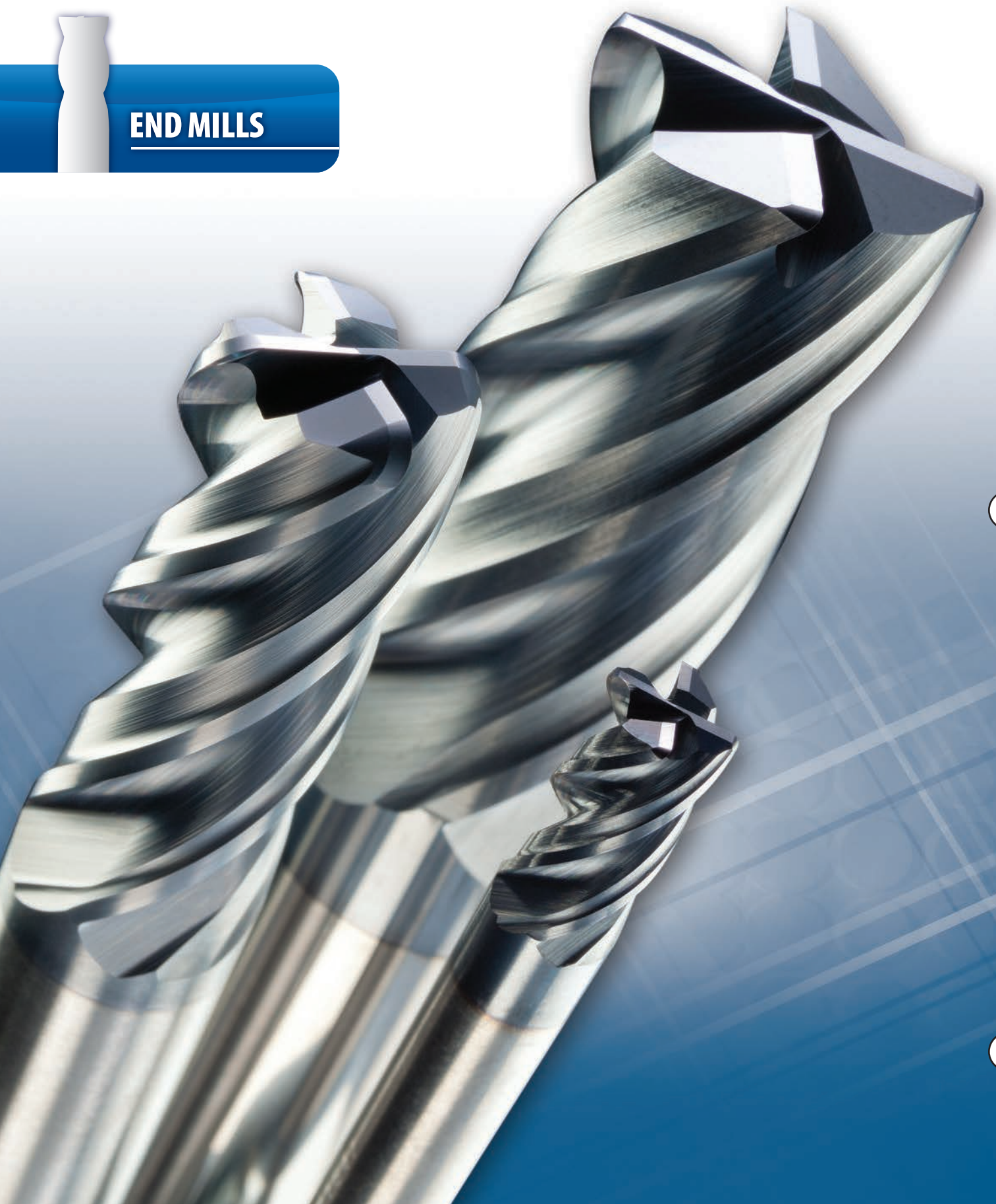
A very wear resistant coating with high toughness and shock resistance. Good in interrupted cuts found in applications like milling.

Applied utilizing a patented process, this coating offers unsurpassed adhesion aiding in long tool life. The coating deposition is consistent and dense giving strength advantages to the coating.

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.



## END MILLS



## Milling

HIGH PERFORMANCE END MILLS	SERIES	PAGE
Z-Carb-AP Variable Rake End Mills	Z1PCR, Z1MPCR, Z1PLC, Z1MPLC, Z1PLB	12–20
Z-Carb End Mills	Z1, Z1M, Z1B, Z1MB, Z16CR	21–25
Z-Carb-HTA End Mills	ZH1CR, ZH1MCR	26
Z-Carb-MD End Mills	ZD1CR, ZD1MCR	27
Series 7 End Mills	7, 7M, 7B, 7MB	28–31
V-Carb Finishing & Semi-Finishing End Mills	55, 55M, 55CR	32–35
Multi-Carb Finishing End Mills	66, 66M, 66CR	36–37
Turbo-Carb End Mills	56B, 56MB	38–39
Power-Carb End Mills	57, 57M	40
Ski-Carb End Mills	45, 44, 44M	41–43
S-Carb 3 Flute End Mills	43CR, 43MCR, 43LC, 43, 43M, 43L	44–50
S-Carb Roughing End Mills	43CB, 43MCB	51
S-Carb 2 Flute End Mills	47, 47M, 47B, 47MB, 47ES, 47MES, 47EB, 47MEB	52–55
CFRP Slow Helix End Mills	27, 27M	56
TECHNICAL INFORMATION		
Speed & Feed Recommendations		57–73

*(continued)*

GENERAL PURPOSE END MILLS	SERIES	PAGE
4 Flute Square End Stub	16, 16M	74
4 Flute Square End	1, 1L, 1EL, 1M, 1XLM	75–77
4 Flute Double End Mills	14, 14M	78–79
4 Flute Ball End	1B, 1LB, 1ELB, 1MB, 1XLMB	80–82
4 Flute Double End Ball End	14B, 14MB	83–84
4 Flute Corner Radius	1CR, 1MCR	85–87
4 Flute High Shear End Mills	54, 54M	88
2 Flute Square End Stub	17, 17M	89
2 Flute Square End	3, 3L, 3EL, 3M, 3XLM	90–92
2 Flute Square End Long Reach	59, 59M	93
2 Flute Double End Mills	15, 15M	94–95
2 Flute Ball End	3B, 3LB, 3ELB, 3MB, 3XLMB	96–98
2 Flute Ball End Long Reach	59B, 59MB	99
2 Flute Double End Ball End	15B, 15MB	100–101
2 Flute Corner Radius	3CR	102
2 Flute High Shear End Mills	52, 52M	103
3 Flute Square End	5, 5M, 5XLM	104–105
3 Flute Ball End	5B, 5MB, 5XLMB	106–107
High Helix End Mills	60, 60M	108
Single End Roughers	61, 61M	109
Micro End Mills	MK2, MK2M	110–111
Tapered Square End	23	112
Tapered Radius End	24	113
End Mills Sets		114
TECHNICAL INFORMATION		
Speed & Feed Recommendations		115–124
Application Tips		125–127

FRESAS DE ALTO RENDIMIENTO	SERIE	PÁGINA
Fresas de inclinación variable Z-Carb-AP	Z1PCR, Z1MPCR, Z1PLC, Z1MPLC, Z1PLB	12–20
Fresas Z-Carb	Z1, Z1M, Z1B, Z1MB, Z16CR	21–25
Fresas Z-Carb-HTA	ZH1CR, ZH1MCR	26
Fresas Z-Carb-MD	ZD1CR, ZD1MCR	27
Fresas Serie 7	7, 7M, 7B, 7MB	28–31
Fresas de acabado y semiacabado V-Carb	55, 55M, 55CR	32–35
Fresas de acabado Multi-Carb	66, 66M, 66CR	36–37
Fresas Turbo-Carb	56B, 56MB	38–39
Fresas Power-Carb	57, 57M	40
Fresas Ski-Carb	45, 44, 44M	41–43
Fresas de 3 filos S-Carb	43CR, 43MCR, 43LC, 43, 43M, 43L	44–50
Fresas desbastadoras S-Carb	43CB, 43MCB	51
Fresas de 2 filos S-Carb	47, 47M, 47B, 47MB, 47ES, 47MES, 47EB, 47MEB	52–55
Fresas helicoidales de avance lento CFRP	27, 27M	56
INFORMACIÓN TÉCNICA		
Velocidades y avances recomendados		57–73
FRESAS DE USO GENERAL	SERIE	PÁGINA
4 filos, pieza de punta cuadrada	16, 16M	74
4 filos, punta cuadrada	1, 1L, 1EL, 1M, 1XLM	75–77
4 filos, fresas dobles	14, 14M	78–79
4 filos, punta esférica	1B, 1LB, 1ELB, 1MB, 1XLMB	80–82
4 filos, punta doble, punta esférica	14B, 14MB	83–84
4 filos, radio angulado	1CR, 1MCR	85–87
4 filos, fresas de corte de alto rendimiento	54, 54M	88
2 filos, pieza de punta cuadrada	17, 17M	89
2 filos, punta cuadrada	3, 3L, 3EL, 3M, 3XLM	90–92
2 filos, punta cuadrada, largo alcance	59, 59M	93
2 filos, fresas dobles	15, 15M	94–95
2 filos, punta esférica	3B, 3LB, 3ELB, 3MB, 3XLMB	96–98
2 filos, punta esférica, largo alcance	59B, 59MB	99
2 filos, punta doble, punta esférica	15B, 15MB	100–101
2 filos, radio angulado	3CR	102
2 filos, fresas de corte de alto rendimiento	52, 52M	103
3 filos, punta cuadrada	5, 5M, 5XLM	104–105
3 filos, punta esférica	5B, 5MB, 5XLMB	106–107
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Desbastadores sencillos Microfresas	61, 61M	109
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Punta cuadrada cónica	23	112
Punta redonda cónica	24	113
Juegos de fresas		114
INFORMACIÓN TÉCNICA		
Velocidades y avances recomendados		115–124
Puntas para aplicaciones		125–127



# Fraisage

FRAISES A DETOURER UNIVERSELLES	SERIES	PAGE
Fraises Z-Carb-AP à vague de coupe variable	Z1PCR, Z1MPCR, Z1PLC, Z1MPLC, Z1PLB	12–20
Fraises en bout Z-Carb	Z1, Z1M, Z1B, Z1MB, Z16CR	21–25
Fraises en bout Z-Carb HTA	ZH1CR, ZH1MCR	26
Fraises en bout Z-Carb MD	ZD1CR, ZD1MCR	27
Fraises en bout série 7	7, 7M, 7B, 7MB	28–31
Fraises en bout de finition et semi-finition V-Carb	55, 55M, 55CR	32–35
Fraises en bout de finition Multi-Carb	66, 66M, 66CR	36–37
Fraises en bout Turbo-Carb	56B, 56MB	38–39
Fraises en bout Power-Carb	57, 57M	40
Fraises en bout Ski-Carb	45, 44, 44M	41–43
Fraise 3 dents S-Carb	43CR, 43MCR, 43LC, 43, 43M, 43L	44–50
Fraise d'ébauche S-Carb	43CB, 43MCB	51
Fraise 2 dents S-Carb	47, 47M, 47B, 47MB, 47ES, 47MES, 47EB, 47MEB	52–55
Fraises hélice lente CFRP	27, 27M	56

## INFORMATIONS TECHNIQUES

Recommandations de vitesse et avance	57–73
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FRAISES A USAGE GENERAL	SERIES	PAGE
Moignon 4 dents bout plat.	16, 16M	74
4 dents bout plat	1, 1L, 1EL, 1M, 1XLM	75–77
Fraises 4 dents double bouts	14, 14M	78–79
Fraise 4 dents en bout hémisphérique	1B, 1LB, 1ELB, 1MB, 1XLMB	80–82
Fraise 4 dents en bout double bouts hémisphérique	14B, 14MB	83–84
4 dents, rayon en coin	1CR, 1MCR	85–87
Fraises 4 dents en bout cisaillement élevé	54, 54M	88
Moignon 2 dents bout plat	17, 17M	89
2 dents en bout plat	3, 3L, 3EL, 3M, 3XLM	90–92
2 dents en bout plat longue portée	59, 59M	93
Fraises 2 dents en double bouts	15, 15M	94–95
2 dents en bout hémisphérique	3B, 3LB, 3ELB, 3MB, 3XLMB	96–98
2 dents en bout hémisphérique longue portée	59B, 59MB	99
2 dents en double bouts hémisphériques	15B, 15MB	100–101
2 dents, rayon en coin	3CR	102
Fraises 2 dents en bout cisaillement élevé	52, 52M	103
3 dents en bout plat	5, 5M, 5XLM	104–105
3 dents bout en hémisphérique	5B, 5MB, 5XLMB	106–107
Fraises en bout à pas rapide	60, 60M	108
Fraises en bout d'ébauche à bout unique	61, 61M	109
Micro fraises	MK2, MK2M	110–111
Bout plat conique	23	112
Bout arrondi conique	24	113
Jeux de fraises		114

## INFORMATIONS TECHNIQUES

Recommandations de vitesse et avance	115–124
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Conseils d'utilisation	125–127
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# End Mill Icon Legend

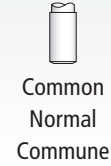
## Leyenda del icono de las fresas

### Légende d'icone de fraise

#### END CONFIGURATIONS CONFIGURACIONES DE LA PUNTA CONFIGURATIONS TERMINALES



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



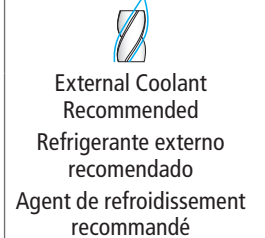
#### HELIX ANGLES ÁNGULOS HELICOIDALES ANGLES DE L'HÉLICE



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



#### COOLANT OPTIONS OPCIONES DE REFRIGERACIÓN OPTIONS DE REFROIDISSEMENT



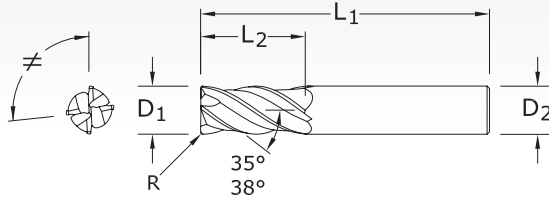
#### ADDITIONAL GEOMETRY CARACTERÍSTICAS GEOMÉTRICAS ADICIONALES GÉOMÉTRIE SUPPLÉMENTAIRE



#### COATINGS REVESTIMIENTOS REVÊTEMENTS



# Z-Carb-AP Variable Rake End Mills



## Z1PCR FRACTIONAL SERIES

TECH INFO 57

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

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.		
					Ti-NAMITE-X	Ti-NAMITE-X W/FLAT	JetStream*
1/16	3/16	1-1/2	1/8	0.005	36872	-	-
3/32	9/32	1-1/2	1/8	0.010	36873	-	-
1/8	3/8	1-1/2	1/8	0.010	36370	-	-
1/8	3/8	1-1/2	1/8	0.015	36851	-	-
3/16	7/16	2	3/16	0.010	36371	-	-
3/16	7/16	2	3/16	0.015	36852	-	-
3/16	7/16	2	3/16	0.030	36722	-	-
1/4	1/2	2-1/2	1/4	0.010	36372	-	-
1/4	1/2	2-1/2	1/4	0.015	36723	-	-
1/4	1/2	2-1/2	1/4	0.020	36854	-	-
1/4	1/2	2-1/2	1/4	0.030	36373	-	-
1/4	3/4	2-1/2	1/4	0.010	36599	-	-
1/4	3/4	2-1/2	1/4	0.015	36600	-	-
1/4	3/4	2-1/2	1/4	0.020	36853	-	-
1/4	3/4	2-1/2	1/4	0.030	36601	-	-
5/16	13/16	2-1/2	5/16	0.015	36724	-	-
5/16	13/16	2-1/2	5/16	0.020	36855	-	-
5/16	13/16	2-1/2	5/16	0.030	36374	-	-
3/8	7/8	2-1/2	3/8	0.010	36375	36701	-
3/8	7/8	2-1/2	3/8	0.015	36725	36736	-
3/8	7/8	2-1/2	3/8	0.020	36856	36864	-
3/8	7/8	2-1/2	3/8	0.030	36376	36702	-
3/8	7/8	2-1/2	3/8	0.060	36727	36738	-
7/16	1	2-3/4	7/16	0.020	36857	36865	-

\*JetStream Patented Coolant Technology

continued on next page

### TOLERANCES (inch)

- <1/8 DIAMETER**
- D<sub>1</sub> = +0.0005/-0.0005
- D<sub>2</sub> = h<sub>6</sub>
- R = +0.000/-0.0010
- 1/8-1/4 DIAMETER**
- D<sub>1</sub> = +0.000/-0.0012
- D<sub>2</sub> = h<sub>6</sub>
- R = +0.000/-0.0020
- >1/4-3/8 DIAMETER**
- D<sub>1</sub> = +0.000/-0.0016
- D<sub>2</sub> = h<sub>6</sub>
- R = +0.000/-0.0020
- >3/8-1 DIAMETER**
- D<sub>1</sub> = +0.000/-0.0020
- D<sub>2</sub> = h<sub>6</sub>
- R = +0.000/-0.0020





# Z-Carb-AP Variable Rake End Mills



**Z1PCR**  
FRACTIONAL SERIES

CONTINUED

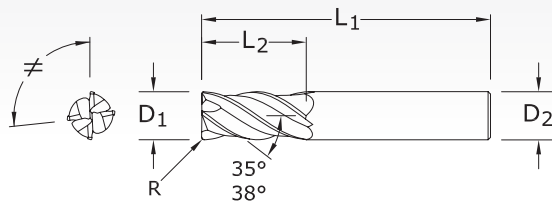
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			CORNER RADIUS R	EDP NO.		
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>			Ti-NAMITE-X	Ti-NAMITE-X W/FLAT	JetStream*
1/2	1	3	1/2	0.010	36378	36704	36804	
1/2	1	3	1/2	0.015	36729	36740	36810	
1/2	1	3	1/2	0.030	36858	36866	36805	
1/2	1	3	1/2	0.060	36380	36706	36811	
1/2	1	3	1/2	0.090	36381	36707	36812	
1/2	1	3	1/2	0.125	36731	36742	36813	
1/2	1-1/4	3-1/4	1/2	0.010	36602	36603	–	
1/2	1-1/4	3-1/4	1/2	0.015	36604	36605	–	
1/2	1-1/4	3-1/4	1/2	0.030	36859	36867	–	
1/2	1-1/4	3-1/4	1/2	0.060	36610	36611	–	
1/2	1-1/4	3-1/4	1/2	0.090	36612	36613	–	
1/2	1-1/4	3-1/4	1/2	0.125	36614	36615	–	
9/16	1-1/8	3-1/2	9/16	0.030	36860	36868	36806	
5/8	1-1/4	3-1/2	5/8	0.030	36383	36709	36814	
5/8	1-1/4	3-1/2	5/8	0.040	36861	36869	36807	
5/8	1-1/4	3-1/2	5/8	0.060	36384	36710	36815	
5/8	1-1/4	3-1/2	5/8	0.090	36385	36711	36816	
5/8	1-1/4	3-1/2	5/8	0.125	36733	36744	36817	
3/4	1-1/2	4	3/4	0.030	36386	36712	36818	
3/4	1-1/2	4	3/4	0.040	36862	36870	36808	
3/4	1-1/2	4	3/4	0.060	36387	36713	36819	
3/4	1-1/2	4	3/4	0.090	36388	36714	36820	
3/4	1-1/2	4	3/4	0.125	36389	36715	36821	
1	1-1/2	4	1	0.030	36390	36716	36822	
1	1-1/2	4	1	0.040	36863	36871	36809	
1	1-1/2	4	1	0.060	36391	36717	36823	
1	1-1/2	4	1	0.090	36392	36718	36824	
1	1-1/2	4	1	0.125	36393	36719	36825	

\*JetStream Patented Coolant Technology

# Z-Carb-AP Variable Rake End Mills



## Z1MPCR METRIC SERIES



TECH INFO 58

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

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	mm			EDP NO.		
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R	Ti-NAMITE-X	Ti-NAMITE-X W/FLAT	JetStream*
1,5	4,5	57,0	6,0	0,1	46849	—	—
2,0	6,0	57,0	6,0	0,2	48850	—	—
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	6,0	57,0	13,0	0,3	46853	—	—
6,0	6,0	57,0	13,0	0,25	46882	—	—
6,0	6,0	57,0	13,0	0,5	46854	—	—
6,0	6,0	57,0	13,0	1,0	46855	—	—
6,0	6,0	57,0	13,0	1,5	46884	—	—
8,0	8,0	63,0	19,0	0,5	46856	—	—
8,0	8,0	63,0	19,0	1,0	46857	—	—
8,0	8,0	63,0	19,0	1,5	46886	—	—
8,0	8,0	63,0	19,0	2,0	46887	—	—
10,0	10,0	72,0	22,0	0,5	46858	—	—
10,0	10,0	72,0	22,0	1,0	46859	—	—
10,0	10,0	72,0	22,0	1,5	46889	—	—
10,0	10,0	72,0	22,0	2,0	46890	—	—
10,0	10,0	72,0	22,0	2,5	46891	—	—
12,0	12,0	83,0	26,0	0,5	46860	46909	—
12,0	12,0	83,0	26,0	0,75	46861	46910	—
12,0	12,0	83,0	26,0	1,0	46893	46911	—
12,0	12,0	83,0	26,0	1,5	46894	46912	—
12,0	12,0	83,0	26,0	2,0	46895	46913	—
12,0	12,0	83,0	26,0	2,5	46896	46914	—
12,0	12,0	83,0	26,0	3,0	42718	46915	—
14,0	14,0	83,0	26,0	1,0	46862	46916	46494
16,0	16,0	92,0	32,0	1,0	46863	46917	46495
16,0	16,0	92,0	32,0	1,5	46898	46918	—
16,0	16,0	92,0	32,0	2,0	46899	46919	—
16,0	16,0	92,0	32,0	2,5	46900	46920	—
16,0	16,0	92,0	32,0	3,0	46864	46921	—
20,0	20,0	104,0	38,0	1,0	46865	46922	46497
20,0	20,0	104,0	38,0	1,5	46903	46923	—
20,0	20,0	104,0	38,0	2,0	46904	46924	—
20,0	20,0	104,0	38,0	2,5	46905	46925	—
20,0	20,0	104,0	38,0	3,0	42722	46926	—
25,0	25,0	104,0	38,0	1,0	46866	46927	46498

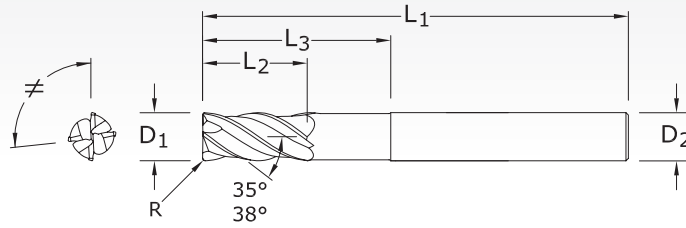
### TOLERANCES (mm)

- <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. Patents 7,306,408 and 7,789,597  
\*JetStream Patented Coolant Technology



# Z-Carb-AP Variable Rake End Mills



## TOLERANCES (inch)

### 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

$$D_1 = +0.000/-0.0020$$

$$D_2 = h_6$$

$$R = +0.000/-0.0020$$

## Z1PLC

FRACTIONAL SERIES

TECH INFO 57

inch						EDP NO.
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-X W/FLAT
1/4	1/2	4	1/4	1-1/4	0.020	36450
5/16	13/16	4	5/16	1-5/8	0.020	36452
3/8	7/8	5	3/8	1-7/8	0.020	36456
7/16	1	6	7/16	2	0.020	36460
1/2	1	6	1/2	2-1/4	0.030	36462
9/16	1-1/8	6	9/16	2-1/2	0.030	36466
5/8	1-1/4	6	5/8	3	0.040	36470
3/4	1-1/2	6	3/4	3-1/2	0.040	36472
1	1-1/2	6	1	4	0.040	36474

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

## TOLERANCES (mm)

### 6 DIAMETER

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

$$D_2 = h_6$$

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

### >6-10 DIAMETER

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

$$D_2 = h_6$$

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

### >10-25 DIAMETER

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

$$D_2 = h_6$$

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

## Z1MPLC

METRIC SERIES

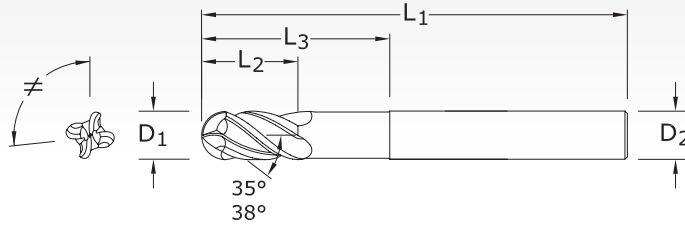
TECH INFO 58

mm						EDP NO.
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-X W/FLAT
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
12,0	15,0	100,0	12,0	48,0	1,5	46827
12,0	15,0	100,0	12,0	48,0	2,0	46828
12,0	15,0	100,0	12,0	48,0	3,0	46829
16,0	20,0	115,0	16,0	65,0	1,0	46830
16,0	20,0	115,0	16,0	65,0	1,5	46831
16,0	20,0	115,0	16,0	65,0	2,0	46832
16,0	20,0	115,0	16,0	65,0	3,0	46833
16,0	20,0	115,0	16,0	65,0	4,0	46834
16,0	20,0	115,0	16,0	65,0	5,0	46835
20,0	24,0	140,0	20,0	80,0	1,0	46836
20,0	24,0	140,0	20,0	80,0	1,5	46737
20,0	24,0	140,0	20,0	80,0	2,0	46838
20,0	24,0	140,0	20,0	80,0	3,0	46839
20,0	24,0	140,0	20,0	80,0	4,0	46840
20,0	24,0	140,0	20,0	80,0	5,0	46841

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



# Z-Carb-AP Variable Rake End Mills



## Z1PLB FRACTIONAL SERIES

TECH INFO 57

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

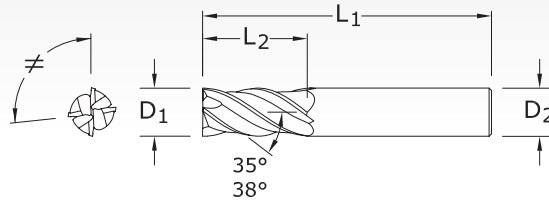
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			REACH L <sub>3</sub>	EDP NO. Ti-NAMITE-X W/FLAT
		OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>			
1/4	1/2	4	1/4	1-1/4	36480	
5/16	13/16	4	5/16	1-5/8	36482	
3/8	7/8	5	3/8	1-7/8	36486	
7/16	1	6	7/16	2	38490	
1/2	1	6	1/2	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	

### TOLERANCES (inch)

- 1/4 DIAMETER**  
D<sub>1</sub> = +0.000/-0.0012  
D<sub>2</sub> = h<sub>6</sub>
- >1/4-3/8 DIAMETER**  
D<sub>1</sub> = +0.000/-0.0016  
D<sub>2</sub> = h<sub>6</sub>
- >3/8-1 DIAMETER**  
D<sub>1</sub> = +0.000/-0.0020  
D<sub>2</sub> = h<sub>6</sub>

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





### TOLERANCES (inch)

**1/8–1/4 DIAMETER**  
 $D_1 = +0.000/-0.0012$   
 $D_2 = h_6$

**>1/4–3/8 DIAMETER**  
 $D_1 = +0.000/-0.0016$   
 $D_2 = h_6$

**>3/8–1 DIAMETER**  
 $D_1 = +0.000/-0.0020$   
 $D_2 = h_6$

## Z1

FRACTIONAL SERIES

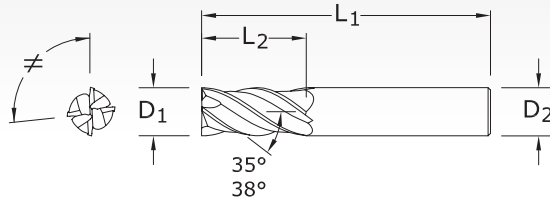
TECH INFO 59

inch				EDP NO.		
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	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	15/32	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

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

# Z-Carb End Mills



## Z1M METRIC SERIES

TECH INFO 60

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

mm				EDP NO.	
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 (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<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

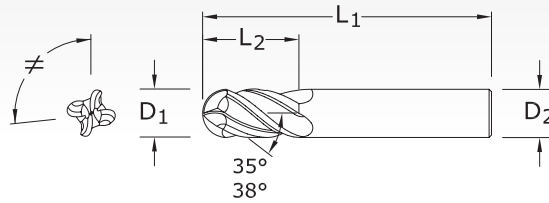
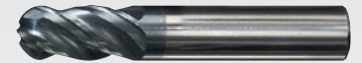
D<sub>2</sub> = h<sub>6</sub>

#### >10–25 DIAMETER

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

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





### TOLERANCES (inch)

#### 1/8–1/4 DIAMETER

$D_1 = +0.000/-0.0012$

$D_2 = h_6$

#### >1/4–3/8 DIAMETER

$D_1 = +0.000/-0.0016$

$D_2 = h_6$

#### >3/8–1 DIAMETER

$D_1 = +0.000/-0.0020$

$D_2 = h_6$

## Z1B

FRACTIONAL SERIES

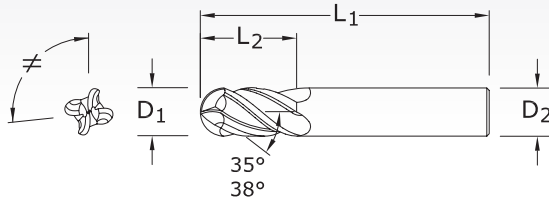
TECH INFO 59

inch				EDP NO.		
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	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

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

# Z-Carb End Mills



## Z1MB METRIC SERIES

TECH INFO 60

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

mm				EDP NO.	
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 (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

### TOLERANCES (mm)

#### 3–6 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>

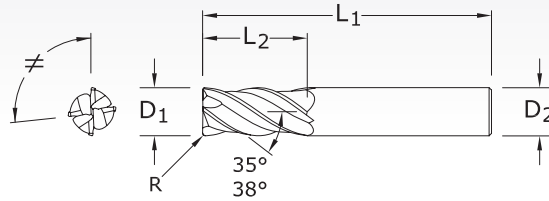
#### >10–25 DIAMETER

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

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







### TOLERANCES (inch)

#### 1/8–1/4 DIAMETER

$D_1 = +0.000/-0.0012$

$D_2 = h_6$

#### >1/4–3/8 DIAMETER

$D_1 = +0.000/-0.0016$

$D_2 = h_6$

#### >3/8–1 DIAMETER

$D_1 = +0.000/-0.0020$

$D_2 = h_6$

## Z16CR

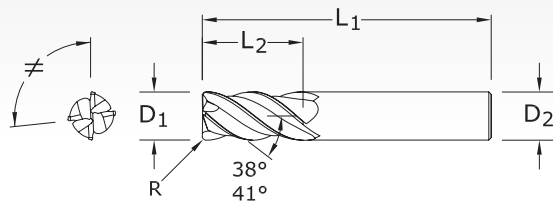
FRACTIONAL SERIES

TECH INFO 59

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			CORNER RADIUS $R$	EDP NO. Ti-NAMITE-A (AlTiN)
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$			
1/8	1/4	1-1/2	1/8	0.010–0.015	36505	
5/32	5/16	2	3/16	0.010–0.015	36506	
3/16	3/8	2	3/16	0.010–0.015	36507	
7/32	3/8	2	1/4	0.015–0.020	36508	
1/4	7/16	2	1/4	0.015–0.020	36509	
5/16	1/2	2	5/16	0.015–0.020	36511	
3/8	5/8	2	3/8	0.015–0.020	36513	
7/16	5/8	2-1/2	7/16	0.015–0.020	36515	
1/2	5/8	2-1/2	1/2	0.025–0.030	36517	
5/8	3/4	3	5/8	0.025–0.040	36519	
3/4	1	3	3/4	0.025–0.040	36520	

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

# Z-Carb-HTA End Mills



## ZH1CR

FRACTIONAL SERIES

TECH INFO 61

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.	
					Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT
1/4	1/2	2-1/2	1/4	0.015-0.020	36570	-
1/4	3/4	2-1/2	1/4	0.015-0.020	36616	-
5/16	13/16	2-1/2	5/16	0.015-0.020	36571	-
3/8	7/8	2-1/2	3/8	0.015-0.020	36572	36555
7/16	1	2-3/4	7/16	0.015-0.020	36573	36556
1/2	1	3	1/2	0.025-0.030	36574	36557
1/2	1-1/4	3-1/4	1/2	0.025-0.030	36618	36617
9/16	1-1/8	3-1/2	9/16	0.025-0.030	36575	36558
5/8	1-1/4	3-1/2	5/8	0.035-0.040	36576	36559
3/4	1-1/2	4	3/4	0.035-0.040	36577	36560
1	1-1/2	4	1	0.035-0.040	36578	36561

HIGH TEMP ALLOYS

TITANIUM

### TOLERANCES (inch)

#### 1/4 DIAMETER

D<sub>1</sub> = +0.000/-0.0012

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

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

D<sub>1</sub> = +0.000/-0.0016

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

#### >3/8-1 DIAMETER

D<sub>1</sub> = +0.000/-0.002

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

## ZH1MCR

METRIC SERIES

TECH INFO 61

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.	
					Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) 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

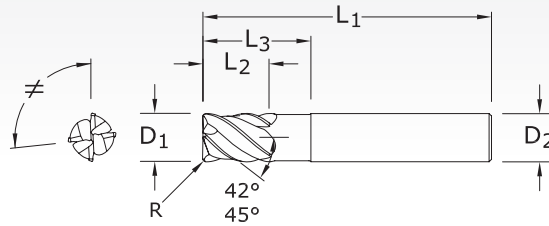
#### >10-20 DIAMETER

D<sub>1</sub> = +0.000/-0.050

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

R = +0.000/-0.050





### TOLERANCES (inch)

#### 1/8–1/4 DIAMETER

$D_1 = +0.000/-0.0012$

$D_2 = h_6$

$R = +0.000/-0.002$

#### >1/4–3/8 DIAMETER

$D_1 = +0.000/-0.0016$

$D_2 = h_6$

$R = +0.000/-0.002$

#### >3/8–1 DIAMETER

$D_1 = +0.000/-0.002$

$D_2 = h_6$

$R = +0.000/-0.002$

## ZD1CR

FRACTIONAL SERIES

TECH INFO 62

inch						EDP NO.
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	CORNER RADIUS $R$	Ti-NAMITE-A (AlTiN)
1/8	5/32	2-1/2	1/4	1/2	0.010	36780
3/16	7/32	2-1/2	1/4	3/4	0.020	36781
1/4	9/32	2-1/2	1/4	3/4	0.020	36782
5/16	13/32	2-1/2	5/16	1	0.040	36783
3/8	15/32	2-1/2	3/8	1	0.040	36784
7/16	9/16	2-3/4	7/16	1	0.040	36785
1/2	5/8	3	1/2	1-1/4	0.040	36786
1/2	5/8	4-1/2	1/2	2-1/4	0.040	36787
5/8	3/4	3-1/2	5/8	1-1/2	0.040	36788
5/8	3/4	4-1/2	5/8	2-1/4	0.040	36789
5/8	3/4	5-1/2	5/8	3-1/4	0.040	36790
3/4	15/16	4	3/4	1-3/4	0.060	36791
3/4	15/16	4-1/2	3/4	2-1/4	0.060	36792
3/4	15/16	5-1/2	3/4	3-1/4	0.060	36793

- STEELS
- HARDENED STEELS

### 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

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

$D_2 = h_6$

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

## ZD1MCR

METRIC SERIES

TECH INFO 62

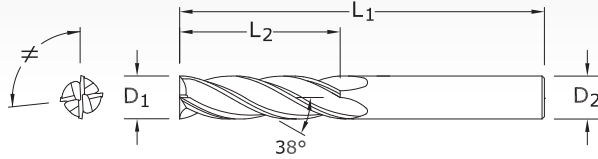
mm						EDP NO.
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	REACH $L_3$	CORNER RADIUS $R$	Ti-NAMITE-A (AlTiN)
3,0	4,0	57,0	6,0	15,0	0,2	46560
4,0	5,0	57,0	6,0	15,0	0,3	46561
5,0	6,0	57,0	6,0	15,0	0,5	46562
6,0	7,0	57,0	6,0	15,0	1,0	46563
8,0	10,0	63,0	8,0	25,0	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



# Series 7 End Mills



## 7 FRACTIONAL SERIES



### TOLERANCES (inch)

$D_1 = +0.000/-0.002$

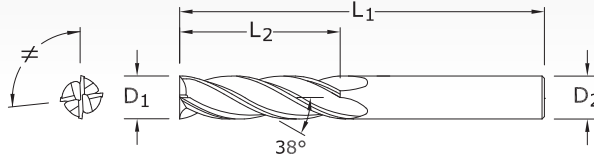
$D_2 = h_6$

TECH INFO 63

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

inch				EDP NO.
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	Ti-NAMITE-A (AlTiN)
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 (mm)**

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

$D_2 = h_6$

**7M**  
METRIC SERIES

TECH INFO 64

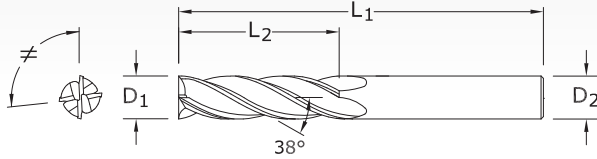
mm				EDP NO.
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	Ti-NAMITE-A (AlTiN)
3,0	25,0	75,0	3,0	70551
4,0	25,0	75,0	4,0	70552
5,0	25,0	75,0	5,0	70553
6,0	25,0	75,0	6,0	70554
8,0	25,0	75,0	8,0	70555
10,0	38,0	100,0	10,0	70556
12,0	50,0	100,0	12,0	70557
12,0	75,0	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

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

# Series 7 End Mills



## 7B FRACTIONAL SERIES



### TOLERANCES (inch)

$D_1 = +0.000/-0.002$

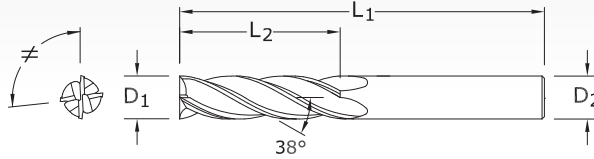
$D_2 = h_6$

TECH INFO 63

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

inch				EDP NO.
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	Ti-NAMITE-A (AlTiN)
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





**TOLERANCES (mm)**

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

$D_2 = h_6$

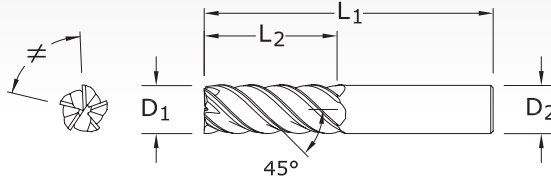
**7MB**  
METRIC SERIES

TECH INFO 64

mm				EDP NO.
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	Ti-NAMITE-A (AlTiN)
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

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

# V-Carb Finishing & Semi Finishing End Mills



## 55 FRACTIONAL SERIES

TECH INFO 65

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

inch				EDP NO.	
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 (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	3/8	32656	—
3/16	5/16	2	3/8	32673	—
3/16	5/8	2	3/8	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

TOLERANCES (inch)

1/8–1 DIAMETER

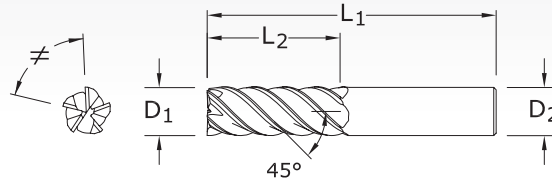
D<sub>1</sub> = +0.000/–0.002

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





# V-Carb Finishing & Semi Finishing End Mills



### TOLERANCES (mm)

#### 6-20 DIAMETER

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

$D_2 = h_6$

## 55M

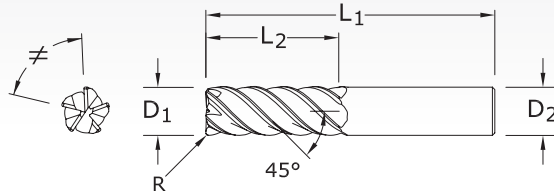
METRIC SERIES

TECH INFO 66

mm				EDP NO.	
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
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	75,0	150,0	16,0	42619	-
20,0	38,0	100,0	20,0	42620	42625
20,0	75,0	150,0	20,0	42621	-

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

# V-Carb Finishing & Semi Finishing End Mills



## 55CR FRACTIONAL SERIES

TECH INFO 65

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

inch					EDP NO.	
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-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT
1/8	1/4	1-1/2	1/8	0.010	32606	—
1/8	1/2	1-1/2	1/8	0.010	32607	—
5/32	5/16	2	3/16	0.010	32608	—
5/32	9/16	2	3/16	0.010	32609	—
3/16	5/16	2	3/16	0.010	32610	—
3/16	5/8	2	3/16	0.010	32611	—
7/32	3/8	2	1/4	0.015	32612	—
7/32	3/4	2-1/2	1/4	0.015	32613	—
1/4	3/8	2	1/4	0.015	32614	—
1/4	3/4	2-1/2	1/4	0.015	32615	—
1/4	1-1/4	4	1/4	0.015	32616	—
5/16	7/16	2	5/16	0.015	32619	—
5/16	13/16	2-1/2	5/16	0.015	32620	—
5/16	1-1/4	4	5/16	0.015	32621	—
3/8	1/2	2	3/8	0.015	32625	32591
3/8	1/2	2	3/8	0.030	32592	32593
3/8	1	2-1/2	3/8	0.015	32626	32628
3/8	1	2-1/2	3/8	0.030	32573	32574
3/8	1-1/2	4	3/8	0.015	32627	—
3/8	1-1/2	4	3/8	0.030	32569	—

TOLERANCES (inch)

1/8-1 DIAMETER

D<sub>1</sub> = +0.000/-0.002

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

R = +0.000/-0.002

continued on next page



# V-Carb Finishing & Semi Finishing End Mills



**55CR**  
FRACTIONAL SERIES

CONTINUED

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			EDP NO.	
		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
7/16	1	2-3/4	7/16	0.015	32632	–
7/16	2	4	7/16	0.015	32633	–
1/2	5/8	2-1/2	1/2	0.030	32594	32595
1/2	5/8	2-1/2	1/2	0.060	32596	32597
1/2	1-1/4	3	1/2	0.030	32575	32576
1/2	1-1/4	3	1/2	0.060	32577	32578
1/2	2	4	1/2	0.030	32685	–
1/2	2	4	1/2	0.060	32686	–
5/8	3/4	3	5/8	0.030	32598	32599
5/8	3/4	3	5/8	0.060	32600	32601
5/8	1-5/8	3-1/2	5/8	0.030	32579	32580
5/8	1-5/8	3-1/2	5/8	0.060	32581	32582
5/8	2-1/2	5	5/8	0.030	32570	–
5/8	2-1/2	5	5/8	0.060	32687	–
3/4	1	3	3/4	0.030	32602	32603
3/4	1	3	3/4	0.060	32604	32605
3/4	1-5/8	4	3/4	0.030	32583	32584
3/4	1-5/8	4	3/4	0.060	32585	32586
3/4	3-1/4	6	3/4	0.030	32571	–
3/4	3-1/4	6	3/4	0.060	32688	–
1	1-1/2	4	1	0.030	32587	32588
1	1-1/2	4	1	0.060	32589	32590
1	2-5/8	6	1	0.030	32572	–
1	2-5/8	6	1	0.060	32689	–

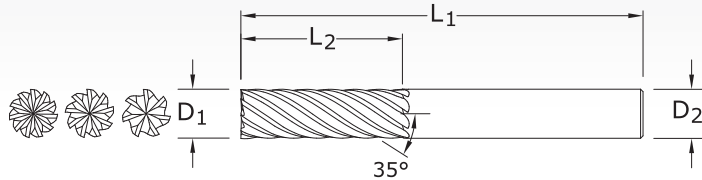
# Multi-Carb Finishing End Mills



## 66

### FRACTIONAL SERIES

TECH INFO 67



TOLERANCES (inch)

3/16–1 DIAMETER

$D_1 = +0.000/-0.002$

$D_2 = h_6$

inch

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	NO. OF FLUTES	EDP NO. Ti-NAMITE-A (AlTiN)
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  
Ideal Tool for High Speed Machining

- STEELS
- STAINLESS STEELS
- HIGH TEMP ALLOYS
- TITANIUM

## 66M

### METRIC SERIES

TECH INFO 68

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	NO. OF FLUTES	EDP NO. 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  
Ideal Tool for High Speed Machining

TOLERANCES (mm)

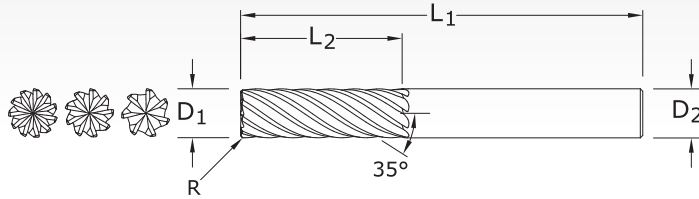
6–20 DIAMETER

$D_1 = +0.000/-0.050$

$D_2 = h_6$

mm





**TOLERANCES (inch)**

**3/16-1 DIAMETER**

$D_1 = +0.000/-0.002$

$D_2 = h_6$

$R = +0.000/-0.002$

**66CR**  
FRACTIONAL SERIES

TECH INFO 67

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			CORNER RADIUS $R$	NO. OF FLUTES	EDP NO. Ti-NAMITE-A (AITiN)
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$				
3/16	5/8	2	3/16	0.010	7	36627	
1/4	3/4	2-1/2	1/4	0.015	7	36628	
3/8	1	3	3/8	0.015	7	36629	
1/2	1-1/4	3	1/2	0.030	9	36630	
1/2	1-1/4	3	1/2	0.090	9	36631	
1/2	1-1/4	3	1/2	0.120	9	36632	
5/8	1-5/8	3-1/2	5/8	0.030	9	36633	
5/8	1-5/8	3-1/2	5/8	0.090	9	36634	
5/8	1-5/8	3-1/2	5/8	0.120	9	36635	
3/4	1-5/8	4	3/4	0.030	11	36636	
3/4	1-5/8	4	3/4	0.090	11	36637	
3/4	1-5/8	4	3/4	0.120	11	36638	
1	2	6	1	0.030	11	36639	
1	2	6	1	0.090	11	36640	
1	2	6	1	0.120	11	36641	

- STEELS
- STAINLESS STEELS
- HIGH TEMP ALLOYS
- TITANIUM

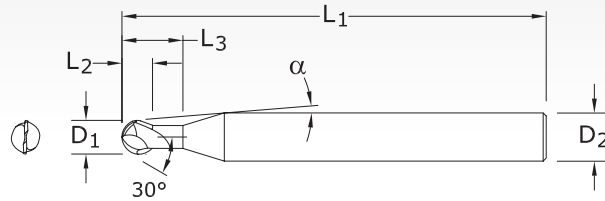
Neck Option Available  
Ideal Tool for High Speed Machining

# Turbo-Carb End Mills



## 56B FRACTIONAL SERIES

TECH INFO 69



STEELS

HARDENED STEELS

inch						EDP NO.
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>	α	REACH L <sub>3</sub>	Ti-NAMITE-A (AlTiN)
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	–	1/4	93281
3/4	3/4	6-1/2	3/4	–	1/2	93282

Neck Option Available

### TOLERANCES (inch)

#### 1/32–3/32 DIAMETER

D<sub>1</sub> = +0.000/–0.001

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

#### >3/32–1/4 DIAMETER

D<sub>1</sub> = +0.000/–0.0012

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

#### >1/4–3/8 DIAMETER

D<sub>1</sub> = +0.000/–0.0016

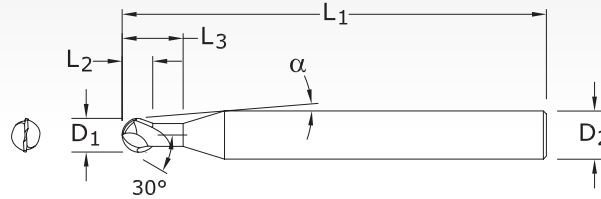
D<sub>2</sub> = h<sub>6</sub>

#### >3/8–3/4 DIAMETER

D<sub>1</sub> = +0.000/–0.002

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





## 56MB

METRIC SERIES

TECH INFO 66

**TOLERANCES (mm)**

**1–2,5 DIAMETER**

$D_1 = +0,000/-0,025$

$D_2 = h_6$

**>2,5–6 DIAMETER**

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

$D_2 = h_6$

**>6–10 DIAMETER**

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

$D_2 = h_6$

**>10–20 DIAMETER**

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

$D_2 = h_6$

mm						EDP NO.
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	$\alpha$	REACH $L_3$	TI-NAMITE-A (AITiN)
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

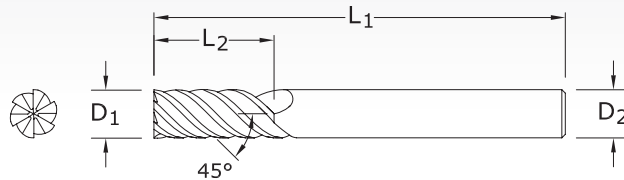
- STEELS
- HARDENED STEELS

# Power-Carb End Mills



## 57 FRACTIONAL SERIES

TECH INFO 70



inch				EDP NO.
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 (AlTiN)
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

HARDENED STEELS

Neck Option Available  
Ideal for Trochoidal Milling

### TOLERANCES (inch)

- 1/4 DIAMETER**  
D<sub>1</sub> = +0.000/-0.0012  
D<sub>2</sub> = h<sub>6</sub>
- 5/16 DIAMETER**  
D<sub>1</sub> = +0.000/-0.0016  
D<sub>2</sub> = h<sub>6</sub>
- 3/8 DIAMETER**  
D<sub>1</sub> = +0.000/-0.0016  
D<sub>2</sub> = h<sub>6</sub>
- 1/2 DIAMETER**  
D<sub>1</sub> = +0.000/-0.002  
D<sub>2</sub> = h<sub>6</sub>

## 57M METRIC SERIES

TECH INFO 70

mm				EDP NO.
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 (AlTiN)
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

Neck Option Available  
Ideal for Trochoidal Milling

### TOLERANCES (mm)

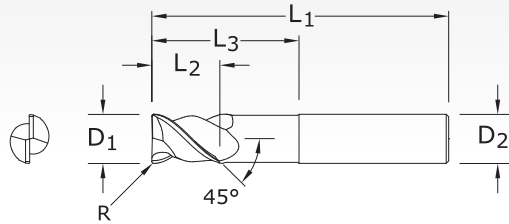
- 6 DIAMETER**  
D<sub>1</sub> = +0,000/-0,030  
D<sub>2</sub> = h<sub>6</sub>
- 8 DIAMETER**  
D<sub>1</sub> = +0,000/-0,040  
D<sub>2</sub> = h<sub>6</sub>
- 10 DIAMETER**  
D<sub>1</sub> = +0,000/-0,040  
D<sub>2</sub> = h<sub>6</sub>
- 12 DIAMETER**  
D<sub>1</sub> = +0,000/-0,050  
D<sub>2</sub>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







# Ski-Carb End Mills



### TOLERANCES (inch)

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

$D_1 = +0.000/-0.00035$

$D_2 = h_6$

$R = +0.000/-0.002$

#### 1/2-5/8 DIAMETER

$D_1 = +0.000/-0.00043$

$D_2 = h_6$

$R = +0.000/-0.002$

#### 3/4-1 DIAMETER

$D_1 = +0.000/-0.00051$

$D_2 = h_6$

$R = +0.000/-0.002$

**45**  
FRACTIONAL SERIES

TECH INFO 71

inch						EDP NO.			
CUTTING DIA.	LENGTH OF CUT	OVERALL LENGTH	SHANK DIA.	REACH	CORNER RADIUS	UNCOATED W/FLAT	UNCOATED W/O FLAT	Ti-NAMITE-B (TiB <sub>2</sub> ) W/FLAT	Ti-NAMITE-B (TiB <sub>2</sub> ) W/O FLAT
$D_1$	$L_2$	$L_1$	$D_2$	$L_3$	$R$				
1/4	3/8	2-1/2	3/8	1	0.010	91257	91250	91235	91242
5/16	7/16	2-1/2	3/8	1-1/8	0.012	91258	91251	91236	91243
3/8	9/16	2-1/2	3/8	1-1/8	0.015	91259	91252	91237	91244
1/2	3/4	3	1/2	1-1/2	0.020	91260	91253	91238	91245
5/8	7/8	3-1/2	5/8	1-3/4	0.025	91261	91254	91239	91246
3/4	1	4	3/4	2	0.030	91262	91255	91240	91247
1	1-1/4	4	1	2-1/8	0.040	91263	91256	91241	91248

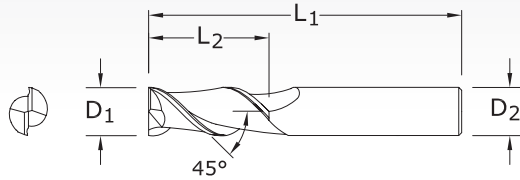


# Ski-Carb End Mills



## 44

FRACTIONAL SERIES



TECH INFO 71

- NON-FERROUS
- PLASTICS/COMPOSITES

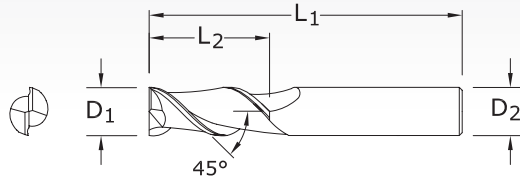
CUTTING DIA. D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIA. D <sub>2</sub>	CORNER RADIUS* R	EDP NO.			
					UNCOATED W/FLAT	UNCOATED W/O FLAT	Ti-NAMITE-B (TiB <sub>2</sub> ) W/FLAT	Ti-NAMITE-B (TiB <sub>2</sub> ) W/O FLAT
1/4	3/4	2-7/16	3/8	.015-.060	34501	32033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

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

### TOLERANCES (inch)

- 1/4-3/8 DIAMETER**
- D<sub>1</sub> = +0.000/-0.00035
- D<sub>2</sub> = h<sub>6</sub>
- R = +0.000/-0.002
- 1/2-5/8 DIAMETER**
- D<sub>1</sub> = +0.000/-0.00043
- D<sub>2</sub> = h<sub>6</sub>
- R = +0.000/-0.002
- 3/4-1 DIAMETER**
- D<sub>1</sub> = +0.000/-0.00051
- D<sub>2</sub> = h<sub>6</sub>
- R = +0.000/-0.002





### TOLERANCES (mm)

#### ≤3 DIAMETER

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

$D_2 = h_6$

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

#### >3–6 DIAMETER

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

$D_2 = h_6$

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

#### >6–10 DIAMETER

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

$D_2 = h_6$

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

#### >10–18 DIAMETER

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

$D_2 = h_6$

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

#### >18–20 DIAMETER

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

$D_2 = h_6$

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

## 44M

METRIC SERIES

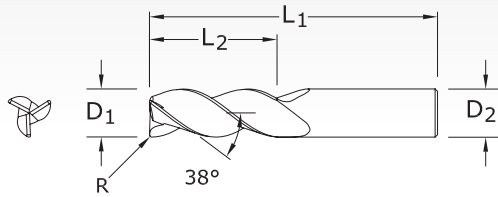
TECH INFO 71

mm					EDP NO.			
CUTTING DIA. $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIA. $D_2$	CORNER RADIUS* $R$	UNCOATED W/FLAT	UNCOATED W/O FLAT	Ti-NAMITE-B (TiB <sub>2</sub> ) W/FLAT	Ti-NAMITE-B (TiB <sub>2</sub> ) W/O FLAT
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 SGS Sales Representative for more information on Corner Radius options.



# S-Carb End Mills



## 43CR FRACTIONAL SERIES

TECH INFO 71

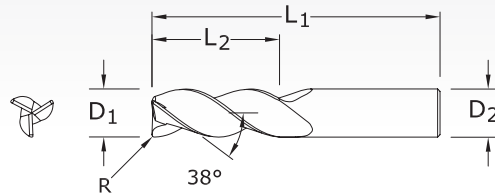
- NON-FERROUS
- PLASTICS/COMPOSITES

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			EDP NO.	
		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	0.010	34771	34793
3/16	9/16	2	3/16	0.010	34772	34794
1/4	3/4	2-1/2	1/4	0.010	34773	34795
1/4	3/4	2-1/2	1/4	0.030	34774	34796
5/16	5/8	2-1/2	5/16	0.030	34775	34797
3/8	1	2-1/2	3/8	0.010	34776	34798
3/8	1	2-1/2	3/8	0.030	34777	34799
3/8	1	2-1/2	3/8	0.060	32761	32825
1/2	1-1/4	3-1/4	1/2	0.010	34778	34800
1/2	1-1/4	3-1/4	1/2	0.030	34779	34801
1/2	1-1/4	3-1/4	1/2	0.060	34780	34802
1/2	1-1/4	3-1/4	1/2	0.090	34781	34803
1/2	1-1/4	3-1/4	1/2	0.120	32766	32830
5/8	1-5/8	3-3/4	5/8	0.030	34782	34804
5/8	1-5/8	3-3/4	5/8	0.060	34783	34805
5/8	1-5/8	3-3/4	5/8	0.090	34784	34806
3/4	1-5/8	4	3/4	0.030	34785	34807
3/4	1-5/8	4	3/4	0.060	34786	34808
3/4	1-5/8	4	3/4	0.090	34787	34809
3/4	1-5/8	4	3/4	0.120	34815	34817
1	2	4-1/2	1	0.030	34789	34811
1	2	4-1/2	1	0.060	34790	34812
1	2	4-1/2	1	0.090	34791	34813
1	2	4-1/2	1	0.120	34816	34818

### TOLERANCES (inch)

- 1/8-3/16 DIAMETER**
- D<sub>1</sub> = +0.000/-0.00032
- D<sub>2</sub> = h<sub>6</sub>
- R = +0.000/-0.002
- 1/4-3/8 DIAMETER**
- D<sub>1</sub> = +0.000/-0.00035
- D<sub>2</sub> = h<sub>6</sub>
- R = +0.000/-0.002
- 1/2-5/8 DIAMETER**
- D<sub>1</sub> = +0.000/-0.00043
- D<sub>2</sub> = h<sub>6</sub>
- R = +0.000/-0.002
- 3/4-1 DIAMETER**
- D<sub>1</sub> = +0.000/-0.00051
- D<sub>2</sub> = h<sub>6</sub>
- R = +0.000/-0.002





## 43MCR

METRIC SERIES

TECH INFO 71

### TOLERANCES (mm)

#### 6 DIAMETER

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

$D_2 = h_6$

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

#### >6-10 DIAMETER

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

$D_2 = h_6$

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

#### >10-18 DIAMETER

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

$D_2 = h_6$

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

#### >18-20 DIAMETER

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

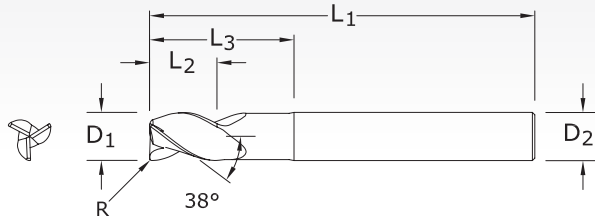
$D_2 = h_6$

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

mm						EDP NO.	
CUTTING DIAMETER	LENGTH OF CUT	OVERALL LENGTH	SHANK DIAMETER	REACH	CORNER RADIUS	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )
D <sub>1</sub>	L <sub>2</sub>	L <sub>1</sub>	D <sub>2</sub>	L <sub>3</sub>	R		
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
16,0	20,0	125,0	16,0	50,0	2,0	44785	44805
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	4,0	44788	44808



# S-Carb End Mills



## 43LC FRACTIONAL SERIES

TECH INFO 71

- NON-FERROUS
- PLASTICS/COMPOSITES

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	inch			EDP NO.	
			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	0.010	32751	32815
3/16	7/32	3	3/16	1/2	0.010	32752	32816
1/4	3/8	4	1/4	3/4	0.010	32753	32817
1/4	3/8	4	1/4	3/4	0.030	32754	32818
1/4	3/8	4	1/4	1-1/2	0.010	32755	32819
1/4	3/8	4	1/4	1-1/2	0.030	32756	32820
1/4	3/8	4	1/4	2-1/8	0.010	32757	32821
1/4	3/8	4	1/4	2-1/8	0.030	32758	32822
5/16	7/16	4	5/16	1-1/8	0.030	32759	32823
5/16	7/16	4	5/16	2-1/8	0.030	32760	32824
3/8	1/2	4	3/8	1-1/8	0.030	32762	32826
3/8	1/2	4	3/8	1-1/8	0.060	32763	32827
3/8	1/2	4	3/8	2-1/8	0.030	32764	32828
3/8	1/2	4	3/8	2-1/8	0.060	32765	32829
1/2	5/8	4	1/2	1-3/8	0.030	32767	32831
1/2	5/8	4	1/2	1-3/8	0.060	32768	32832
1/2	5/8	4	1/2	1-3/8	0.090	32769	32833
1/2	5/8	4	1/2	1-3/8	0.120	32770	32834
1/2	5/8	6	1/2	2-1/8	0.030	32771	32835
1/2	5/8	6	1/2	2-1/8	0.060	32772	32836
1/2	5/8	6	1/2	2-1/8	0.090	32773	32837
1/2	5/8	6	1/2	2-1/8	0.120	32774	32838
1/2	5/8	6	1/2	3-3/8	0.030	32775	32839
1/2	5/8	6	1/2	3-3/8	0.060	32776	32840
1/2	5/8	6	1/2	3-3/8	0.090	32777	32841
1/2	5/8	6	1/2	3-3/8	0.120	32778	32842

continued on next page

### TOLERANCES (inch)

#### 1/8-3/16 DIAMETER

D<sub>1</sub> = +0.000/-0.00032

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

R = +0.000/-0.002

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

D<sub>1</sub> = +0.000/-0.00035

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

R = +0.000/-0.002

#### 1/2-5/8 DIAMETER

D<sub>1</sub> = +0.000/-0.00043

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

R = +0.000/-0.002

#### 3/4-1 DIAMETER

D<sub>1</sub> = +0.000/-0.00051

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

R = +0.000/-0.002





# S-Carb End Mills



## 43LC FRACTIONAL SERIES

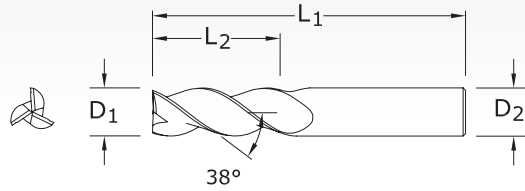
CONTINUED

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch				CORNER RADIUS R	EDP NO.	
		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> )	
5/8	3/4	4	5/8	1-3/4	0.030	32779	32843	
5/8	3/4	4	5/8	1-3/4	0.060	32780	32844	
5/8	3/4	4	5/8	1-3/4	0.090	32781	32845	
5/8	3/4	4	5/8	1-3/4	0.120	32782	32846	
5/8	3/4	4	5/8	2-3/8	0.030	32783	32847	
5/8	3/4	4	5/8	2-3/8	0.060	32784	32848	
5/8	3/4	4	5/8	2-3/8	0.090	32785	32849	
5/8	3/4	4	5/8	2-3/8	0.120	32786	32850	
5/8	3/4	6	5/8	3-3/8	0.030	32787	32851	
5/8	3/4	6	5/8	3-3/8	0.060	32788	32852	
5/8	3/4	6	5/8	3-3/8	0.090	32789	32853	
5/8	3/4	6	5/8	3-3/8	0.120	32790	32854	
3/4	1	4	3/4	1-3/4	0.030	32791	32855	
3/4	1	4	3/4	1-3/4	0.060	32792	32856	
3/4	1	4	3/4	1-3/4	0.090	32793	32857	
3/4	1	4	3/4	1-3/4	0.120	32794	32858	
3/4	1	6	3/4	2-3/8	0.030	32795	32859	
3/4	1	6	3/4	2-3/8	0.060	32796	32860	
3/4	1	6	3/4	2-3/8	0.090	32797	32861	
3/4	1	6	3/4	2-3/8	0.120	32798	32862	
3/4	1	6	3/4	3-3/8	0.030	32799	32863	
3/4	1	6	3/4	3-3/8	0.060	32800	32864	
3/4	1	6	3/4	3-3/8	0.090	32801	32865	
3/4	1	6	3/4	3-3/8	0.120	32802	32866	
1	1-1/4	6	1	2-3/8	0.030	32803	32867	
1	1-1/4	6	1	2-3/8	0.060	32804	32868	
1	1-1/4	6	1	2-3/8	0.090	32805	32869	
1	1-1/4	6	1	2-3/8	0.120	32806	32870	
1	1-1/4	6	1	3-3/8	0.030	32807	32871	
1	1-1/4	6	1	3-3/8	0.060	32808	32872	
1	1-1/4	6	1	3-3/8	0.090	32809	32873	
1	1-1/4	6	1	3-3/8	0.120	32810	32874	

- NON-FERROUS
- PLASTICS/COMPOSITES



# S-Carb End Mills



## 43

FRACTIONAL SERIES

TECH INFO 71

- NON-FERROUS
- PLASTICS/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.	
				UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )
1/8	3/8	1-1/2	1/8	34701	34728
3/16	9/16	2	3/8	34702	34729
1/4	3/8	2	1/4	34703	34730
1/4	3/4	2-1/2	1/4	34704	34731
1/4	1-1/4	3-1/2	1/4	34705	34732
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	1-1/2	3-1/2	3/8	34711	34738
1/2	5/8	2-1/2	1/2	34712	34739
1/2	1-1/4	3-1/4	1/2	34713	34740
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	2-1/2	5	5/8	34718	34745
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

### TOLERANCES (inch)

**1/8-3/16 DIAMETER**  
D<sub>1</sub> = +0.000/-0.00032  
D<sub>2</sub> = h<sub>6</sub>

**1/4-3/8 DIAMETER**  
D<sub>1</sub> = +0.000/-0.00035  
D<sub>2</sub> = h<sub>6</sub>

**1/2-5/8 DIAMETER**  
D<sub>1</sub> = +0.000/-0.00043  
D<sub>2</sub> = h<sub>6</sub>

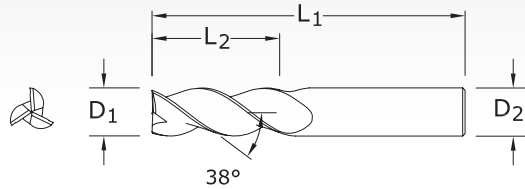
**3/4-1 DIAMETER**  
D<sub>1</sub> = +0.000/-0.00051  
D<sub>2</sub> = h<sub>6</sub>







# S-Carb End Mills



## 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

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

$D_2 = h_6$

# 43M

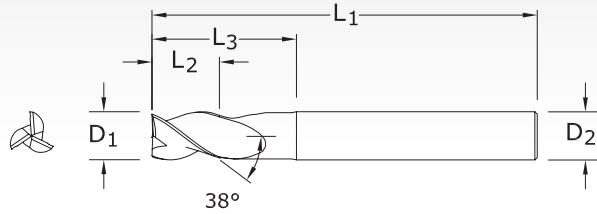
METRIC SERIES

TECH INFO 71

mm				EDP NO.	
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



# S-Carb End Mills



## 43L

FRACTIONAL SERIES

TECH INFO 71

- NON-FERROUS
- PLASTICS/COMPOSITES

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			EDP NO.	
		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
3/16	7/32	3	3/16	1/2	32701	32726
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
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
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
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

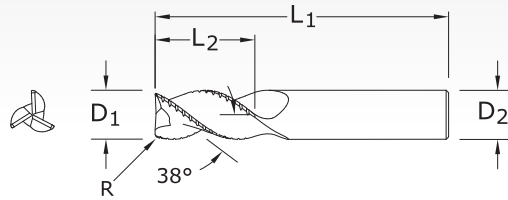
TOLERANCES (inch)

- 1/8-3/16 DIAMETER**  
D<sub>1</sub> = +0.000/-0.00032  
D<sub>2</sub> = h<sub>6</sub>
- 1/4-3/8 DIAMETER**  
D<sub>1</sub> = +0.000/-0.00035  
D<sub>2</sub> = h<sub>6</sub>
- 1/2-5/8 DIAMETER**  
D<sub>1</sub> = +0.000/-0.00043  
D<sub>2</sub> = h<sub>6</sub>
- 3/4-1 DIAMETER**  
D<sub>1</sub> = +0.000/-0.00051  
D<sub>2</sub> = h<sub>6</sub>





# S-Carb Roughing End Mills



## TOLERANCES (inch)

### 3/8 DIAMETER

$D_1 = +0.000/-0.00035$

$D_2 = h_6$

$R = +0.000/-0.002$

### 1/2-5/8 DIAMETER

$D_1 = +0.000/-0.00043$

$D_2 = h_6$

$R = +0.000/-0.002$

### 3/4-1 DIAMETER

$D_1 = +0.000/-0.00051$

$D_2 = h_6$

$R = +0.000/-0.002$

## TOLERANCES (mm)

### 8-10 DIAMETER

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

$D_2 = h_6$

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

### >10-18 DIAMETER

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

$D_2 = h_6$

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

### >18-20 DIAMETER

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

$D_2 = h_6$

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

## 43CB

FRACTIONAL SERIES

TECH INFO 71

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			EDP NO.	
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	CORNER RADIUS $R$	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )
3/8	1	2-1/2	3/8	.010	34300	34305
1/2	1-1/4	3-1/4	1/2	.030	34301	34306
5/8	1-5/8	3-3/4	5/8	.030	34302	34307
3/4	1-5/8	4	3/4	.030	34303	34308
1	2	4-1/2	1	.030	34304	34309



## 43MCB

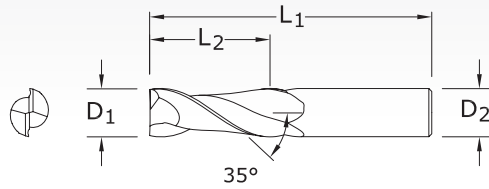
METRIC SERIES

TECH INFO 71

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	mm			EDP NO.	
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	CORNER RADIUS $R$	UNCOATED	Ti-NAMITE-B (TiB <sub>2</sub> )
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



# S-Carb End Mills



## 47

### FRACTIONAL SERIES

TECH INFO 71

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.	
				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

TOLERANCES (inch)

1/8–1 DIAMETER

D<sub>1</sub> = +0.0001/-0.0004

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

NON-FERROUS

PLASTICS/COMPOSITES

## 47M

### METRIC SERIES

TECH INFO 71

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.	
				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

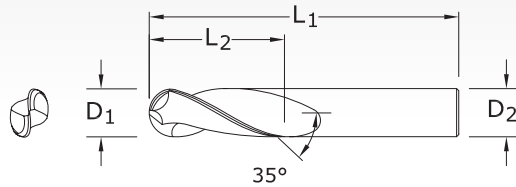
TOLERANCES (mm)

3–25 DIAMETER

D<sub>1</sub> = +0,0025/-0,010

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





### TOLERANCES (inch)

#### 1/8-1 DIAMETER

$D_1 = +0.0001/-0.0004$

$D_2 = h_6$

## 47B

FRACTIONAL SERIES

TECH INFO 71

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.	
				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 (mm)

#### 3-25 DIAMETER

$D_1 = +0,0025/-0,010$

$D_2 = h_6$

## 47MB

METRIC SERIES

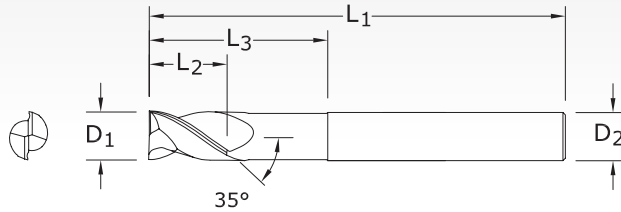
TECH INFO 71

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.	
				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

# S-Carb End Mills



## 47ES FRACTIONAL SERIES



TECH INFO 71

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	inch			EDP NO.	
		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> )
1/4	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

- NON-FERROUS
- PLASTICS/COMPOSITES

TOLERANCES (inch)

1/4-3/4 DIAMETER  
D<sub>1</sub> = +0.0001/-0.0004  
D<sub>2</sub> = h<sub>6</sub>

## 47MES METRIC SERIES

TECH INFO 71

CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	mm			EDP NO.	
		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> )
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

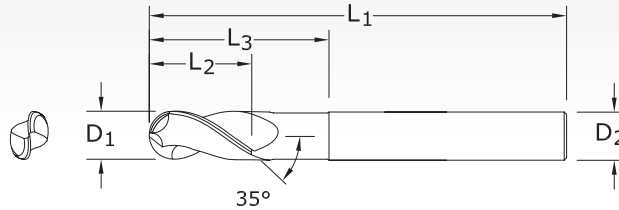
TOLERANCES (mm)

6-20 DIAMETER  
D<sub>1</sub> = +0,0025/-0,010  
D<sub>2</sub> = h<sub>6</sub>





# S-Carb End Mills



## TOLERANCES (inch)

### 1/4–3/4 DIAMETER

$$D_1 = +0.0001/-0.0004$$

$$D_2 = h_6$$

## 47EB

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>	REACH L <sub>3</sub>	EDP NO.	
					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	34690
5/8	3/4	6	5/8	2-3/8	34655	34691
3/4	1	6	3/4	2-1/2	34656	34693
3/4	1	6	3/4	3-3/8	34657	34692

TECH INFO 71



## TOLERANCES (mm)

### 6–20 DIAMETER

$$D_1 = +0,0025/-0,010$$

$$D_2 = h_6$$

## 47MEB

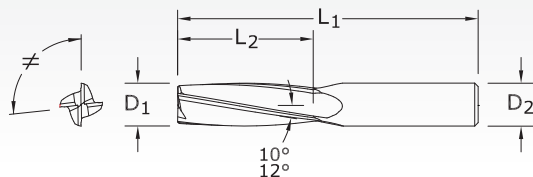
METRIC SERIES

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>	REACH L <sub>3</sub>	EDP NO.	
					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

TECH INFO 71



# CFRP Slow Helix End Mills



## 27 FRACTIONAL SERIES

**TOLERANCES (inch)**  
 $D_1 = +0.000/-0.0030$   
 $D_2 = h_6$

TECH INFO 72

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.	
				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

- NON-FERROUS
- PLASTICS/COMPOSITES

## 27M METRIC SERIES

**TOLERANCES (mm)**  
 $D_1 = +0,000/-0,080$   
 $D_2 = h_6$

TECH INFO 73



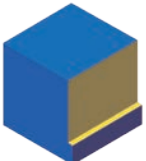
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.	
				UNCOATED	Di-NAMITE (Diamond)
6,0	25,0	63,0	6,0	83056	83057
8,0	25,0	63,0	8,0	83058	83059
10,0	28,0	63,0	10,0	83060	83061
12,0	38,0	89,0	12,0	83062	83063
16,0	48,0	115,0	16,0	83064	83065





# Speed & Feed Recommendations

Z1PCR, Z1PLC, Z1PLB Fractional	HARDNESS	CUT	SPEED	FEED (inch/flute)						
	BRINELL	Type	sfm	1/16	1/8	1/4	3/8	1/2	3/4	1
<b>CARBON STEEL</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175	Slot	505	0.00019	0.00047	0.0012	0.0023	0.0031	0.0037	0.0043
		Profile	630	0.00019	0.00047	0.0012	0.0023	0.0031	0.0037	0.0043
		Light	1040	0.00044	0.00107	0.0028	0.0053	0.0071	0.0085	0.0100
	> 175 ≤ 275	Slot	440	0.00019	0.00047	0.0012	0.0023	0.0031	0.0037	0.0043
		Profile	550	0.00019	0.00047	0.0012	0.0023	0.0031	0.0037	0.0043
		Light	910	0.00044	0.00107	0.0028	0.0053	0.0071	0.0085	0.0100
<b>ALLOY STEEL</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275	Slot	370	0.00014	0.00035	0.0009	0.0017	0.0023	0.0028	0.0032
		Profile	465	0.00014	0.00035	0.0009	0.0017	0.0023	0.0028	0.0032
		Light	765	0.00033	0.00079	0.0021	0.0040	0.0053	0.0063	0.0074
	> 275 ≤ 375	Slot	250	0.00014	0.00035	0.0009	0.0017	0.0023	0.0028	0.0032
		Profile	315	0.00014	0.00035	0.0009	0.0017	0.0023	0.0028	0.0032
		Light	520	0.00033	0.00079	0.0021	0.0040	0.0053	0.0063	0.0074
<b>TOOL STEEL</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Slot	240	0.00014	0.00035	0.0009	0.0017	0.0023	0.0028	0.0032
		Profile	300	0.00014	0.00035	0.0009	0.0017	0.0023	0.0028	0.0032
		Light	495	0.00033	0.00079	0.0021	0.0040	0.0053	0.0063	0.0074
	> 250 ≤ 375	Slot	145	0.00011	0.00027	0.0007	0.0014	0.0018	0.0022	0.0025
		Profile	185	0.00011	0.00027	0.0007	0.0014	0.0018	0.0022	0.0025
		Light	305	0.00026	0.00062	0.0017	0.0031	0.0041	0.0050	0.0058
<b>CAST IRON</b> Gray, Malleable, Ductile	≤ 220	Slot	355	0.00018	0.00042	0.0011	0.0021	0.0028	0.0034	0.0039
		Profile	445	0.00018	0.00042	0.0011	0.0021	0.0028	0.0034	0.0039
		Light	730	0.00040	0.00096	0.0026	0.0048	0.0064	0.0077	0.0090
	> 220 ≤ 260	Slot	265	0.00018	0.00042	0.0011	0.0021	0.0028	0.0034	0.0039
		Profile	330	0.00018	0.00042	0.0011	0.0021	0.0028	0.0034	0.0039
		Light	545	0.00040	0.00096	0.0026	0.0048	0.0064	0.0077	0.0090
<b>STAINLESS (free machining)</b> 303, 416, 420F, 430F, 440F	≤ 275	Slot	455	0.00014	0.00035	0.0009	0.0017	0.0023	0.0028	0.0032
		Profile	570	0.00014	0.00035	0.0009	0.0017	0.0023	0.0028	0.0032
		Light	935	0.00033	0.00079	0.0021	0.0040	0.0053	0.0063	0.0074
<b>STAINLESS (difficult)</b> 304, 304L, 316, 316L	≤ 275	Slot	315	0.00011	0.00027	0.0007	0.0014	0.0018	0.0022	0.0025
		Profile	395	0.00011	0.00027	0.0007	0.0014	0.0018	0.0022	0.0025
		Light	650	0.00026	0.00062	0.0017	0.0031	0.0041	0.0050	0.0058
<b>STAINLESS (PH)</b> 17-4PH, 15-5PH, Custom 450, 16-6PH, PH13-8Mo	≤ 325	Slot	290	0.00011	0.00027	0.0007	0.0014	0.0018	0.0022	0.0025
		Profile	360	0.00011	0.00027	0.0007	0.0014	0.0018	0.0022	0.0025
		Light	595	0.00026	0.00062	0.0017	0.0031	0.0041	0.0050	0.0058
<b>TITANIUM</b> Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Slot	170	0.00013	0.00030	0.0008	0.0015	0.0020	0.0024	0.0028
		Profile	215	0.00013	0.00030	0.0008	0.0015	0.0020	0.0024	0.0028
		Light	355	0.00029	0.00069	0.0018	0.0034	0.0046	0.0055	0.0064
<b>HIGH TEMPERATURE ALLOY</b> A-286, Hastelloy, Incoloy, Inconel, Rene, Waspalloy	≤ 300	Slot	65	0.00009	0.00023	0.0006	0.0011	0.0015	0.0018	0.0021
		Profile	80	0.00009	0.00023	0.0006	0.0011	0.0015	0.0018	0.0021
		Light	130	0.00022	0.00052	0.0014	0.0026	0.0034	0.0041	0.0048

SLOT		PROFILE		LIGHT*	rpm = sfm x 3.82 / D <sub>1</sub> ipm = (inch/flute) x rpm  • maximum recommended depths shown • reduce speed and feed for materials harder than listed * finish cuts typically require reduced feed and cutting depths of .02 x D <sub>1</sub> maximum • refer to the SGS Tool Wizard for more complete technical information (available at www.sgstool.com)
Regular Rw = D <sub>1</sub> Ad = D <sub>1</sub>	Long Reach Rw = D <sub>1</sub> Ad = .25 x D <sub>1</sub>	Regular Rw = .5 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Long Reach Rw = .2 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Regular, Long Reach Rw = .05 x D <sub>1</sub> Ad = L <sub>2</sub>	
					

# Speed & Feed Recommendations



Z1MPCR, Z1MPLC Metric	HARDNESS BRINELL	CUT Type	SPEED m/min	FEED (mm/flute)						
				1.5	3	6	10	12	20	25
CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175	Slot	154	0.0046	0.0113	0.029	0.061	0.074	0.099	0.108
		Profile	192	0.0046	0.0113	0.029	0.061	0.074	0.099	0.108
		Light	317	0.0106	0.0257	0.067	0.141	0.170	0.227	0.250
	> 175 ≤ 275	Slot	134	0.0046	0.0113	0.029	0.061	0.074	0.099	0.108
		Profile	168	0.0046	0.0113	0.029	0.061	0.074	0.099	0.108
		Light	278	0.0106	0.0257	0.067	0.141	0.170	0.227	0.250
ALLOY STEEL 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275	Slot	113	0.0034	0.0084	0.022	0.045	0.055	0.075	0.080
		Profile	141	0.0034	0.0084	0.022	0.045	0.055	0.075	0.080
		Light	233	0.0079	0.0190	0.050	0.107	0.127	0.168	0.185
	> 275 ≤ 375	Slot	77	0.0034	0.0084	0.022	0.045	0.055	0.075	0.080
		Profile	96	0.0034	0.0084	0.022	0.045	0.055	0.075	0.080
		Light	158	0.0079	0.0190	0.050	0.107	0.127	0.168	0.185
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Slot	73	0.0034	0.0084	0.022	0.045	0.055	0.075	0.080
		Profile	91	0.0034	0.0084	0.022	0.045	0.055	0.075	0.080
		Light	151	0.0079	0.0190	0.050	0.107	0.127	0.168	0.185
	> 250 ≤ 375	Slot	45	0.0026	0.0065	0.017	0.037	0.043	0.059	0.063
		Profile	56	0.0026	0.0065	0.017	0.037	0.043	0.059	0.063
		Light	93	0.0062	0.0149	0.041	0.083	0.098	0.133	0.145
CAST IRON Gray, Malleable, Ductile	≤ 220	Slot	108	0.0043	0.0101	0.026	0.056	0.067	0.091	0.098
		Profile	135	0.0043	0.0101	0.026	0.056	0.067	0.091	0.098
		Light	223	0.0096	0.0230	0.062	0.128	0.154	0.205	0.225
	> 220 ≤ 260	Slot	80	0.0043	0.0101	0.026	0.056	0.067	0.091	0.098
		Profile	101	0.0043	0.0101	0.026	0.056	0.067	0.091	0.098
		Light	166	0.0096	0.0230	0.062	0.128	0.154	0.205	0.225
STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 275	Slot	138	0.0034	0.0084	0.022	0.045	0.055	0.075	0.080
		Profile	173	0.0034	0.0084	0.022	0.045	0.055	0.075	0.080
		Light	286	0.0079	0.0190	0.050	0.107	0.127	0.168	0.185
STAINLESS (difficult) 304, 304L, 316, 316L	≤ 275	Slot	96	0.0026	0.0065	0.017	0.037	0.043	0.059	0.063
		Profile	120	0.0026	0.0065	0.017	0.037	0.043	0.059	0.063
		Light	198	0.0062	0.0149	0.041	0.083	0.098	0.133	0.145
STAINLESS (PH) 17-4PH, 15-5PH, Custom 450, 16-6PH, PH13-8Mo	≤ 325	Slot	88	0.0026	0.0065	0.017	0.037	0.043	0.059	0.063
		Profile	110	0.0026	0.0065	0.017	0.037	0.043	0.059	0.063
		Light	181	0.0062	0.0149	0.041	0.083	0.098	0.133	0.145
TITANIUM Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Slot	52	0.0031	0.0072	0.019	0.040	0.048	0.064	0.070
		Profile	65	0.0031	0.0072	0.019	0.040	0.048	0.064	0.070
		Light	108	0.0070	0.0166	0.043	0.091	0.110	0.147	0.160
HIGH TEMPERATURE ALLOY A-286, Hastelloy, Incoloy, Inconel, Rene, Waspalloy	≤ 300	Slot	19	0.0022	0.0055	0.014	0.029	0.036	0.048	0.053
		Profile	24	0.0022	0.0055	0.014	0.029	0.036	0.048	0.053
		Light	40	0.0053	0.0125	0.034	0.069	0.082	0.109	0.120

CUT TYPE				
SLOT		PROFILE		LIGHT*
Regular Rw = D <sub>1</sub> Ad = D <sub>1</sub>	Long Reach Rw = D <sub>1</sub> Ad = .25 x D <sub>1</sub>	Regular Rw = .5 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Long Reach Rw = .2 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Regular, Long Reach Rw = .05 x D <sub>1</sub> Ad = L <sub>2</sub>

$$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$$

$$\text{mm/min} = (\text{mm/flute}) \times \text{rpm}$$


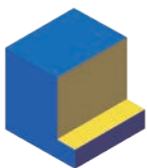
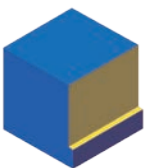
- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- \* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))





# Speed & Feed Recommendations

Z1, Z1B, Z16CR Fractional	HARDNESS	CUT	SPEED		FEED (inch/flute)				
	BRINELL	Type	sfm	1/8	1/4	3/8	1/2	3/4	1
<b>CARBON STEEL</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175	Slot	505	0.00038	0.0010	0.0019	0.0025	0.0030	0.0035
		Profile	630	0.00038	0.0010	0.0019	0.0025	0.0030	0.0035
		Light	1040	0.00086	0.0023	0.0043	0.0057	0.0069	0.0080
	> 175 ≤ 275	Slot	440	0.00038	0.0010	0.0019	0.0025	0.0030	0.0035
		Profile	550	0.00038	0.0010	0.0019	0.0025	0.0030	0.0035
		Light	910	0.00086	0.0023	0.0043	0.0057	0.0069	0.0080
<b>ALLOY STEEL</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275	Slot	370	0.00028	0.0008	0.0014	0.0019	0.0023	0.0026
		Profile	465	0.00028	0.0008	0.0014	0.0019	0.0023	0.0026
		Light	765	0.00065	0.0017	0.0032	0.0043	0.0052	0.0060
	> 275 ≤ 375	Slot	250	0.00028	0.0008	0.0014	0.0019	0.0023	0.0026
		Profile	315	0.00028	0.0008	0.0014	0.0019	0.0023	0.0026
		Light	520	0.00065	0.0017	0.0032	0.0043	0.0052	0.0060
<b>TOOL STEEL</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Slot	240	0.00025	0.0007	0.0012	0.0017	0.0020	0.0023
		Profile	300	0.00025	0.0007	0.0012	0.0017	0.0020	0.0023
		Light	495	0.00057	0.0015	0.0028	0.0038	0.0045	0.0053
	> 250 ≤ 375	Slot	145	0.00020	0.0005	0.0010	0.0013	0.0016	0.0018
		Profile	185	0.00020	0.0005	0.0010	0.0013	0.0016	0.0018
		Light	305	0.00045	0.0012	0.0023	0.0030	0.0036	0.0042
<b>CAST IRON</b> Gray, Malleable, Ductile	≤ 220	Slot	355	0.00035	0.0009	0.0018	0.0024	0.0028	0.0033
		Profile	445	0.00035	0.0009	0.0018	0.0024	0.0028	0.0033
		Light	730	0.00081	0.0022	0.0041	0.0054	0.0065	0.0076
	> 220 ≤ 260	Slot	265	0.00035	0.0009	0.0018	0.0024	0.0028	0.0033
		Profile	330	0.00035	0.0009	0.0018	0.0024	0.0028	0.0033
		Light	545	0.00081	0.0022	0.0041	0.0054	0.0065	0.0076
<b>STAINLESS (free machining)</b> 303, 416, 420F, 430F, 440F	≤ 275	Slot	455	0.00027	0.0007	0.0014	0.0018	0.0022	0.0025
		Profile	570	0.00027	0.0007	0.0014	0.0018	0.0022	0.0025
		Light	935	0.00062	0.0017	0.0031	0.0041	0.0050	0.0058
<b>STAINLESS (difficult)</b> 304, 304L, 316, 316L	≤ 275	Slot	315	0.00022	0.0006	0.0011	0.0014	0.0017	0.0020
		Profile	395	0.00022	0.0006	0.0011	0.0014	0.0017	0.0020
		Light	650	0.00050	0.0013	0.0025	0.0033	0.0040	0.0046
<b>STAINLESS (PH)</b> 17-4PH, 15-5PH, Custom 450, 16-6PH, PH13-8Mo	≤ 325	Slot	290	0.00022	0.0006	0.0011	0.0014	0.0017	0.0020
		Profile	360	0.00022	0.0006	0.0011	0.0014	0.0017	0.0020
		Light	595	0.00050	0.0013	0.0025	0.0033	0.0040	0.0046
<b>TITANIUM</b> Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Slot	170	0.00020	0.0005	0.0010	0.0013	0.0016	0.0018
		Profile	215	0.00020	0.0005	0.0010	0.0013	0.0016	0.0018
		Light	355	0.00045	0.0012	0.0023	0.0030	0.0036	0.0042
<b>HIGH TEMPERATURE ALLOY</b> A-286, Hastelloy, Incoloy, Inconel, Rene, Waspalloy	≤ 300	Slot	65	0.00015	0.0004	0.0008	0.0010	0.0012	0.0014
		Profile	80	0.00015	0.0004	0.0008	0.0010	0.0012	0.0014
		Light	130	0.00034	0.0009	0.0017	0.0023	0.0028	0.0032

SLOT	CUT TYPE		
	PROFILE		LIGHT*
Short, Regular $Rw = D_1$ $Ad = D_1$	Short $Rw = .5 \times D_1$ $Ad = L_2$	Regular $Rw = .5 \times D_1$ $Ad = 1.5 \times D_1$	Short, Regular $Rw = .05 \times D_1$ $Ad = L_2$
			$rpm = sfm \times 3.82 / D_1$ $ipm = (inch/flute) \times 4 \times rpm$ <ul style="list-style-type: none"> <li>• maximum recommended depths shown</li> <li>• reduce speed and feed for materials harder than listed</li> <li>* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum</li> <li>• refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a>)</li> </ul>



# Speed & Feed Recommendations



Z1M, Z1MB Metric	HARDNESS	CUT	SPEED		FEED (mm/flute)				
	BRINELL	Type	m/min	3	6	10	12	20	25
<b>CARBON STEEL</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175	Slot	154	0.0091	0.024	0.051	0.060	0.080	0.088
		Profile	192	0.0091	0.024	0.051	0.060	0.080	0.088
		Light	317	0.0206	0.055	0.115	0.137	0.184	0.200
	> 175 ≤ 275	Slot	134	0.0091	0.024	0.051	0.060	0.080	0.088
		Profile	168	0.0091	0.024	0.051	0.060	0.080	0.088
		Light	278	0.0206	0.055	0.115	0.137	0.184	0.200
<b>ALLOY STEEL</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275	Slot	113	0.0067	0.019	0.037	0.046	0.061	0.065
		Profile	141	0.0067	0.019	0.037	0.046	0.061	0.065
		Light	233	0.0156	0.041	0.085	0.103	0.139	0.150
	> 275 ≤ 375	Slot	77	0.0067	0.019	0.037	0.046	0.061	0.065
		Profile	96	0.0067	0.019	0.037	0.046	0.061	0.065
		Light	158	0.0156	0.041	0.085	0.103	0.139	0.150
<b>TOOL STEEL</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Slot	73	0.0060	0.017	0.032	0.041	0.053	0.058
		Profile	91	0.0060	0.017	0.032	0.041	0.053	0.058
		Light	151	0.0137	0.036	0.075	0.091	0.120	0.133
	> 250 ≤ 375	Slot	45	0.0048	0.012	0.027	0.031	0.043	0.045
		Profile	56	0.0048	0.012	0.027	0.031	0.043	0.045
		Light	93	0.0108	0.029	0.061	0.072	0.096	0.105
<b>CAST IRON</b> Gray, Malleable, Ductile	≤ 220	Slot	108	0.0084	0.022	0.048	0.058	0.075	0.083
		Profile	135	0.0084	0.022	0.048	0.058	0.075	0.083
		Light	223	0.0194	0.053	0.109	0.130	0.173	0.190
	> 220 ≤ 260	Slot	80	0.0084	0.022	0.048	0.058	0.075	0.083
		Profile	101	0.0084	0.022	0.048	0.058	0.075	0.083
		Light	166	0.0194	0.053	0.109	0.130	0.173	0.190
<b>STAINLESS (free machining)</b> 303, 416, 420F, 430F, 440F	≤ 275	Slot	138	0.0065	0.017	0.037	0.043	0.059	0.063
		Profile	173	0.0065	0.017	0.037	0.043	0.059	0.063
		Light	286	0.0149	0.041	0.083	0.098	0.133	0.145
<b>STAINLESS (difficult)</b> 304, 304L, 316, 316L	≤ 275	Slot	96	0.0053	0.014	0.029	0.034	0.045	0.050
		Profile	120	0.0053	0.014	0.029	0.034	0.045	0.050
		Light	198	0.0120	0.031	0.067	0.079	0.107	0.115
<b>STAINLESS (PH)</b> 17-4PH, 15-5PH, Custom 450, 16-6PH, PH13-8Mo	≤ 325	Slot	88	0.0053	0.014	0.029	0.034	0.045	0.050
		Profile	110	0.0053	0.014	0.029	0.034	0.045	0.050
		Light	181	0.0120	0.031	0.067	0.079	0.107	0.115
<b>TITANIUM</b> Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Slot	52	0.0048	0.012	0.027	0.031	0.043	0.045
		Profile	65	0.0048	0.012	0.027	0.031	0.043	0.045
		Light	108	0.0108	0.029	0.061	0.072	0.096	0.105
<b>HIGH TEMPERATURE ALLOY</b> A-286, Hastelloy, Incoloy, Inconel, Rene, Waspalloy	≤ 300	Slot	19	0.0036	0.010	0.021	0.024	0.032	0.035
		Profile	24	0.0036	0.010	0.021	0.024	0.032	0.035
		Light	40	0.0082	0.022	0.045	0.055	0.075	0.080


CUT TYPE		
SLOT	PROFILE	LIGHT*
$R_w = D_1$ $Ad = D_1$	$R_w = .5 \times D_1$ $Ad = 1.5 \times D_1$	$R_w = .05 \times D_1$ $Ad = L_2$


$$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$$



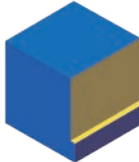
$$\text{ipm} = (\text{mm/flute}) \times 4 \times \text{rpm}$$

- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- \* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum
- refer to the SGStool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))

# Speed & Feed Recommendations

ZH1CR Fractional	HARDNESS	CUT	SPEED	FEED (inch/flute)				
	BRINELL	Type	sfm	1/4	3/8	1/2	3/4	1
 HIGH TEMPERATURE ALLOY A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Udimet, Waspalloy	≤ 300	Slot	70	0.0007	0.0012	0.0017	0.0020	0.0023
		Profile	85	0.0007	0.0012	0.0017	0.0020	0.0023
		Light	145	0.0015	0.0028	0.0038	0.0045	0.0053
	> 300	Slot	55	0.0005	0.0009	0.0012	0.0014	0.0016
		Profile	70	0.0005	0.0009	0.0012	0.0014	0.0016
		Light	110	0.0011	0.0020	0.0026	0.0032	0.0037

ZH1MCR Metric	HARDNESS	CUT	SPEED	FEED (mm/flute)				
	BRINELL	Type	m/min	6	10	12	20	25
 HIGH TEMPERATURE ALLOY A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Udimet, Waspalloy	≤ 300	Slot	21	0.017	0.032	0.041	0.053	0.058
		Profile	27	0.017	0.032	0.041	0.053	0.058
		Light	45	0.036	0.075	0.091	0.120	0.133
	> 300	Slot	16	0.012	0.024	0.029	0.037	0.040
		Profile	21	0.012	0.024	0.029	0.037	0.040
		Light	34	0.026	0.053	0.062	0.085	0.093




CUT TYPE			$rpm = sfm \times 3.82 / D_1$ $rpm = (1000 \times m/min) / (3.14 \times D_1)$ $ipm = (inch/flute) \times 4 \times rpm$ $mm/min = (mm/flute) \times 4 \times rpm$
SLOT	PROFILE	LIGHT*	
$Rw = D_1$ $Ad = D_1$	$Rw = .5 \times D_1$ $Ad = 1.5 \times D_1$	$Rw = .05 \times D_1$ $Ad = 1.5 \times D_1$	<ul style="list-style-type: none"> <li>• maximum recommended depths shown</li> <li>• reduce speed and feed for materials harder than listed</li> <li>* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum</li> <li>• refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a>)</li> </ul>
			

# Speed & Feed Recommendations



ZD1CR Fractional	HARDNESS	CUT	SPEED	FEED (inch/flute)					
	BRINELL	Type	sfm	1/8	1/4	3/8	1/2	5/8	3/4
<b>STEEL</b> TOOL STEEL MOLD & DIE STEEL 300M, 4340, 52100, HP 9-4-20, M-50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 420	Slot	215	0.0006	0.0013	0.0019	0.0025	0.0031	0.0038
		Profile	265	0.0009	0.0018	0.0026	0.0035	0.0044	0.0053
		Light	560	0.0011	0.0022	0.0033	0.0044	0.0055	0.0066
	> 420 ≤ 560	Slot	120	0.0005	0.0010	0.0015	0.0020	0.0025	0.0030
		Profile	150	0.0007	0.0014	0.0021	0.0028	0.0035	0.0042
		Light	490	0.0009	0.0018	0.0026	0.0035	0.0044	0.0053
	> 560 ≤ 655	Slot	65	0.0004	0.0008	0.0011	0.0015	0.0019	0.0023
		Profile	80	0.0005	0.0011	0.0016	0.0021	0.0026	0.0032
		Light	250	0.0006	0.0013	0.0019	0.0025	0.0031	0.0038

ZD1MCR Metric	HARDNESS	CUT	SPEED	FEED (mm/flute)					
	BRINELL	Type	m/min	3	6	10	12	16	20
<b>STEEL</b> TOOL STEEL MOLD & DIE STEEL 300M, 4340, 52100, HP 9-4-20, M-50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 420	Slot	66	0.016	0.032	0.048	0.064	0.079	0.097
		Profile	81	0.023	0.046	0.066	0.089	0.112	0.135
		Light	171	0.028	0.056	0.084	0.112	0.140	0.168
	> 420 ≤ 560	Slot	37	0.013	0.025	0.038	0.051	0.064	0.076
		Profile	46	0.018	0.036	0.053	0.071	0.089	0.107
		Light	149	0.023	0.046	0.066	0.089	0.112	0.135
	> 560 ≤ 655	Slot	20	0.010	0.020	0.028	0.038	0.048	0.058
		Profile	24	0.013	0.028	0.041	0.053	0.066	0.081
		Light	76	0.015	0.033	0.048	0.064	0.079	0.097


CUT TYPE					rpm = sfm x 3.82 / D <sub>1</sub> rpm = (1000 x m/min) / (3.14 x D <sub>1</sub> ) ipm = (inch/flute) x 4 x rpm mm/min = (mm/flute) x 4 x rpm  • maximum recommended depths shown *finish cuts typically require reduced feed and cutting depths of .02 x D <sub>1</sub> maximum • refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )
SLOT		PROFILE		LIGHT*	
≤ 560 Brinell Rw = D <sub>1</sub> Ad = .5 x D <sub>1</sub>	> 560 ≤ 655 Brinell Rw = D <sub>1</sub> Ad = .3 x D <sub>1</sub>	≤ 560 Brinell Rw = .5 x D <sub>1</sub> Ad = D <sub>1</sub>	> 560 ≤ 655 Brinell Rw = .3 x D <sub>1</sub> Ad = D <sub>1</sub>	≤ 655 Brinell Rw = .1 x D <sub>1</sub> Ad = .1 x D <sub>1</sub>	
					

7, 7B Fractional	HARDNESS	CUT	SPEED	FEED (inch/flute)					
	BRINELL	Type	sfm	1/8	1/4	3/8	1/2	3/4	1
CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175	Finish	825	0.00069	0.0018	0.0035	0.0046	0.0055	0.0064
	> 175 ≤ 275	Finish	720	0.00069	0.0018	0.0035	0.0046	0.0055	0.0064
ALLOY STEEL 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275	Finish	605	0.00051	0.0014	0.0026	0.0034	0.0041	0.0048
	> 275 ≤ 375	Finish	410	0.00051	0.0014	0.0026	0.0034	0.0041	0.0048
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Finish	565	0.00036	0.0010	0.0018	0.0024	0.0029	0.0034
	> 250 ≤ 375	Finish	350	0.00029	0.0008	0.0015	0.0020	0.0024	0.0028
CAST IRON Gray, Malleable, Ductile	≤ 220	Finish	605	0.00055	0.0015	0.0028	0.0037	0.0044	0.0052
	> 220 ≤ 260	Finish	450	0.00055	0.0015	0.0028	0.0037	0.0044	0.0052
STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 275	Finish	420	0.00036	0.0010	0.0018	0.0024	0.0029	0.0034
STAINLESS (difficult) 304, 304L, 316, 316L	≤ 275	Finish	290	0.00034	0.0009	0.0017	0.0020	0.0027	0.0031
STAINLESS (PH) 17-4PH, 15-5PH, Custom 450, 16-6PH, PH13-8Mo	≤ 325	Finish	265	0.00029	0.0008	0.0015	0.0020	0.0024	0.0028
TITANIUM Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Finish	300	0.00038	0.0010	0.0019	0.0025	0.0030	0.0035
HIGH TEMPERATURE ALLOY Inconel, Rene, Waspalloy	≤ 300	Finish	80	0.00030	0.0008	0.0014	0.0019	0.0023	0.0034

CUT TYPE	
<b>FINISH</b>	$rpm = sfm \times 3.82 / D_1$ $ipm = (inch/flute) \times 4 \times rpm$
$Rw = .02 \times D_1$ $Ad = L_2$	<ul style="list-style-type: none"> <li>• maximum recommended depths shown</li> <li>• adjust feed as required for optimum results</li> <li>• reduce speed and feed for materials harder than listed</li> <li>• refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a>)</li> </ul>

# Speed & Feed Recommendations

7M, 7MB Metric	HARDNESS	CUT	SPEED	FEED (mm/flute)					
	BRINELL	Type	m/min	3	6	10	12	20	25
CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175	Finish	250	0.0166	0.043	0.093	0.110	0.147	0.160
	> 175 ≤ 275	Finish	220	0.0166	0.043	0.093	0.110	0.147	0.160
ALLOY STEEL 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275	Finish	185	0.0122	0.034	0.069	0.082	0.109	0.120
	> 275 ≤ 375	Finish	125	0.0122	0.034	0.069	0.082	0.109	0.120
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Finish	170	0.0086	0.024	0.048	0.058	0.077	0.085
	> 250 ≤ 375	Finish	105	0.0070	0.019	0.040	0.048	0.064	0.070
CAST IRON Gray, Malleable, Ductile	≤ 220	Finish	185	0.0132	0.036	0.075	0.089	0.117	0.130
	> 220 ≤ 260	Finish	135	0.0132	0.036	0.075	0.089	0.117	0.130
STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 275	Finish	130	0.0086	0.024	0.048	0.058	0.077	0.085
STAINLESS (difficult) 304, 304L, 316, 316L	≤ 275	Finish	90	0.0082	0.022	0.045	0.048	0.072	0.078
STAINLESS (PH) 17-4PH, 15-5PH, Custom 450, 16-6PH, PH13-8Mo	≤ 325	Finish	80	0.0070	0.019	0.040	0.048	0.064	0.070
TITANIUM Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Finish	90	0.0091	0.024	0.051	0.060	0.080	0.088
HIGH TEMPERATURE ALLOY Inconel, Rene, Waspalloy	≤ 300	Finish	25	0.0072	0.019	0.037	0.046	0.061	0.085

CUT TYPE
<b>FINISH</b>
Rw = .02 x D <sub>1</sub> Ad = L <sub>2</sub>


$$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$$

$$\text{mm/min} = (\text{mm/flute}) \times 4 \times \text{rpm}$$

- maximum recommended depths shown
- adjust feed as required for optimum results
- reduce speed and feed for materials harder than listed
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))



55CR, 55 Fractional	HARDNESS BRINELL	CUT Type	SPEED sfm	FEED (inch/flute)					
				1/8	1/4	3/8	1/2	3/4	1
<b>CARBON STEEL</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175	Slot	350	0.00030	0.0008	0.0015	0.0020	0.0024	0.0028
		Profile	435	0.00030	0.0008	0.0015	0.0020	0.0024	0.0028
		Light	720	0.00069	0.0018	0.0034	0.0046	0.0055	0.0064
	> 175 ≤ 275	Slot	305	0.00030	0.0008	0.0015	0.0020	0.0024	0.0028
		Profile	380	0.00030	0.0008	0.0015	0.0020	0.0024	0.0028
		Light	630	0.00069	0.0018	0.0034	0.0046	0.0055	0.0064
<b>ALLOY STEEL</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275	Slot	255	0.00023	0.0006	0.0011	0.0015	0.0018	0.0021
		Profile	320	0.00023	0.0006	0.0011	0.0015	0.0018	0.0021
		Light	530	0.00052	0.0014	0.0026	0.0034	0.0041	0.0048
	> 275 ≤ 375	Slot	175	0.00023	0.0006	0.0011	0.0015	0.0018	0.0021
		Profile	220	0.00023	0.0006	0.0011	0.0015	0.0018	0.0021
		Light	360	0.00052	0.0014	0.0026	0.0034	0.0041	0.0048
<b>TOOL STEEL</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Slot	230	0.00021	0.0006	0.0011	0.0014	0.0017	0.0020
		Profile	285	0.00021	0.0006	0.0011	0.0014	0.0017	0.0020
		Light	470	0.00048	0.0013	0.0024	0.0032	0.0039	0.0045
	> 250 ≤ 375	Slot	140	0.00017	0.0004	0.0008	0.0011	0.0013	0.0015
		Profile	175	0.00017	0.0004	0.0008	0.0011	0.0013	0.0015
		Light	290	0.00038	0.0010	0.0019	0.0025	0.0030	0.0035
<b>CAST IRON</b> Gray, Malleable, Ductile	≤ 220	Slot	340	0.00030	0.0008	0.0015	0.0020	0.0024	0.0028
		Profile	430	0.00030	0.0008	0.0015	0.0020	0.0024	0.0028
		Light	705	0.00069	0.0018	0.0034	0.0046	0.0055	0.0064
	> 220 ≤ 260	Slot	255	0.00030	0.0008	0.0015	0.0020	0.0024	0.0028
		Profile	320	0.00030	0.0008	0.0015	0.0020	0.0024	0.0028
		Light	525	0.00069	0.0018	0.0034	0.0046	0.0055	0.0064
<b>STAINLESS (free machining)</b> 303, 416, 420F, 430F, 440F	≤ 275	Slot	270	0.00023	0.0006	0.0011	0.0015	0.0018	0.0021
		Profile	340	0.00023	0.0006	0.0011	0.0015	0.0018	0.0021
		Light	560	0.00052	0.0014	0.0026	0.0034	0.0041	0.0048
<b>STAINLESS (difficult)</b> 304, 304L, 316, 316L	≤ 275	Slot	185	0.00018	0.0005	0.0009	0.0012	0.0014	0.0017
		Profile	235	0.00018	0.0005	0.0009	0.0012	0.0014	0.0017
		Light	385	0.00041	0.0001	0.0021	0.0028	0.0033	0.0039
<b>STAINLESS (PH)</b> 17-4PH, 15-5PH, Custom 450, 16-6PH, PH13-8Mo	≤ 325	Slot	170	0.00018	0.0005	0.0009	0.0012	0.0014	0.0017
		Profile	215	0.00018	0.0005	0.0009	0.0012	0.0014	0.0017
		Light	355	0.00041	0.0001	0.0021	0.0028	0.0033	0.0039
<b>TITANIUM</b> Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Slot	190	0.00021	0.0006	0.0011	0.0014	0.0017	0.0020
		Profile	235	0.00021	0.0006	0.0011	0.0014	0.0017	0.0020
		Light	390	0.00048	0.0013	0.0024	0.0032	0.0039	0.0045
<b>HIGH TEMPERATURE ALLOY</b> A-286, Hastelloy, Incoloy, Inconel, Rene, Waspalloy	≤ 300	Slot	52	0.00018	0.0005	0.0009	0.0012	0.0014	0.0017
		Profile	64	0.00018	0.0005	0.0009	0.0012	0.0014	0.0017
		Light	107	0.00041	0.0001	0.0021	0.0028	0.0033	0.0039

CUT TYPE					
SLOT		PROFILE		LIGHT*	
Short Rw = D <sub>1</sub> Ad = .6 x D <sub>1</sub>	Regular Rw = D <sub>1</sub> Ad = .5 x D <sub>1</sub>	Short Rw = .5 x D <sub>1</sub> Ad = L <sub>2</sub>	Regular Rw = .3 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Short, Regular Rw = .05 x D <sub>1</sub> Ad = L <sub>2</sub>	Long Rw = .02 x D <sub>1</sub> Ad = 3 x D <sub>1</sub>

$$\text{rpm} = \text{sfm} \times 3.82 / D_1$$

$$\text{ipm} = (\text{inch/flute}) \times 5 \times \text{rpm}$$

- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- long flute tools not recommended for Slot or Profile
- \* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))

# Speed & Feed Recommendations



55M Metric	HARDNESS	CUT	SPEED	FEED (mm/flute)					
	BRINELL	Type	m/min	6	8	10	12	16	20
<b>CARBON STEEL</b> 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175	Slot	107	0.0192	0.032	0.040	0.048	0.064	0.064
		Profile	133	0.0192	0.032	0.040	0.048	0.064	0.064
		Light	219	0.0432	0.073	0.091	0.110	0.147	0.147
	> 175 ≤ 275	Slot	93	0.0192	0.032	0.040	0.048	0.064	0.064
		Profile	116	0.0192	0.032	0.040	0.048	0.064	0.064
		Light	192	0.0432	0.073	0.091	0.110	0.147	0.147
<b>ALLOY STEEL</b> 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275	Slot	78	0.0144	0.023	0.029	0.036	0.048	0.048
		Profile	98	0.0144	0.023	0.029	0.036	0.048	0.048
		Light	162	0.0336	0.055	0.069	0.082	0.109	0.109
	> 275 ≤ 375	Slot	53	0.0144	0.023	0.029	0.036	0.048	0.048
		Profile	67	0.0144	0.023	0.029	0.036	0.048	0.048
		Light	110	0.0336	0.055	0.069	0.082	0.109	0.109
<b>TOOL STEEL</b> A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Slot	70	0.0144	0.023	0.029	0.034	0.045	0.045
		Profile	87	0.0144	0.023	0.029	0.034	0.045	0.045
		Light	143	0.0312	0.051	0.064	0.077	0.102	0.104
	> 250 ≤ 375	Slot	43	0.0096	0.017	0.021	0.026	0.035	0.035
		Profile	53	0.0096	0.017	0.021	0.026	0.035	0.035
		Light	88	0.0240	0.041	0.051	0.060	0.080	0.080
<b>CAST IRON</b> Gray, Malleable, Ductile	≤ 220	Slot	104	0.0192	0.032	0.040	0.048	0.064	0.064
		Profile	131	0.0192	0.032	0.040	0.048	0.064	0.064
		Light	215	0.0432	0.073	0.091	0.110	0.147	0.147
	> 220 ≤ 260	Slot	78	0.0192	0.032	0.040	0.048	0.064	0.064
		Profile	98	0.0192	0.032	0.040	0.048	0.064	0.064
		Light	160	0.0432	0.073	0.091	0.110	0.147	0.147
<b>STAINLESS (free machining)</b> 303, 416, 420F, 430F, 440F	≤ 275	Slot	82	0.0144	0.023	0.029	0.036	0.048	0.048
		Profile	104	0.0144	0.023	0.029	0.036	0.048	0.048
		Light	171	0.0336	0.055	0.069	0.082	0.109	0.109
<b>STAINLESS (difficult)</b> 304, 304L, 316, 316L	≤ 275	Slot	56	0.0120	0.019	0.024	0.029	0.038	0.037
		Profile	72	0.0120	0.019	0.024	0.029	0.038	0.037
		Light	117	0.0026	0.045	0.056	0.067	0.090	0.088
<b>STAINLESS (PH)</b> 17-4PH, 15-5PH, Custom 450, 16-6PH, PH13-8Mo	≤ 325	Slot	52	0.0120	0.019	0.024	0.029	0.038	0.037
		Profile	66	0.0120	0.019	0.024	0.029	0.038	0.037
		Light	108	0.0026	0.045	0.056	0.067	0.090	0.088
<b>TITANIUM</b> Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Slot	58	0.0144	0.023	0.029	0.034	0.045	0.045
		Profile	72	0.0144	0.023	0.029	0.034	0.045	0.045
		Light	119	0.0312	0.051	0.064	0.077	0.102	0.104
<b>HIGH TEMPERATURE ALLOY</b> A-286, Hastelloy, Incoloy, Inconel, Rene, Waspalloy	≤ 300	Slot	16	0.0120	0.019	0.024	0.029	0.038	0.037
		Profile	20	0.0120	0.019	0.024	0.029	0.038	0.037
		Light	33	0.0026	0.045	0.056	0.067	0.090	0.088

CUT TYPE					
SLOT		PROFILE		LIGHT*	
Short Rw = D <sub>1</sub> Ad = .6 x D <sub>1</sub>	Regular Rw = D <sub>1</sub> Ad = .5 x D <sub>1</sub>	Short Rw = .5 x D <sub>1</sub> Ad = L <sub>2</sub>	Regular Rw = .3 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Short, Regular Rw = .05 x D <sub>1</sub> Ad = L <sub>2</sub>	Long Rw = .02 x D <sub>1</sub> Ad = 3 x D <sub>1</sub>

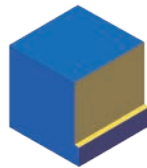
$$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$$

$$\text{mm/min} = (\text{mm/flute}) \times 5 \times \text{rpm}$$

- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- long flute tools not recommended for Slot or Profile
- \* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))

66CR, 66 Fractional	HARDNESS	CUT	SPEED	FEED (inch/flute)						
	BRINELL	Type	sfm	3/16	1/4	3/8	1/2	5/8	3/4	1
CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175	Profile	570	0.0006	0.0009	0.0016	0.0022	0.0024	0.0026	0.0030
		Light	720	0.0008	0.0012	0.0022	0.0030	0.0033	0.0036	0.0042
	> 175 ≤ 275	Profile	495	0.0006	0.0009	0.0016	0.0022	0.0024	0.0026	0.0030
		Light	630	0.0008	0.0012	0.0022	0.0030	0.0033	0.0036	0.0042
ALLOY STEEL 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275	Profile	415	0.0004	0.0007	0.0013	0.0017	0.0019	0.0020	0.0023
		Light	530	0.0006	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032
	> 275 ≤ 375	Profile	285	0.0004	0.0007	0.0013	0.0017	0.0019	0.0020	0.0023
		Light	360	0.0006	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Profile	370	0.0004	0.0006	0.0011	0.0015	0.0017	0.0018	0.0021
		Light	470	0.0005	0.0008	0.0015	0.0021	0.0023	0.0025	0.0029
	> 250 ≤ 375	Profile	230	0.0003	0.0005	0.0009	0.0012	0.0013	0.0014	0.0016
		Light	290	0.0004	0.0006	0.0012	0.0016	0.0018	0.0019	0.0022
CAST IRON Gray, Malleable, Ductile	≤ 220	Profile	555	0.0006	0.0009	0.0016	0.0022	0.0024	0.0026	0.0030
		Light	705	0.0008	0.0012	0.0022	0.0030	0.0033	0.0036	0.0042
	> 220 ≤ 260	Profile	415	0.0006	0.0009	0.0016	0.0022	0.0024	0.0026	0.0030
		Light	525	0.0008	0.0012	0.0022	0.0030	0.0033	0.0036	0.0042
STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 275	Profile	430	0.0004	0.0007	0.0013	0.0017	0.0019	0.0020	0.0023
		Light	560	0.0006	0.0009	0.0017	0.0023	0.0026	0.0028	0.0032
STAINLESS (difficult) 304, 304L, 316, 316L	≤ 275	Profile	305	0.0004	0.0005	0.0010	0.0013	0.0015	0.0016	0.0019
		Light	385	0.0005	0.0007	0.0014	0.0018	0.0020	0.0022	0.0026
STAINLESS (PH) 17-4PH, 15-5PH, Custom 450, 16-6PH, PH13-8Mo	≤ 325	Profile	280	0.0004	0.0005	0.0010	0.0013	0.0015	0.0016	0.0019
		Light	355	0.0005	0.0007	0.0014	0.0018	0.0020	0.0022	0.0026
TITANIUM Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Profile	305	0.0004	0.0006	0.0011	0.0015	0.0017	0.0018	0.0021
		Light	390	0.0005	0.0008	0.0015	0.0021	0.0023	0.0025	0.0029
HIGH TEMPERATURE ALLOY A-286, Hastelloy, Incoloy, Inconel, Rene, Waspalloy	≤ 300	Profile	85	0.0004	0.0005	0.0010	0.0013	0.0015	0.0016	0.0019
		Light	105	0.0005	0.0007	0.0014	0.0018	0.0020	0.0022	0.0026

CUT TYPE	
PROFILE	LIGHT*
Rw = .1 x D <sub>1</sub> Ad = D <sub>1</sub>	Rw = .05 x D <sub>1</sub> Ad = D <sub>1</sub>



rpm = sfm x 3.82 / D<sub>1</sub>  
ipm = (inch/flute) x no. of flutes x rpm

- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- \* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))

# Speed & Feed Recommendations

66M Metric	HARDNESS BRINELL	CUT Type	SPEED m/min	FEED (mm/flute)						
				6	8	10	12	16	20	25
CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 175	Profile	174	0.022	0.034	0.043	0.053	0.061	0.069	0.075
		Light	219	0.029	0.047	0.059	0.072	0.084	0.096	0.105
	> 175 ≤ 275	Profile	151	0.022	0.034	0.043	0.053	0.061	0.069	0.075
		Light	192	0.029	0.047	0.059	0.072	0.084	0.096	0.105
ALLOY STEEL 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275	Profile	126	0.017	0.028	0.035	0.041	0.049	0.053	0.058
		Light	162	0.022	0.036	0.045	0.055	0.067	0.075	0.080
	> 275 ≤ 375	Profile	87	0.017	0.028	0.035	0.041	0.049	0.053	0.058
		Light	110	0.022	0.036	0.045	0.055	0.067	0.075	0.080
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Profile	113	0.014	0.023	0.029	0.036	0.044	0.048	0.053
		Light	143	0.019	0.032	0.040	0.050	0.059	0.067	0.073
	> 250 ≤ 375	Profile	70	0.012	0.019	0.024	0.029	0.033	0.037	0.040
		Light	88	0.014	0.026	0.032	0.038	0.046	0.051	0.055
CAST IRON Gray, Malleable, Ductile	≤ 220	Profile	169	0.022	0.034	0.043	0.053	0.061	0.069	0.075
		Light	215	0.029	0.047	0.059	0.072	0.084	0.096	0.105
	> 220 ≤ 260	Profile	126	0.022	0.034	0.043	0.053	0.061	0.069	0.075
		Light	160	0.029	0.047	0.059	0.072	0.084	0.096	0.105
STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 275	Profile	131	0.017	0.028	0.035	0.041	0.049	0.053	0.058
		Light	171	0.022	0.036	0.045	0.055	0.067	0.075	0.080
STAINLESS (difficult) 304, 304L, 316, 316L	≤ 275	Profile	93	0.012	0.021	0.027	0.031	0.038	0.043	0.048
		Light	117	0.017	0.030	0.037	0.043	0.051	0.059	0.065
STAINLESS (PH) 17-4PH, 15-5PH, Custom 450, 16-6PH, PH13-8Mo	≤ 325	Profile	85	0.012	0.021	0.027	0.031	0.038	0.043	0.048
		Light	108	0.017	0.030	0.037	0.043	0.051	0.059	0.065
TITANIUM Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Profile	93	0.014	0.023	0.029	0.036	0.044	0.048	0.053
		Light	119	0.019	0.032	0.040	0.050	0.059	0.067	0.073
HIGH TEMPERATURE ALLOY A-286, Hastelloy, Incoloy, Inconel, Rene, Waspalloy	≤ 300	Profile	26	0.012	0.021	0.027	0.031	0.038	0.043	0.048
		Light	33	0.017	0.030	0.037	0.043	0.051	0.059	0.065

CUT TYPE	
PROFILE	LIGHT*
Rw = .1 x D <sub>1</sub> Ad = D <sub>1</sub>	Rw = .05 x D <sub>1</sub> Ad = D <sub>1</sub>





$$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$$

$$\text{mm/min} = (\text{mm/flute}) \times \text{no. of flutes} \times \text{rpm}$$

- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- \* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))

# Speed & Feed Recommendations

56B Fractional	HARDNESS	CUT	SPEED	FEED (inch/flute)							
	BRINELL	Type	sfm	1/32	1/16	1/8	3/16	1/4	3/8	1/2	3/4
 STEEL, TOOL STEEL, MOLD & DIE STEEL 300M, 4340, 52100, HP 9-4-20, M-50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 370	Heavy	625	0.0006	0.0015	0.0030	0.0040	0.0050	0.0080	0.0100	0.0120
		Light	950	0.0007	0.0017	0.0033	0.0044	0.0044	0.0088	0.0110	0.0130
	> 370 ≤ 475	Heavy	750	0.0005	0.0011	0.0023	0.0030	0.0038	0.0060	0.0075	0.0085
		Light	1150	0.0006	0.0012	0.0025	0.0033	0.0042	0.0066	0.0082	0.0100
	> 475 ≤ 655	Heavy	500	0.0004	0.0008	0.0017	0.0023	0.0029	0.0045	0.0057	0.0063
		Light	1000	0.0005	0.0009	0.0019	0.0025	0.0032	0.0050	0.0063	0.0071

56MB Metric	HARDNESS	CUT	SPEED	FEED (mm/flute)							
	BRINELL	Type	m/min	1	1.5	3	5	6	10	12	20
 STEEL, TOOL STEEL, MOLD & DIE STEEL 300M, 4340, 52100, HP 9-4-20, M-50, A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 370	Heavy	191	0.015	0.038	0.076	0.102	0.127	0.203	0.254	0.305
		Light	290	0.018	0.043	0.084	0.112	0.112	0.224	0.279	0.330
	> 370 ≤ 475	Heavy	229	0.013	0.028	0.058	0.076	0.097	0.152	0.191	0.216
		Light	351	0.015	0.030	0.064	0.084	0.107	0.168	0.208	0.254
	> 475 ≤ 655	Heavy	152	0.010	0.020	0.043	0.058	0.074	0.114	0.145	0.160
		Light	305	0.013	0.023	0.048	0.064	0.081	0.127	0.160	0.180

CUT TYPE					
< 370 BRINELL		> 370 ≤ BRINELL		> 475 ≤ BRINELL	
HEAVY	LIGHT*	HEAVY	LIGHT*	HEAVY	LIGHT*
Rw = .4 x D <sub>1</sub> Ad = .1 x D <sub>1</sub>	Rw = .4 x D <sub>1</sub> Ad = .03 x D <sub>1</sub>	Rw = .4 x D <sub>1</sub> Ad = .05 x D <sub>1</sub>	Rw = .4 x D <sub>1</sub> Ad = .02 x D <sub>1</sub>	Rw = .4 x D <sub>1</sub> Ad = .04 x D <sub>1</sub>	Rw = .4 x D <sub>1</sub> Ad = .01 x D <sub>1</sub>



$rpm = sfm \times 3.82 / D_1$   
 $rpm = (1000 \times m/min) / (3.14 \times D_1)$   
 $ipm = (inch/flute) \times 2 \times rpm$   
 $mm/min = (mm/flute) \times 2 \times rpm$   
 $Rw = Pitch$

- maximum recommended depths shown
- \* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))

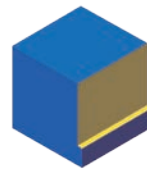
# Speed & Feed Recommendations



57 Fractional	HARDNESS	CUT	SPEED	FEED (inch/flute)			
	BRINELL	Type	sfm	1/4	5/16	3/8	1/2
<b>STEEL</b> TOOL STEEL MOLD & DIE STEEL 300M, 4340, 52100, HP 9-4-20, M-50, A2, D2, H13, L2, M2, P20, S7, T15, W2	> 280 ≤ 420	Slot	215	0.0013	0.0019	0.0025	0.0031
		Profile	265	0.0018	0.0026	0.0035	0.0044
		High Speed	560	0.0022	0.0033	0.0044	0.0055
	> 420 ≤ 560	Slot	120	0.0010	0.0015	0.0020	0.0025
		Profile	150	0.0014	0.0021	0.0028	0.0035
		High Speed	490	0.0018	0.0026	0.0035	0.0044
	> 560 ≤ 745	Slot	65	0.0008	0.0011	0.0015	0.0019
		Profile	80	0.0011	0.0016	0.0021	0.0026
		High Speed	250	0.0013	0.0019	0.0025	0.0031

57M Metric	HARDNESS	CUT	SPEED	FEED (mm/flute)			
	BRINELL	Type	m/min	6	8	10	12
<b>STEEL</b> TOOL STEEL MOLD & DIE STEEL 300M, 4340, 52100, HP 9-4-20, M-50, A2, D2, H13, L2, M2, P20, S7, T15, W2	> 280 ≤ 420	Slot	66	0.032	0.048	0.064	0.079
		Profile	81	0.046	0.066	0.089	0.112
		High Speed	171	0.056	0.084	0.112	0.140
	> 420 ≤ 560	Slot	37	0.025	0.038	0.051	0.064
		Profile	46	0.036	0.053	0.071	0.089
		High Speed	149	0.046	0.066	0.089	0.112
	> 560 ≤ 745	Slot	20	0.020	0.028	0.038	0.048
		Profile	24	0.028	0.041	0.053	0.066
		High Speed	76	0.033	0.048	0.064	0.079

CUT TYPE					
SLOT		PROFILE		HIGH SPEED	
> 280 ≤ 560 Bhn Rw = D <sub>1</sub> Ad = .3 x D <sub>1</sub>	> 560 ≤ 740 Bhn Rw = D <sub>1</sub> Ad = .1 x D <sub>1</sub>	> 280 ≤ 560 Bhn Rw = .1 x D <sub>1</sub> Ad = 1.5 X D <sub>1</sub>	> 560 ≤ 740 Bhn Rw = .05 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	> 280 ≤ 560 Bhn Rw = .04 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	> 560 ≤ 740 Bhn Rw = .01 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>



$rpm = sfm \times 3.82 / D_1$   
 $rpm = (1000 \times m/min) / (3.14 \times D_1)$   
 $ipm = (inch/flute) \times 6 \times rpm$   
 $mm/min = (mm/flute) \times 6 \times rpm$

- maximum recommended depths shown
- finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))

# Speed & Feed Recommendations



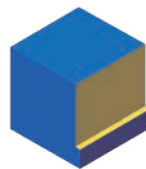
44, 45, 43CR, 43CB, 43LC, 43, 43L, 47, 47B, 47ES, 47EB Fractional	CUT	SPEED		FEED (inch/flute)				
	Type	sfm	1/8	1/4	3/8	1/2	3/4	1
ALUMINUM ALLOY 2024, 5052, 5086, 6061, 6063, 7075	Slot	1600	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085
	Profile	2000	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085
	Light	3300	0.0021	0.0055	0.0105	0.0140	0.0165	0.0195
ALUMINUM DIE CAST ALLOY (High Silicon) A-390, A-392, B-390	Slot	600	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085
	Profile	750	0.0009	0.0025	0.0045	0.0060	0.0070	0.0085
	Light	1240	0.0021	0.0055	0.0105	0.0140	0.0165	0.0195
COPPER ALLOY Aluminum Bronze, Muntz Brass, Naval Brass, Red Brass	Slot	865	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
	Profile	1080	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
	Light	1780	0.0017	0.0045	0.0085	0.0115	0.0140	0.0160
COPPER ALLOY Beryllium Copper, C110, Manganese Bronze, Tin Bronze	Slot	345	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
	Profile	430	0.0008	0.0020	0.0040	0.0050	0.0060	0.0070
	Light	710	0.0017	0.0045	0.0085	0.0115	0.0140	0.0160
PLASTIC ABS, Polycarbonate, PVC, Polypropylene	Slot	1600	0.0015	0.0040	0.0075	0.0100	0.0120	0.0140
	Profile	2000	0.0015	0.0040	0.0075	0.0100	0.0120	0.0140
	Light	3300	0.0034	0.0090	0.0170	0.0230	0.0275	0.0320

44M, 43MCR, 43MCB, 43M, 47M, 47MB, 47MES, 47MEB Metric	CUT	SPEED		FEED (mm/flute)				
	Type	m/min	3	6	10	12	20	25
ALUMINUM ALLOY 2024, 5052, 5086, 6061, 6063, 7075	Slot	490	0.022	0.060	0.120	0.144	0.187	0.213
	Profile	610	0.022	0.060	0.120	0.144	0.187	0.213
	Light	1005	0.050	0.132	0.280	0.336	0.440	0.488
ALUMINUM DIE CAST ALLOY (High Silicon) A-390, A-392, B-390	Slot	185	0.022	0.060	0.120	0.144	0.187	0.213
	Profile	230	0.022	0.060	0.120	0.144	0.187	0.213
	Light	380	0.050	0.132	0.280	0.336	0.440	0.488
COPPER ALLOY Aluminum Bronze, Muntz Brass, Naval Brass, Red Brass	Slot	265	0.019	0.048	0.107	0.120	0.160	0.175
	Profile	330	0.019	0.048	0.107	0.120	0.160	0.175
	Light	545	0.041	0.108	0.227	0.276	0.373	0.400
COPPER ALLOY Beryllium Copper, C110, Manganese Bronze, Tin Bronze	Slot	105	0.019	0.048	0.107	0.120	0.160	0.175
	Profile	130	0.019	0.048	0.107	0.120	0.160	0.175
	Light	215	0.041	0.108	0.227	0.276	0.373	0.400
PLASTIC ABS, Polycarbonate, PVC, Polypropylene	Slot	490	0.036	0.096	0.200	0.240	0.320	0.350
	Profile	610	0.036	0.096	0.200	0.240	0.320	0.350
	Light	1005	0.082	0.216	0.453	0.552	0.733	0.800

CUT TYPE						rpm = sfm x 3.82 / D <sub>1</sub> rpm = (1000 x m/min) / (3.14 x D <sub>1</sub> )  ipm = (inch/flute) x no. of flutes x rpm mm/min = (mm/flute) x no. of flutes x rpm
SLOT		PROFILE		LIGHT*		
Short, Regular Rw = D <sub>1</sub> Ad = .6 x D <sub>1</sub>	Long Reach, Long Flute Rw = D <sub>1</sub> Ad = .5 x D <sub>1</sub>	Short, Regular Rw = .5 x D <sub>1</sub> Ad = L <sub>2</sub>	Long Reach, Long Flute Rw = .3 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Short, Regular, Long Reach Rw = .05 x D <sub>1</sub> Ad = L <sub>2</sub>	Long Flute, Extra Long Flute Rw = .02 x D <sub>1</sub> Ad = 3 x D <sub>1</sub>	<ul style="list-style-type: none"> <li>• maximum recommended depths shown</li> <li>* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum</li> <li>• refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a>)</li> </ul>

# Speed & Feed Recommendations

27 Fractional	CUT	SPEED	FEED (inch/flute)				
	Type	sfm	1/4	5/16	3/8	1/2	3/4
CFRP, AFRP (Carbon Fiber, Aramid Fiber)	Slot	400	0.0016	0.0025	0.0030	0.0040	0.0048
	Profile	500	0.0016	0.0025	0.0030	0.0040	0.0048
	Light	825	0.0037	0.0057	0.0069	0.0092	0.0110
GFRP (Fiberglass)	Slot	320	0.0016	0.0025	0.0030	0.0040	0.0048
	Profile	400	0.0016	0.0025	0.0030	0.0040	0.0048
	Light	660	0.0037	0.0057	0.0069	0.0092	0.0110
CARBON, GRAPHITE	Slot	480	0.0020	0.0031	0.0038	0.0050	0.0060
	Profile	600	0.0020	0.0031	0.0038	0.0050	0.0060
	Light	990	0.0046	0.0072	0.0086	0.0115	0.0138
PLASTIC	Slot	800	0.0020	0.0031	0.0038	0.0050	0.0060
	Profile	1000	0.0020	0.0031	0.0038	0.0050	0.0060
	Light	1650	0.0046	0.0072	0.0086	0.0115	0.0138
MACHINABLE CERAMIC, MACHINABLE GLASS	Slot	40	0.0008	0.0013	0.0015	0.0020	0.0024
	Profile	50	0.0008	0.0013	0.0015	0.0020	0.0024
	Light	85	0.0018	0.0029	0.0034	0.0046	0.0055

CUT TYPE		
SLOT	PROFILE	LIGHT*
Rw = D <sub>1</sub> Ad = D <sub>1</sub>	Rw = .5 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Rw = .05 x D <sub>1</sub> Ad = L <sub>2</sub>
		

$$\text{rpm} = \text{sfm} \times 3.82 / D_1$$


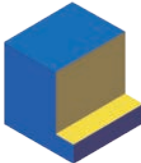
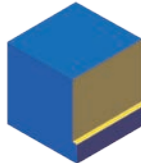
$$\text{ipm} = (\text{inch/flute}) \times \text{no. of flutes} \times \text{rpm}$$

- maximum recommended depths shown
- adjust speed and feed based upon resin type and/or fiber structure
- reduce speed when overheating causes melting or damage to resin
- reduce feed if delamination or fraying occurs
- \* finish cuts typically require reduced feed and cutting depths
- rates shown are for use without coolant; rates may be increased with coolant use
- 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 more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))



# Speed & Feed Recommendations

27M Metric	CUT Type	SPEED m/min	FEED (mm/flute)				
			6	8	10	12	16
CFRP, AFRP (Carbon Fiber, Aramid Fiber)	Slot	120	0.040	0.065	0.075	0.100	0.120
	Profile	150	0.040	0.065	0.075	0.100	0.120
	Light	250	0.095	0.145	0.175	0.235	0.280
GFRP (Fiberglass)	Slot	100	0.040	0.065	0.075	0.100	0.120
	Profile	120	0.040	0.065	0.075	0.100	0.120
	Light	200	0.095	0.145	0.175	0.235	0.280
CARBON, GRAPHITE	Slot	145	0.050	0.080	0.095	0.125	0.150
	Profile	185	0.050	0.080	0.095	0.125	0.150
	Light	300	0.115	0.185	0.220	0.290	0.350
PLASTIC	Slot	245	0.050	0.080	0.095	0.125	0.150
	Profile	305	0.050	0.080	0.095	0.125	0.150
	Light	505	0.115	0.185	0.220	0.290	0.350
MACHINABLE CERAMIC, MACHINABLE GLASS	Slot	10	0.020	0.035	0.040	0.050	0.060
	Profile	15	0.020	0.035	0.040	0.050	0.060
	Light	25	0.045	0.075	0.085	0.115	0.140

CUT TYPE		
SLOT	PROFILE	LIGHT*
Rw = D <sub>1</sub> Ad = D <sub>1</sub>	Rw = .5 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Rw = .05 x D <sub>1</sub> Ad = L <sub>2</sub>
		

$$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$$

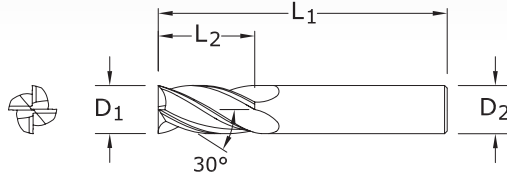
$$\text{mm/min} = (\text{mm/flute}) \times \text{no. of flutes} \times \text{rpm}$$

- maximum recommended depths shown
- adjust speed and feed based upon resin type and/or fiber structure
- reduce speed when overheating causes melting or damage to resin
- reduce feed if delamination or fraying occurs
- \* finish cuts typically require reduced feed and cutting depths
- rates shown are for use without coolant; rates may be increased with coolant use
- 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 more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))

# 4 Flute Square End Stub



## 16 FRACTIONAL SERIES



### TOLERANCES (inch)

$D_1 = +0.000/-0.002$   
 $D_2 = h_6$

TECH INFO 115

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

inch				EDP NO.			
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	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

## 16M METRIC SERIES

TECH INFO 116

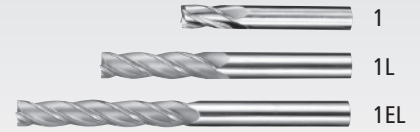
mm				EDP NO.			
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED EDP NO.	TI-NAMITE (TiN)	TI-NAMITE-C (TiCN)	TI-NAMITE-A (AlTiN)
1,0	2,0	38,0	3,0	41605	49136	49157	49178
1,5	3,0	38,0	3,0	41609	49137	49158	49179
2,0	4,0	38,0	3,0	41613	49138	49159	49180
2,5	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

### TOLERANCES (mm)

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



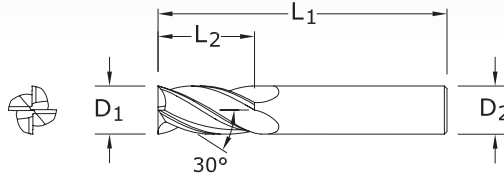
# 4 Flute End Mills



### TOLERANCES (inch)

$D_1 = +0.000/-0.002$

$D_2 = h_6$



**1 · 1L · 1EL**  
FRACTIONAL SERIES

inch				EDP NO.							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
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

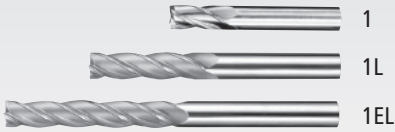
TECH INFO 115

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

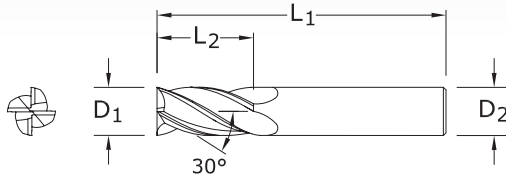
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# 4 Flute End Mills



**1·1L·1EL**  
FRACTIONAL SERIES



**TOLERANCES (inch)**  
D<sub>1</sub> = +0.000/-0.002  
D<sub>2</sub> = h<sub>6</sub>

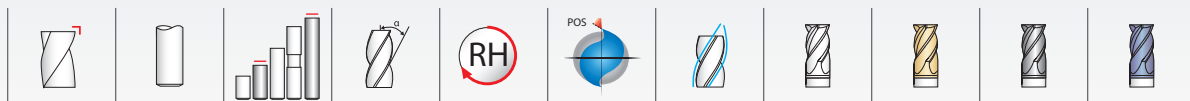
TECH INFO 115

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

CUTTING DIAMETER D <sub>1</sub>	inch			EDP NO.							SERIES
	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER 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)	
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



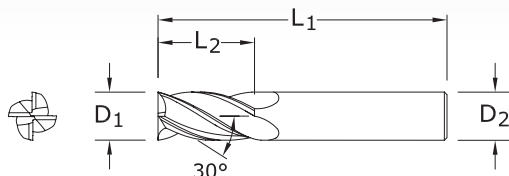
# 4 Flute End Mills



## TOLERANCES (mm)

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

$D_2 = h_6$

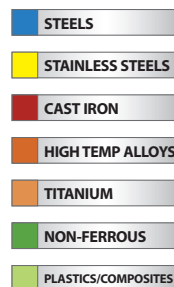


## 1M • 1XLM

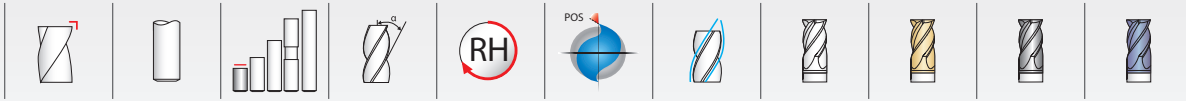
METRIC SERIES

mm				EDP NO.				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

TECH INFO 116

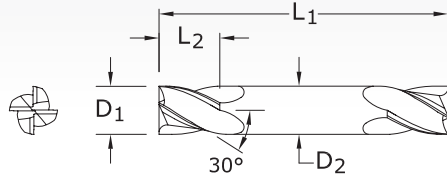


# 4 Flute Double End Mills



**14**

FRACTIONAL SERIES



TOLERANCES (inch)

$D_1 = +0.000/-0.002$

$D_2 = h_6$

TECH INFO 115

inch

EDP NO.

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	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

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



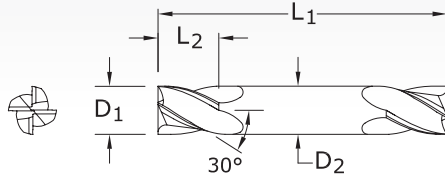
# 4 Flute Double End Mills



## TOLERANCES (mm)

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

$D_2 = h_6$



**14M**  
METRIC SERIES

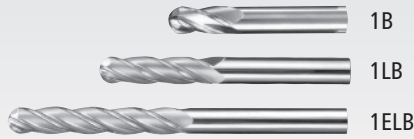
TECH INFO 116

mm				EDP NO.			
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

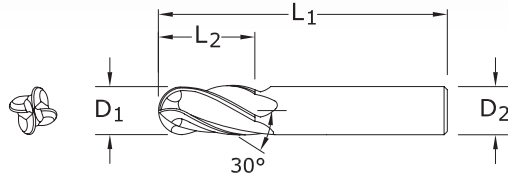
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- NON-FERROUS
- PLASTICS/COMPOSITES



# 4 Flute Ball End



## 1B • 1LB • 1ELB FRACTIONAL SERIES



**TOLERANCES (inch)**  
 $D_1 = +0.000/-0.002$   
 $D_2 = h_6$

TECH INFO 115

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

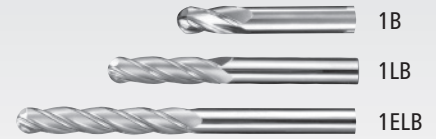
inch				EDP NO.							SERIES
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED	UNCOATED W/ FLAT	TI-NAMITE (TiN)	TI-NAMITE-C (TiCN)	TI-NAMITE-A (AlTiN)	TI-NAMITE-A (AlTiN) W/FLAT	DI-NAMITE (Diamond)	
1/64	1/32	1-1/2	1/8	30102	—	39102	39002	30031	—	—	1B
1/32	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

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# 4 Flute Ball End



## 1B • 1LB • 1ELB

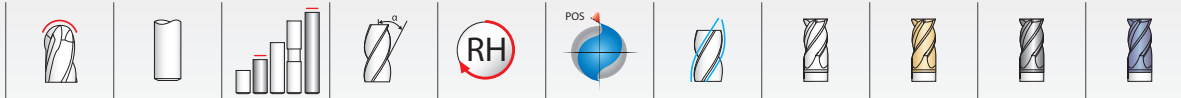
FRACTIONAL SERIES

inch				EDP NO.							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	UNCOATED W/ FLAT	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	Ti-NAMITE-A (AlTiN) W/FLAT	Di-NAMITE (Diamond)	
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
*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

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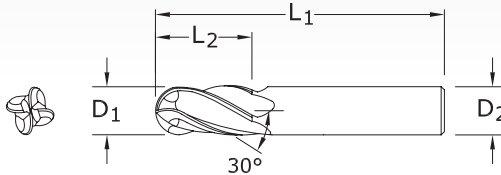


# 4 Flute Ball End



## 1MB • 1XLMB

METRIC SERIES



### TOLERANCES (mm)

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

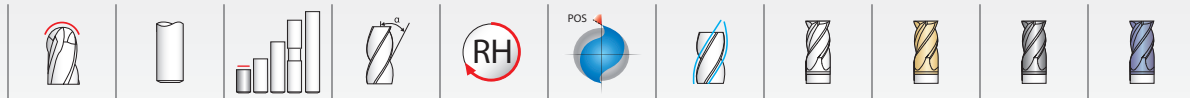
TECH INFO 116

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

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.				SERIES
				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



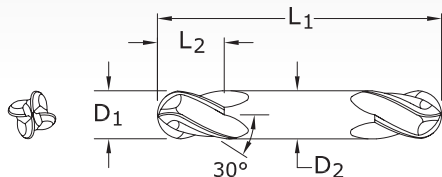
# 4 Flute Double End Ball End



### TOLERANCES (inch)

$D_1 = +0.000/-0.002$

$D_2 = h_6$



**14B**  
FRACTIONAL SERIES

TECH INFO 115

inch				EDP NO.			
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	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

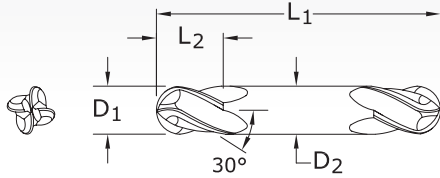
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- NON-FERROUS
- PLASTICS/COMPOSITES



# 4 Flute Double End Ball End



**14MB**  
METRIC SERIES



**TOLERANCES (mm)**

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

$D_2 = h_6$

TECH INFO 116

mm

EDP NO.

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
- NON-FERROUS
- PLASTICS/COMPOSITES



# 4 Flute Corner Radius

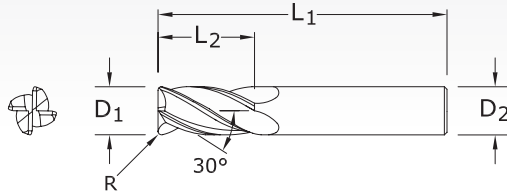


## TOLERANCES (inch)

$D_1 = -0.001/-0.002$

$D_2 = h_6$

$R = +0.000/-0.002$

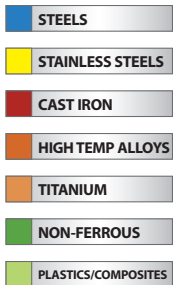


**1CR**  
FRACTIONAL SERIES

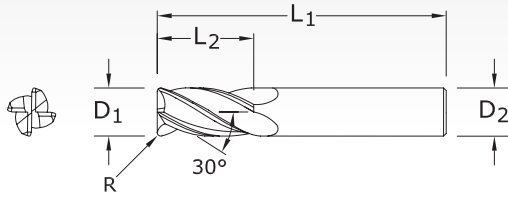
TECH INFO 115

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			EDP NO.			
		OVERALL LENGTH $L_1$	SHANK DIA. $D_2$	CORNER RADIUS $R$	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)
1/8	1/2	1-1/2	1/8	0.015	38001	38002	38115	38157
1/8	1/2	1-1/2	1/8	0.020	38003	38004	38116	38158
3/16	5/8	2	3/16	0.015	38009	38010	38117	38159
3/16	5/8	2	3/16	0.020	38011	38012	38118	38160
3/16	5/8	2	3/16	0.030	38013	38014	38119	38161
1/4	3/4	2-1/2	1/4	0.015	38019	38020	38120	38162
1/4	3/4	2-1/2	1/4	0.020	38021	38022	38121	38163
1/4	3/4	2-1/2	1/4	0.030	38023	38024	38122	38164
1/4	3/4	2-1/2	1/4	0.045	38025	38026	38123	38165
5/16	13/16	2-1/2	5/16	0.015	38031	38032	38124	38166
5/16	13/16	2-1/2	5/16	0.020	38033	38034	38125	38167
5/16	13/16	2-1/2	5/16	0.030	38035	38036	38126	38168
5/16	13/16	2-1/2	5/16	0.045	38037	38038	38127	38169
3/8	1	2-1/2	3/8	0.015	38045	38046	38128	38170
3/8	1	2-1/2	3/8	0.020	38047	38048	38129	38171
3/8	1	2-1/2	3/8	0.030	38049	38050	38130	38172
3/8	1	2-1/2	3/8	0.045	38051	38052	38131	38173
1/2	1	3	1/2	0.015	38059	38060	38132	38174
1/2	1	3	1/2	0.020	38061	38062	38133	38175
1/2	1	3	1/2	0.030	38063	38064	38134	38176
1/2	1	3	1/2	0.045	38065	38066	38135	38177
1/2	1	3	1/2	0.060	38067	38068	38136	38178
5/8	1-1/4	3-1/2	5/8	0.015	38073	38074	38137	38179
5/8	1-1/4	3-1/2	5/8	0.020	38075	38076	38138	38180
5/8	1-1/4	3-1/2	5/8	0.030	38077	38078	38139	38181
5/8	1-1/4	3-1/2	5/8	0.045	38079	38080	38140	38182
5/8	1-1/4	3-1/2	5/8	0.060	38081	38082	38141	38183
5/8	1-1/4	3-1/2	5/8	0.090	38083	38084	38142	38184
3/4	1-1/2	4	3/4	0.015	38087	38088	38143	38185
3/4	1-1/2	4	3/4	0.020	38089	38090	38144	38186

continued on next page



# 4 Flute Corner Radius



### TOLERANCES (inch)

$D_1 = -0.001/-0.002$

$D_2 = h_6$

$R = +0.000/-0.002$

## 1CR

FRACTIONAL SERIES

TECH INFO 115

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

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			CORNER RADIUS $R$	EDP NO.			
		OVERALL LENGTH $L_1$	SHANK DIA. $D_2$			UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)
3/4	1-1/2	4	3/4	0.030	38091	38092	38145	38187	
3/4	1-1/2	4	3/4	0.045	38093	38094	38146	38188	
3/4	1-1/2	4	3/4	0.060	38095	38096	38147	38189	
3/4	1-1/2	4	3/4	0.090	38097	38098	38148	38190	
3/4	1-1/2	4	3/4	0.125	38099	38100	38149	38191	
1	1-1/2	4	1	0.015	38101	38102	38150	38192	
1	1-1/2	4	1	0.020	38103	38104	38151	38193	
1	1-1/2	4	1	0.030	38105	38106	38152	38194	
1	1-1/2	4	1	0.045	38107	38108	38153	38195	
1	1-1/2	4	1	0.060	38109	38110	38154	38196	
1	1-1/2	4	1	0.090	38111	38112	38155	38197	
1	1-1/2	4	1	0.125	38113	38114	38156	38198	



# 4 Flute Corner Radius

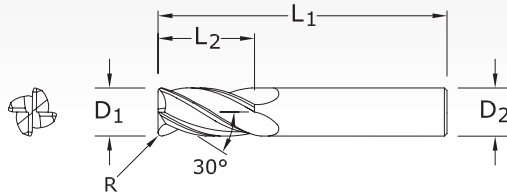


## TOLERANCES (mm)

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

$D_2 = h_6$

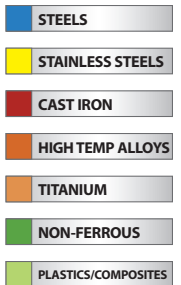
$R = +0,000/-0,050$



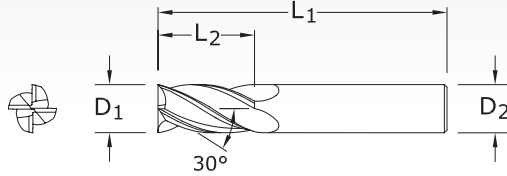
**1MCR**  
METRIC SERIES

TECH INFO 116

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	mm		CORNER RADIUS $R$	SHANK DIAMETER $D_2$	EDP NO. Ti-NAMITE-A (AITiN)
		OVERALL LENGTH $L_1$				
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 High Shear End Mills



## 54

FRACTIONAL SERIES

TECH INFO 118

- NON-FERROUS
- PLASTICS/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.	
				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

TOLERANCES (inch)

D<sub>1</sub> = +0.000/-0.002

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

## 54M

METRIC SERIES

TECH INFO 119

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.	
				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

TOLERANCES (mm)

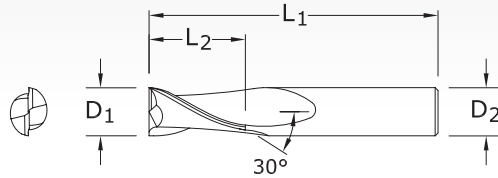
D<sub>1</sub> = +0.000/-0.050

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





# 2 Flute Square End Stub



## TOLERANCES (inch)

D1 = +0.000/-0.002  
D2 = h<sub>6</sub>

**17**  
FRACTIONAL SERIES

inch				EDP NO.			
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)
1/16	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

TECH INFO 115

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

## TOLERANCES (mm)

D1 = +0,000/-0,050  
D2 = h<sub>6</sub>

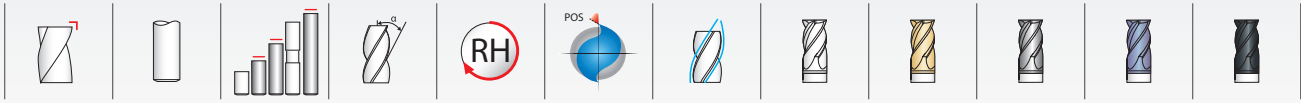
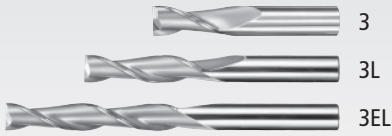
**17M**  
METRIC SERIES

mm				EDP NO.			
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	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

TECH INFO 116

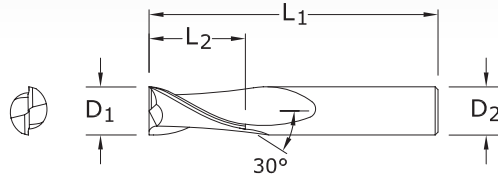


# 2 Flute Square End



## 3 · 3L · 3EL

FRACTIONAL SERIES



**TOLERANCES (inch)**  
 $D_1 = +0.000/-0.002$   
 $D_2 = h_6$

TECH INFO 115

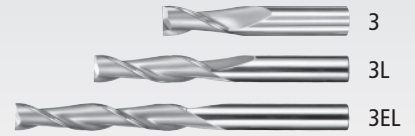
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- NON-FERROUS
- PLASTICS/COMPOSITES

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.					SERIES
				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

continued on next page



# 2 Flute Square End



## 3 • 3L • 3EL

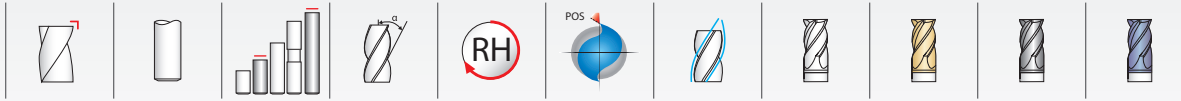
FRACTIONAL SERIES

inch				EDP NO.					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)	Di-NAMITE (Diamond)	
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
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

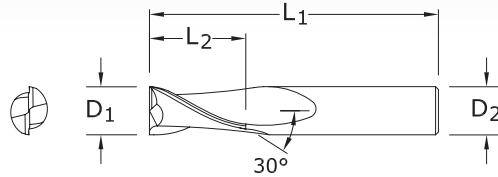
CONTINUED



# 2 Flute Square End



## 3M · 3XLM METRIC SERIES



TOLERANCES (mm)

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

$D_2 = h_6$

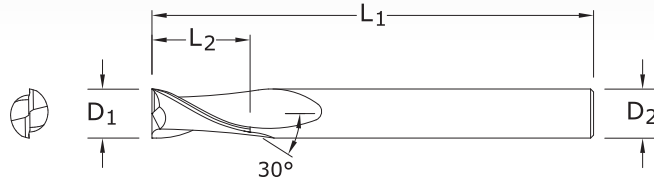
TECH INFO 116

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

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.				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 (inch)

$D_1 = +0.000/-0.002$   
 $D_2 = h_6$

**59**  
 FRACTIONAL SERIES

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.		
				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

TECH INFO 115

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

### TOLERANCES (mm)

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

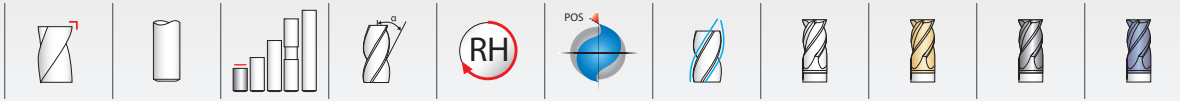
**59M**  
 METRIC SERIES

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.			
				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

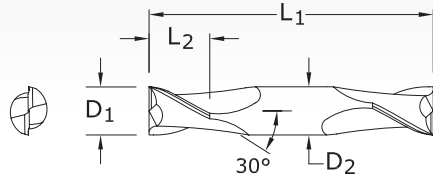
TECH INFO 116



# 2 Flute Double End Mills



## 15 FRACTIONAL SERIES



### TOLERANCES (inch)

$D_1 = +0.000/-0.002$

$D_2 = h_6$

TECH INFO 115

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

inch				EDP NO.			
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



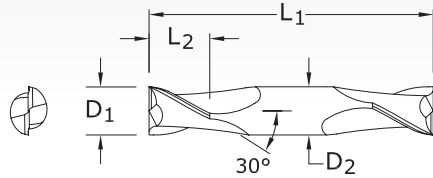
# 2 Flute Double End Mills



## TOLERANCES (mm)

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

$D_2 = h_6$



**15M**  
METRIC SERIES

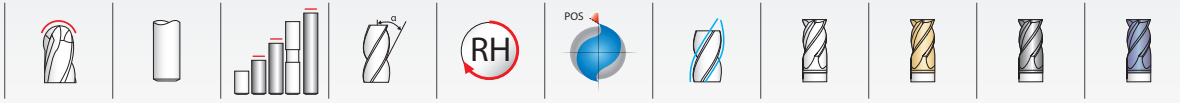
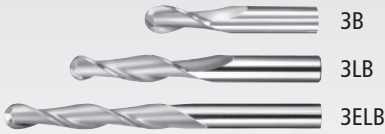
TECH INFO 116

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.			
				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

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

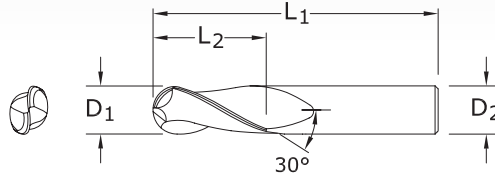


# 2 Flute Ball End



## 3B • 3LB • 3ELB

FRACTIONAL SERIES



**TOLERANCES (inch)**  
 $D_1 = +0.000/-0.002$   
 $D_2 = h_6$

TECH INFO 115

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

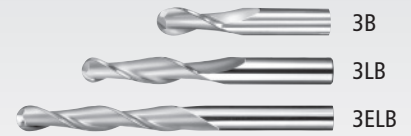
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.				SERIES
				UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)	
1/64	1/32	1-1/2	1/8	30302	39302	39502	30471	3B
1/32	5/64	1-1/2	1/8	30304	39304	39504	30472	3B
3/64	7/64	1-1/2	1/8	30306	39306	39506	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

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# 2 Flute Ball End



## 3B • 3LB • 3ELB

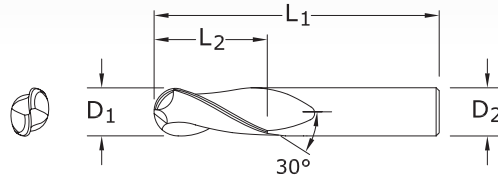
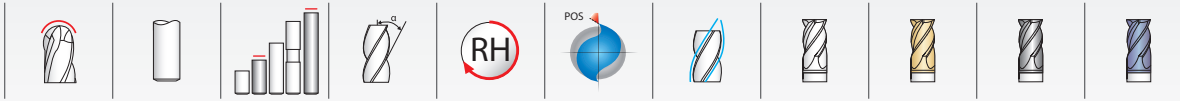
FRACTIONAL SERIES

inch				EDP NO.				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)	
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
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

CONTINUED



# 2 Flute Ball End



## 3MB • 3XLMB

METRIC SERIES

**TOLERANCES (mm)**  
 $D_1 = +0,000/-0,050$   
 $D_2 = h_6$

TECH INFO 116

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

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.				SERIES
				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

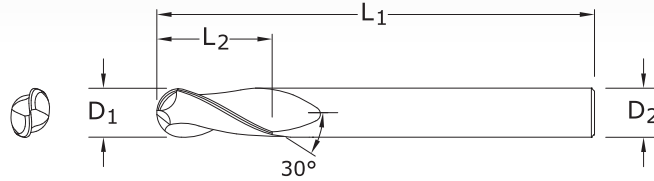


# 2 Flute Ball End Long Reach



## TOLERANCES (inch)

$D_1 = +0.000/-0.002$   
 $D_2 = h_6$



**59B**  
 FRACTIONAL SERIES

inch				EDP NO.		
CUTTING DIAMETER $D_1$	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	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

TECH INFO 115

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

## TOLERANCES (mm)

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

mm				EDP NO.			
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

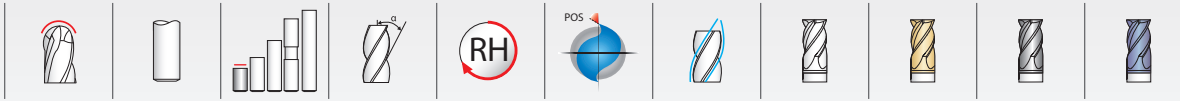
**59MB**  
 METRIC SERIES

TECH INFO 116

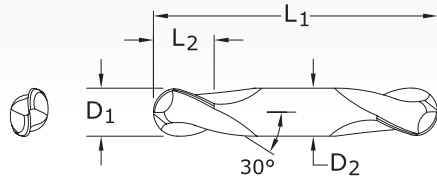
Neck Option Available



# 2 Flute Double End Ball End



## 15B FRACTIONAL SERIES



### TOLERANCES (inch)

$D_1 = +0.000/-0.002$

$D_2 = h_6$

TECH INFO 115

inch

EDP NO.

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
- NON-FERROUS
- PLASTICS/COMPOSITES



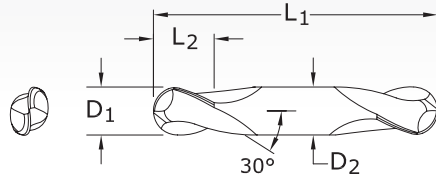
# 2 Flute Double End Ball End



## TOLERANCES (mm)

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

$D_2 = h_6$



## 15MB

METRIC SERIES

TECH INFO 116

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.			
				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

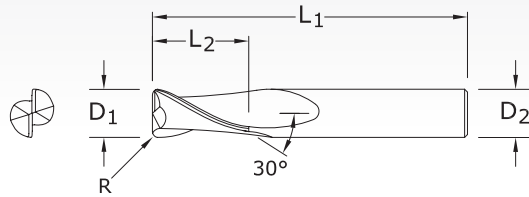
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- NON-FERROUS
- PLASTICS/COMPOSITES



# 2 Flute Corner Radius



**3CR**  
FRACTIONAL SERIES



**TOLERANCES (inch)**

D<sub>1</sub> = -0.001/-0.002

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

R = +0.000/-0.002

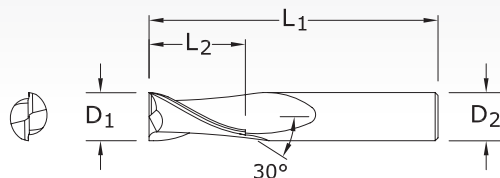
TECH INFO 115

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

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.			
					UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)
1/8	1/2	1-1/2	1/8	0.015	38201	38202	38315	38357
1/8	1/2	1-1/2	1/8	0.020	38203	38204	38316	38358
3/16	5/8	2	3/16	0.015	38209	38210	38317	38359
3/16	5/8	2	3/16	0.020	38211	38212	38318	38360
3/16	5/8	2	3/16	0.030	38213	38214	38319	38361
1/4	3/4	2-1/2	1/4	0.015	38219	38220	38320	38362
1/4	3/4	2-1/2	1/4	0.020	38221	38222	38321	38363
1/4	3/4	2-1/2	1/4	0.030	38223	38224	38322	38364
1/4	3/4	2-1/2	1/4	0.045	38225	38226	38323	38365
5/16	13/16	2-1/2	5/16	0.015	38231	38232	38324	38366
5/16	13/16	2-1/2	5/16	0.020	38233	38234	38325	38367
5/16	13/16	2-1/2	5/16	0.030	38235	38236	38326	38368
5/16	13/16	2-1/2	5/16	0.045	38237	38238	38327	38369
3/8	1	2-1/2	3/8	0.015	38245	38246	38328	38370
3/8	1	2-1/2	3/8	0.020	38247	38248	38329	38371
3/8	1	2-1/2	3/8	0.030	38249	38250	38330	38372
3/8	1	2-1/2	3/8	0.045	38251	38252	38331	38373
1/2	1	3	1/2	0.015	38259	38260	38332	38374
1/2	1	3	1/2	0.020	38261	38262	38333	38375
1/2	1	3	1/2	0.030	38263	38264	38334	38376
1/2	1	3	1/2	0.045	38265	38266	38335	38377
1/2	1	3	1/2	0.060	38267	38268	38336	38378
5/8	1-1/4	3-1/2	5/8	0.015	38273	38274	38337	38379
5/8	1-1/4	3-1/2	5/8	0.020	38275	38276	38338	38380
5/8	1-1/4	3-1/2	5/8	0.030	38277	38278	38339	38381
5/8	1-1/4	3-1/2	5/8	0.045	38279	38280	38340	38382
5/8	1-1/4	3-1/2	5/8	0.060	38281	38282	38341	38383
5/8	1-1/4	3-1/2	5/8	0.090	38283	38284	38342	38384
3/4	1-1/2	4	3/4	0.015	38287	38288	38343	38385
3/4	1-1/2	4	3/4	0.020	38289	38290	38344	38386
3/4	1-1/2	4	3/4	0.030	38291	38292	38345	38387
3/4	1-1/2	4	3/4	0.045	38293	38294	38346	38388
3/4	1-1/2	4	3/4	0.060	38295	38296	38347	38389
3/4	1-1/2	4	3/4	0.090	38297	38298	38348	38390
3/4	1-1/2	4	3/4	0.125	38299	38300	38349	38391
1	1-1/2	4	1	0.015	38301	38302	38350	38392
1	1-1/2	4	1	0.020	38303	38304	38351	38393
1	1-1/2	4	1	0.030	38305	38306	38352	38394
1	1-1/2	4	1	0.045	38307	38308	38353	38395
1	1-1/2	4	1	0.060	38309	38310	38354	38396
1	1-1/2	4	1	0.090	38311	38312	38355	38397
1	1-1/2	4	1	0.125	38313	38314	38356	38398



# 2 Flute High Shear End Mills



## TOLERANCES (inch)

$D_1 = +0.000/-0.002$

$D_2 = h_6$

**52**  
FRACTIONAL SERIES

TECH INFO 118

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.	
				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

NON-FERROUS

PLASTICS/COMPOSITES

## TOLERANCES (mm)

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

$D_2 = h_6$

**52M**  
FRACTIONAL SERIES

TECH INFO 119

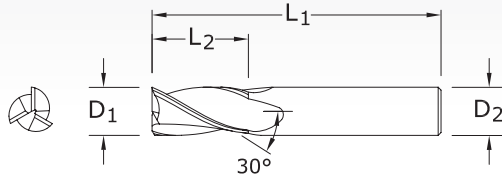
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	EDP NO.	
				UNCOATED	TI-NAMITE-C (TiCN)
3,0	7,0	38,0	3,0	45277	49829
3,5	7,0	57,0	6,0	45279	49830
4,0	8,0	57,0	6,0	45281	49831
4,5	8,0	57,0	6,0	45283	49832
5,0	10,0	57,0	6,0	45285	49833
6,0	10,0	57,0	6,0	45287	49834
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



# 3 Flute Square End



## 5 FRACTIONAL SERIES



### TOLERANCES (inch)

$D_1 = +0.000/-0.002$

$D_2 = h_6$

TECH INFO 115

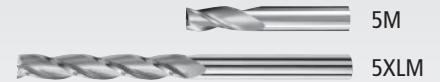
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- NON-FERROUS
- PLASTICS/COMPOSITES

inch				EDP NO.			
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	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





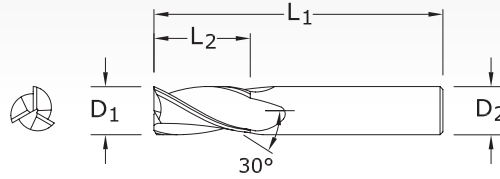
# 3 Flute Square End



## TOLERANCES (mm)

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

$D_2 = h_6$

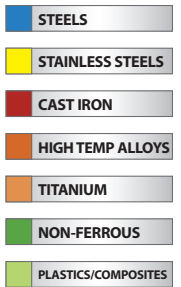


## 5M • 5XLM

METRIC SERIES

mm				EDP NO.				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)	
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

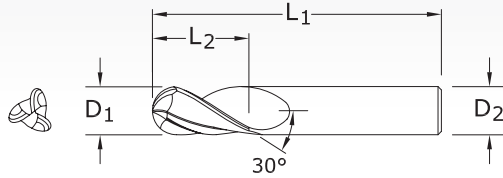
TECH INFO 116



# 3 Flute Ball End



## 5B FRACTIONAL SERIES



### TOLERANCES (inch)

D<sub>1</sub> = +0.000/-0.002

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

TECH INFO 115

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

inch				EDP NO.			
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	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



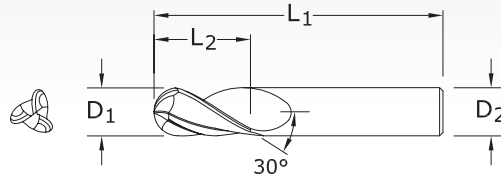
# 3 Flute Ball End



## TOLERANCES (mm)

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

$D_2 = h_6$



## 5MB • 5XLMB

METRIC SERIES

mm				EDP NO.				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)	
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

TECH INFO 116

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

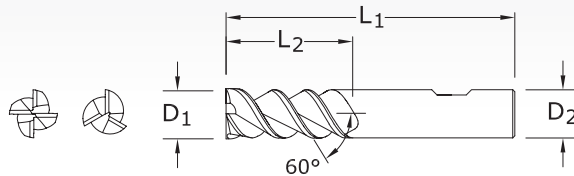


# High Helix End Mills



## 60

FRACTIONAL SERIES



TOLERANCES (inch)

$D_1 = +0.000/-0.002$

$D_2 = h_6$

TECH INFO 120

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			EDP NO.			
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	NO. OF FLUTES	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)
1/8	1/2	2-1/2	1/4	3	36001	32169	32180	32220
3/16	5/8	2-1/2	1/4	3	36003	32170	32181	32221
1/4	3/4	2-1/2	1/4	3	36005	32171	32182	32222
5/16	13/16	2-1/2	5/16	3	36007	32172	32183	32223
3/8	1	2-1/2	3/8	3	36009	32173	32184	32224
7/16	1	3	7/16	3	36011	32174	32185	32225
1/2	1	3	1/2	3	36013	32175	32186	32226
9/16	1-1/4	3-1/2	9/16	3	36015	32176	32187	32227
5/8	1-1/4	3-1/2	5/8	3	36017	32177	32188	32228
3/4	1-1/2	4	3/4	4	36023	32191	32193	32231
1	1-1/2	4	1	4	36025	32192	32194	32232

- STAINLESS STEELS
- HIGH TEMP ALLOYS
- TITANIUM

## 60M

METRIC SERIES

TECH INFO 120

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	mm			EDP NO.			
		OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	NO. OF FLUTES	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)
3,0	8,0	57,0	6,0	3	46001	46002	43940	43960
4,0	11,0	57,0	6,0	3	46003	46006	43941	43961
5,0	13,0	57,0	6,0	3	46004	46010	43942	43962
6,0	13,0	57,0	6,0	3	46005	46011	43943	43963
8,0	19,0	69,0	10,0	3	46009	46012	43944	43964
10,0	22,0	72,0	10,0	3	46013	46014	43945	43965
12,0	26,0	83,0	12,0	3	46017	46018	43946	43966
16,0	32,0	92,0	16,0	4	46021	46022	43947	43967
20,0	38,0	104,0	20,0	4	46025	46026	43948	43968

TOLERANCES (inch)

**3 DIAMETER**

$D_1 = +0.000/-0.040$

$D_2 = h_6$

**>3-6 DIAMETER**

$D_1 = +0.000/-0.048$

$D_2 = h_6$

**>6-10 DIAMETER**

$D_1 = +0.000/-0.058$

$D_2 = h_6$

**>10-18 DIAMETER**

$D_1 = +0.000/-0.070$

$D_2 = h_6$

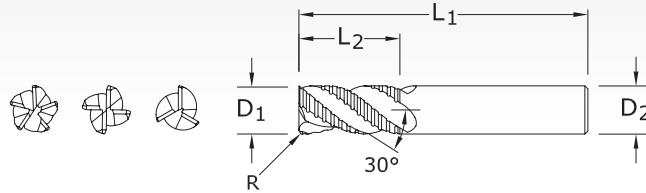
**>18-20 DIAMETER**

$D_1 = +0.000/-0.084$

$D_2 = h_6$



# Single End Roughers



## TOLERANCES (inch)

$$D_1 = +0.000/-0.004$$

$$D_2 = h_6$$

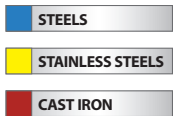
$$R = +0.005/-0.005$$

## 61 FRACTIONAL SERIES

TECH INFO 121

inch						EDP NO.		
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	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



## TOLERANCES h10 (mm)

$$D_1 = +0,000/-0,100$$

$$D_2 = h_6$$

$$R = +0,127/-0,127$$

## 61M METRIC SERIES

TECH INFO 122

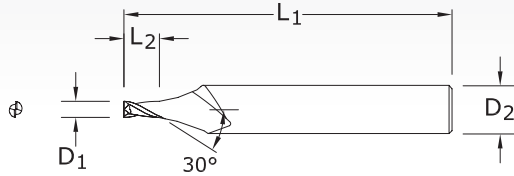
mm						EDP NO.		
CUTTING DIAMETER D <sub>1</sub>	LENGTH OF CUT L <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	SHANK DIAMETER D <sub>2</sub>	CORNER RADIUS R	NO. OF FLUTES	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)
6,0	19,0	63,0	6,0	1,14	3	46107	46106	46110
8,0	19,0	63,0	8,0	1,14	3	46109	46108	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



# Micro End Mills



## MK2 FRACTIONAL SERIES



### TOLERANCES (inch)

$D_1 = \pm 0.0005$

$D_2 = h_6$

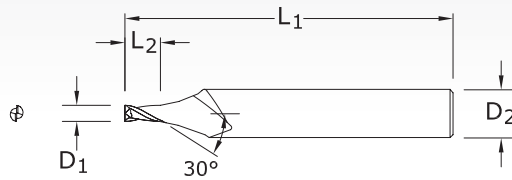
TECH INFO 123

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

inch				EDP NO.
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	UNCOATED
0.008	0.012	1-1/2	1/8	39208
0.009	0.014	1-1/2	1/8	39209
0.010	0.015	1-1/2	1/8	39210
0.011	0.017	1-1/2	1/8	39211
0.012	0.018	1-1/2	1/8	39212
0.013	0.020	1-1/2	1/8	39213
0.014	0.021	1-1/2	1/8	39214
0.015	0.023	1-1/2	1/8	39215
0.016	0.024	1-1/2	1/8	39216
0.017	0.026	1-1/2	1/8	39217
0.018	0.027	1-1/2	1/8	39218
0.019	0.029	1-1/2	1/8	39219
0.020	0.030	1-1/2	1/8	39220
0.021	0.032	1-1/2	1/8	39221
0.022	0.033	1-1/2	1/8	39222
0.023	0.035	1-1/2	1/8	39223
0.024	0.036	1-1/2	1/8	39224
0.025	0.038	1-1/2	1/8	39225
0.026	0.039	1-1/2	1/8	39226
0.027	0.041	1-1/2	1/8	39227
0.028	0.042	1-1/2	1/8	39228
0.029	0.044	1-1/2	1/8	39229
0.030	0.045	1-1/2	1/8	39230
0.031	0.047	1-1/2	1/8	39231
0.035	0.053	1-1/2	1/8	39235
0.040	0.060	1-1/2	1/8	39240
0.047	0.071	1-1/2	1/8	39247
0.050	0.075	1-1/2	1/8	39250
0.055	0.083	1-1/2	1/8	39255
0.060	0.090	1-1/2	1/8	39260



# Micro End Mills



## TOLERANCES (mm)

$D_1 = \pm 0,013$

$D_2 = h_6$

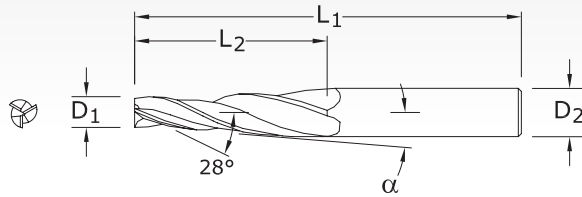
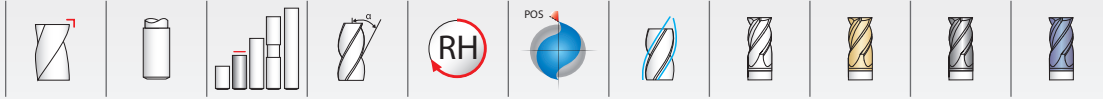
## MK2M METRIC SERIES

TECH INFO 124

mm				EDP NO. UNCOATED
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	
0,20	0,30	38,0	3,17	39208
0,23	0,36	38,0	3,17	39209
0,25	0,38	38,0	3,17	39210
0,28	0,43	38,0	3,17	39211
0,30	0,46	38,0	3,17	39212
0,33	0,51	38,0	3,17	39213
0,36	0,53	38,0	3,17	39214
0,38	0,58	38,0	3,17	39215
0,41	0,61	38,0	3,17	39216
0,43	0,66	38,0	3,17	39217
0,46	0,69	38,0	3,17	39218
0,48	0,74	38,0	3,17	39219
0,51	0,76	38,0	3,17	39220
0,53	0,81	38,0	3,17	39221
0,56	0,84	38,0	3,17	39222
0,58	0,89	38,0	3,17	39223
0,61	0,91	38,0	3,17	39224
0,63	0,96	38,0	3,17	39225
0,66	0,99	38,0	3,17	39226
0,69	1,04	38,0	3,17	39227
0,71	1,07	38,0	3,17	39228
0,74	1,12	38,0	3,17	39229
0,76	1,14	38,0	3,17	39230
0,79	1,19	38,0	3,17	39231
0,89	1,35	38,0	3,17	39235
1,02	1,52	38,0	3,17	39240
1,19	1,80	38,0	3,17	39247
1,27	1,90	38,0	3,17	39250
1,40	2,11	38,0	3,17	39255
1,52	2,29	38,0	3,17	39260

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

# Tapered Square End



**23**

FRACTIONAL SERIES

TOLERANCES (inch)

$D_1 = +0.001/-0.002$

$D_2 = h_6$

TECH INFO 115

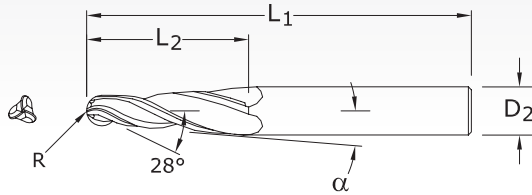
- STEELS
- STAINLESS STEELS
- CAST IRON
- HIGH TEMP ALLOYS
- TITANIUM
- NON-FERROUS
- PLASTICS/COMPOSITES

SHANK DIAMETER $D_2$	CENTER LINE ANGLE	inch			EDP NO.			
		SMALL DIAMETER $D_1$	APPROX. LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	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	2°	1/4	2	4	32329	32384	32330	32359
1/2	2°	1/4	2	4	32333	32385	323324	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	5°	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

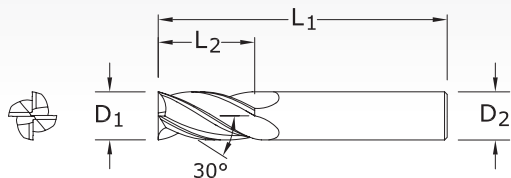
TECH INFO 115

SHANK DIAMETER $D_2$	CENTER LINE ANGLE	inch			EDP NO.			
		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
- NON-FERROUS
- PLASTICS/COMPOSITES



# End Mills Sets



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.			
	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

## Ball End

FRACTIONAL SERIES


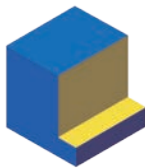


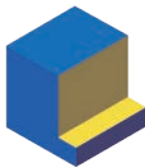



DESCRIPTION	EDP NO.			
	UNCOATED	Ti-NAMITE (TiN)	Ti-NAMITE-C (TiCN)	Ti-NAMITE-A (AlTiN)
Series 1B – 4 Flute, Single End	30190	39109	39090	30070
Series 3B – 2 Flute, Single End	30390	39390	39590	30600
Series 5B – 3 Flute, Single End	30590	30900	30944	31169
Series 14B – 4 Flute, Double End	31490	31482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



# Speed & Feed Recommendations

	HARDNESS BRINELL	CUT Type	SPEED (sfm)				FEED (inch/flute)								
			AlTiN	TiCN	TiN	non	1/64	1/32	1/16	1/8	1/4	3/8	1/2	3/4	1
1, 3, 5, 14, 15, 16, 17, 23, 24, 59 Fractional CARBON STEEL 1018, 1040, 1080, 10L50, 1525, 1536	≤ 175	Slot	335	320	305	255	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028
		Profile	460	440	420	350	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028
		Light	685	660	635	530	0.00007	0.00014	0.00029	0.0007	0.0018	0.0034	0.0046	0.0055	0.0064
ALLOY STEEL 4140, 4150, 4340, 5150, 8630	≤ 275	Slot	245	235	225	190	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
		Profile	335	325	310	260	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
		Light	505	485	465	390	0.00005	0.00011	0.00022	0.0005	0.0014	0.0026	0.0034	0.0041	0.0048
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Slot	230	220	210	175	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
		Profile	315	305	290	240	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
		Light	470	455	435	365	0.00005	0.00011	0.00022	0.0005	0.0014	0.0026	0.0034	0.0041	0.0048
CAST IRON Gray, Malleable, Ductile	≤ 220	Slot	245	235	225	190	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028
		Profile	335	325	310	260	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028
		Light	505	485	465	390	0.00007	0.00014	0.00029	0.0007	0.0018	0.0034	0.0046	0.0055	0.0064
STAINLESS (free machining) 303, 420F, 440F	≤ 275	Slot	270	260	250	210	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
		Profile	370	360	345	285	0.00002	0.00005	0.00009	0.0002	0.0006	0.0011	0.0015	0.0018	0.0021
		Light	560	535	515	430	0.00005	0.00011	0.00022	0.0005	0.0014	0.0026	0.0034	0.0041	0.0048
STAINLESS (difficult) 304, 316, 17-4PH	≤ 275	Slot	185	180	175	145	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017
		Profile	255	250	240	200	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017
		Light	385	370	355	295	0.00004	0.00009	0.00017	0.0004	0.0011	0.0021	0.0028	0.0033	0.0039
TITANIUM Ti5Al-5V-5Mo, Ti6Al4V	≤ 350	Slot	130	125	120	100	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017
		Profile	180	170	165	140	0.00002	0.00004	0.00008	0.0002	0.0005	0.0009	0.0012	0.0014	0.0017
		Light	270	260	250	205	0.00004	0.00009	0.00017	0.0004	0.0011	0.0021	0.0028	0.0033	0.0039
HIGH TEMPERATURE ALLOY Incoloy, Inconel, Rene, Waspalloy	≤ 300	Slot	45	45	45	35	0.00002	0.00003	0.00006	0.0002	0.0004	0.0008	0.0010	0.0012	0.0014
		Profile	65	60	60	50	0.00002	0.00003	0.00006	0.0002	0.0004	0.0008	0.0010	0.0012	0.0014
		Light	95	95	90	75	0.00004	0.00007	0.00014	0.0003	0.0009	0.0017	0.0023	0.0028	0.0032
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 150	Slot	-	640	-	640	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056
		Profile	-	880	-	880	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056
		Light	-	1320	-	1320	0.00014	0.00029	0.00057	0.0014	0.0037	0.0069	0.0092	0.0110	0.0128
COPPER ALLOY Aluminum Bronze, C110, Muntz Brass	≤ 140	Slot	-	350	-	350	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028
		Profile	-	485	-	485	0.00003	0.00006	0.00013	0.0003	0.0008	0.0015	0.0020	0.0024	0.0028
		Light	-	725	-	725	0.00007	0.00014	0.00029	0.0007	0.0018	0.0034	0.0046	0.0055	0.0064
PLASTIC Polycarbonate, PVC, Polypropylene		Slot	-	640	-	640	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056
		Profile	-	880	-	880	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056
		Light	-	1320	-	1320	0.00014	0.00029	0.00057	0.0014	0.0037	0.0069	0.0092	0.0110	0.0128
GRAPHITE		Slot	-	480	-	480	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056
		Profile	-	660	-	660	0.00006	0.00013	0.00025	0.0006	0.0016	0.0030	0.0040	0.0048	0.0056
		Light	-	990	-	990	0.00014	0.00029	0.00057	0.0014	0.0037	0.0069	0.0092	0.0110	0.0128


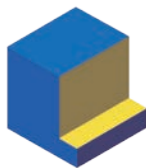

CUT TYPE					
SLOT		PROFILE		LIGHT*	
4 flute Rw = D <sub>1</sub> Ad = .4 x D <sub>1</sub>	3 flute Rw = D <sub>1</sub> Ad = .5 x D <sub>1</sub>	2 flute Rw = D <sub>1</sub> Ad = D <sub>1</sub>	4, 3 flute Rw = .25 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	2 flute Rw = .5 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	6, 4, 3, 2 flute Rw = .05 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>
					

rpm = sfm x 3.82 / D<sub>1</sub>  
ipm = (inch/flute) x no. of flutes x rpm

- maximum recommended depths shown
- 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 flute, extra long flute, and straight flute to .05 x D<sub>1</sub> Ad for Slot or Rw for Profile
- \* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))

# Speed & Feed Recommendations

1M, 3M, 5M, 14M, 15M, 16M, 17M, 59M Metric	HARDNESS	CUT	SPEED (m/min)				FEED (mm/flute)								
	BRINELL	Type	AlTiN	TiCN	TiN	non	0.40	0.75	1.5	3	6	10	12	20	25
CARBON STEEL 1018, 1040, 1080, 10L50, 1525, 1536	≤ 225	Slot	101	98	94	78	0.0008	0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070
		Profile	140	134	129	107	0.0008	0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070
		Light	209	201	193	161	0.0018	0.0034	0.0070	0.017	0.043	0.091	0.110	0.147	0.160
ALLOY STEEL 4140, 4150, 4340, 5150, 8630	≤ 275	Slot	74	72	69	57	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052
		Profile	102	98	94	79	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052
		Light	154	148	142	118	0.0013	0.0027	0.0053	0.012	0.034	0.069	0.082	0.109	0.120
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Slot	70	67	64	54	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052
		Profile	96	92	88	74	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052
		Light	144	138	133	111	0.0013	0.0027	0.0053	0.012	0.034	0.069	0.082	0.109	0.120
CAST IRON Gray, Malleable, Ductile	≤ 200	Slot	74	72	69	57	0.0008	0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070
		Profile	102	98	94	79	0.0008	0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070
		Light	154	148	142	118	0.0018	0.0034	0.0070	0.017	0.043	0.091	0.110	0.147	0.160
STAINLESS (free machining) 303, 420F, 440F	≤ 185	Slot	82	79	76	63	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052
		Profile	113	109	105	87	0.0005	0.0012	0.0022	0.006	0.014	0.029	0.036	0.048	0.052
		Light	170	163	157	131	0.0013	0.0027	0.0053	0.012	0.034	0.069	0.082	0.109	0.120
STAINLESS (difficult) 304, 316, 17-4PH	≤ 185	Slot	57	55	53	44	0.0005	0.0010	0.0019	0.004	0.012	0.024	0.029	0.037	0.042
		Profile	78	76	73	60	0.0005	0.0010	0.0019	0.004	0.012	0.024	0.029	0.037	0.042
		Light	118	113	109	91	0.0010	0.0022	0.0041	0.010	0.026	0.056	0.067	0.088	0.097
TITANIUM Ti5Al-5V-5Mo, Ti6Al4V	≤ 350	Slot	40	38	37	30	0.0005	0.0010	0.0019	0.004	0.012	0.024	0.029	0.037	0.042
		Profile	55	52	50	42	0.0005	0.0010	0.0019	0.004	0.012	0.024	0.029	0.037	0.042
		Light	82	79	76	63	0.0010	0.0022	0.0041	0.010	0.026	0.056	0.067	0.088	0.097
HIGH TEMPERATURE ALLOY Incoloy, Inconel, Rene, Waspalloy	≤ 300	Slot	14	14	13	11	0.0005	0.0007	0.0014	0.004	0.010	0.021	0.024	0.032	0.035
		Profile	20	19	18	15	0.0005	0.0007	0.0014	0.004	0.010	0.021	0.024	0.032	0.035
		Light	30	28	27	23	0.0010	0.0017	0.0034	0.008	0.022	0.045	0.055	0.075	0.080
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 150	Slot	-	195	-	195	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140
		Profile	-	268	-	268	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140
		Light	-	402	-	402	0.0036	0.0071	0.0137	0.033	0.089	0.184	0.221	0.293	0.320
COPPER ALLOY Aluminum Bronze, C110, Muntz Brass	≤ 140	Slot	-	107	-	107	0.0008	0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070
		Profile	-	148	-	148	0.0008	0.0015	0.0031	0.007	0.019	0.040	0.048	0.064	0.070
		Light	-	221	-	221	0.0018	0.0034	0.0070	0.017	0.043	0.091	0.110	0.147	0.160
PLASTIC Polycarbonate, PVC, Polypropylene		Slot	-	195	-	195	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140
		Profile	-	268	-	268	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140
		Light	-	402	-	402	0.0036	0.0071	0.0137	0.033	0.089	0.184	0.221	0.293	0.320
GRAPHITE		Slot	-	146	-	146	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140
		Profile	-	201	-	201	0.0015	0.0032	0.0060	0.014	0.038	0.080	0.096	0.128	0.140
		Light	-	302	-	302	0.0036	0.0071	0.0137	0.033	0.089	0.184	0.221	0.293	0.320




CUT TYPE					
SLOT		PROFILE		LIGHT*	
4 flute Rw = D <sub>1</sub> Ad = .4 x D <sub>1</sub>	3 flute Rw = D <sub>1</sub> Ad = .5 x D <sub>1</sub>	2 flute Rw = D <sub>1</sub> Ad = D <sub>1</sub>	4, 3 flute Rw = .25 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	2 flute Rw = .5 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	4, 3, 2 flute Rw = .05 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>
					

rpm = (1000 x m/min) / (3.14 x D<sub>1</sub>)  
 mm/min = (mm/flute) x no. of flutes x rpm

- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- limit cut depths of long flute, extra long flute, and straight flute to .05 x D<sub>1</sub> Ad for Slot or Rw for Profile
- \* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))





# Speed & Feed Recommendations

Diamond 1, 1B, 3, 3B Fractional	CUT		SPEED					FEED (inch/flute)				
	Type	sfm	1/8	1/4	5/16	3/8	1/2	1/8	1/4	5/16	3/8	1/2
ALUMINUM DIE CAST ALLOY* (High Silicon) A-390, A-392, B-390	Slot	290	0.00060	0.0016	0.0025	0.0030	0.0040					
	Profile	360	0.00069	0.0018	0.0029	0.0035	0.0046					
	Light	400	0.00138	0.0037	0.0057	0.0069	0.0092					
CERAMIC* Machinable	Slot	30	0.00030	0.0008	0.0013	0.0015	0.0020					
	Profile	40	0.00035	0.0009	0.0014	0.0017	0.0023					
	Light	60	0.00069	0.0018	0.0029	0.0034	0.0046					
GRAPHITE Ultrafine, Superfine	Slot	580	0.00075	0.0020	0.0031	0.0038	0.0050					
	Profile	720	0.00087	0.0023	0.0036	0.0043	0.0058					
	Light	800	0.00172	0.0046	0.0072	0.0086	0.0115					
COMPOSITE FRP, CFRP, GRP	Slot	350	0.00045	0.0012	0.0019	0.0023	0.0030					
	Profile	385	0.00052	0.0014	0.0022	0.0026	0.0035					
	Light	580	0.00103	0.0028	0.0043	0.0052	0.0069					
PLASTIC G10, PVC, PEEK, Phenolic	Slot	960	0.00075	0.0020	0.0031	0.0038	0.0050					
	Profile	1200	0.00087	0.0023	0.0036	0.0043	0.0058					
	Light	1320	0.00172	0.0046	0.0072	0.0086	0.0115					

CUT TYPE			rpm = sfm x 3.82 / D <sub>1</sub> ipm = (inch/flute) x no. of flutes x rpm  *Diamond not intended for Aluminum Alloys or Ceramics
SLOT	PROFILE	LIGHT*	
Rw = D <sub>1</sub> Ad = D <sub>1</sub>	Rw = .25 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Rw = .05 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	<ul style="list-style-type: none"> <li>• maximum recommended depths shown</li> <li>• limit cut depths of long flute and extra long flute to .05 x D<sub>1</sub> Ad for Slot or Rw for Profile</li> <li>* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum</li> <li>• refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a>)</li> </ul>
			



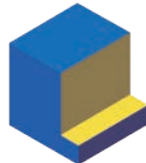
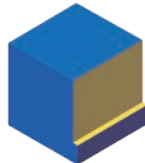
# Speed & Feed Recommendations

52, 54 Fractional	CUT		SPEED						FEED (inch/flute)			
	Type	sfm	1/8	1/4	3/8	1/2	3/4	1	3/8	1/2	3/4	1
ALUMINUM ALLOY 2024, 5052, 5086, 6061, 6063, 7075	Slot	1090	0.00063	0.0017	0.0032	0.0042	0.0050	0.0059				
	Profile	1360	0.00069	0.0018	0.0034	0.0046	0.0055	0.0064				
	Light	2245	0.00145	0.0039	0.0072	0.0096	0.0116	0.0135				
ALUMINUM DIE CAST ALLOY (High Silicon) A-390, A-392, B-390	Slot	410	0.00063	0.0017	0.0032	0.0042	0.0050	0.0059				
	Profile	510	0.00069	0.0018	0.0034	0.0046	0.0055	0.0064				
	Light	840	0.00145	0.0039	0.0072	0.0096	0.0116	0.0135				
COPPER ALLOY Aluminum Bronze, Muntz Brass, Naval Brass, Red Brass	Slot	475	0.00036	0.0010	0.0018	0.0024	0.0029	0.0034				
	Profile	590	0.00039	0.0010	0.0020	0.0026	0.0031	0.0037				
	Light	980	0.00083	0.0022	0.0041	0.0055	0.0066	0.0077				
COPPER ALLOY Beryllium Copper, C110, Manganese Bronze, Tin Bronze	Slot	190	0.00036	0.0010	0.0018	0.0024	0.0029	0.0034				
	Profile	235	0.00039	0.0010	0.0020	0.0026	0.0031	0.0037				
	Light	390	0.00083	0.0022	0.0041	0.0055	0.0066	0.0077				
PLASTIC ABS, Polycarbonate, PVC, Polypropylene	Slot	1280	0.00100	0.0027	0.0051	0.0068	0.0082	0.0095				
	Profile	1600	0.00110	0.0030	0.0056	0.0074	0.0089	0.0100				
	Light	2640	0.00230	0.0062	0.0117	0.0156	0.0187	0.0220				
PLASTIC Fiberglass, Glass Filled	Slot	575	0.00075	0.0020	0.0038	0.0050	0.0060	0.0070				
	Profile	720	0.00082	0.0022	0.0041	0.0055	0.0065	0.0076				
	Light	1185	0.00172	0.0046	0.0086	0.0115	0.0138	0.0016				

CUT TYPE				rpm = sfm x 3.82 / D <sub>1</sub> ipm = (inch/flute) x 6 x rpm
SLOT		PROFILE	LIGHT*	
Series 52 Rw = D <sub>1</sub> Ad = D <sub>1</sub>	Series 54 Rw = D <sub>1</sub> Ad = .25 x D <sub>1</sub>	Series 52, 54 Rw = .3 x D <sub>1</sub> Ad = 1.5 X D <sub>1</sub>	Series 52, 54 Rw = .05 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	<ul style="list-style-type: none"> <li>• maximum recommended depths shown</li> <li>* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum</li> <li>• refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a>)</li> </ul>
				

# Speed & Feed Recommendations


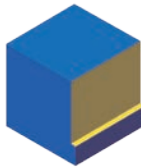
52M, 54M Metric	CUT		SPEED						FEED (mm/flute)			
	Type	m/min	3	6	10	12	20	25				
ALUMINUM ALLOY 2024, 5052, 5086, 6061, 6063, 7075	Slot	330	0.0151	0.041	0.085	0.101	0.133	0.148				
	Profile	415	0.0166	0.043	0.091	0.110	0.147	0.160				
	Light	685	0.0348	0.094	0.192	0.230	0.309	0.338				
ALUMINUM DIE CAST ALLOY (High Silicon) A-390, A-392, B-390	Slot	125	0.0151	0.041	0.085	0.101	0.133	0.148				
	Profile	155	0.0166	0.043	0.091	0.110	0.147	0.160				
	Light	255	0.0348	0.094	0.192	0.230	0.309	0.338				
COPPER ALLOY Aluminum Bronze, Muntz Brass, Naval Brass, Red Brass	Slot	145	0.0086	0.024	0.048	0.058	0.077	0.085				
	Profile	180	0.0094	0.024	0.053	0.062	0.083	0.093				
	Light	300	0.0199	0.053	0.109	0.132	0.176	0.193				
COPPER ALLOY Beryllium Copper, C110, Manganese Bronze, Tin Bronze	Slot	60	0.0086	0.024	0.048	0.058	0.077	0.085				
	Profile	70	0.0094	0.024	0.053	0.062	0.083	0.093				
	Light	120	0.0199	0.053	0.109	0.132	0.176	0.193				
PLASTIC ABS, Polycarbonate, PVC, Polypropylene	Slot	390	0.0240	0.065	0.136	0.163	0.219	0.238				
	Profile	490	0.0264	0.072	0.149	0.178	0.237	0.250				
	Light	805	0.0552	0.149	0.312	0.374	0.499	0.550				
PLASTIC Fiberglass, Glass Filled	Slot	175	0.0180	0.048	0.101	0.120	0.160	0.175				
	Profile	220	0.0197	0.053	0.109	0.132	0.173	0.190				
	Light	360	0.0413	0.110	0.229	0.276	0.368	0.040				

CUT TYPE				rpm = (1000 x m/min) / (3.14 x D <sub>1</sub> ) mm/min = (mm/flute) x 6 x rpm
SLOT		PROFILE	LIGHT*	
Series 52 Rw = D <sub>1</sub> Ad = D <sub>1</sub>	Series 54 Rw = D <sub>1</sub> Ad = .25 x D <sub>1</sub>	Series 52, 54 Rw = .3 x D <sub>1</sub> Ad = 1.5 X D <sub>1</sub>	Series 52, 54 Rw = .05 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	<ul style="list-style-type: none"> <li>• maximum recommended depths shown</li> <li>* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum</li> <li>• refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a>)</li> </ul>
				

# Speed & Feed Recommendations

60 Fractional	HARDNESS BRINELL	CUT Type	SPEED (sfm)				FEED (inch/flute)					
			AlTiN	TiCN	TiN	non	1/8	1/4	3/8	1/2	3/4	1
STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 185	Profile	395	380	365	300	.00050	.0015	.0025	.0035	.0040	.0045
		Light	650	625	600	500	.00100	.0030	.0050	.0070	.0085	.0095
	> 185 ≤ 275	Profile	370	360	345	285	.00050	.0015	.0025	.0035	.0040	.0045
		Light	615	590	565	470	.00100	.0030	.0050	.0070	.0085	.0095
STAINLESS (difficult) 304, 316, 15-5PH, 17-4PH	≤ 185	Profile	315	300	290	240	.00040	.0010	.0020	.0025	.0030	.0035
		Light	520	500	480	400	.00085	.0020	.0040	.0055	.0065	.0075
	> 185 ≤ 325	Profile	235	225	220	180	.00040	.0010	.0020	.0025	.0030	.0035
		Light	390	375	360	300	.00085	.0020	.0040	.0055	.0065	.0075
TITANIUM Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Profile	180	170	165	140	.00040	.0010	.0020	.0025	.0030	.0035
		Light	295	285	275	225	.00085	.0020	.0040	.0055	.0065	.0075
	> 350 ≤ 380	Profile	145	140	130	110	.00040	.0010	.0020	.0025	.0030	.0035
		Light	235	225	220	180	.00085	.0020	.0040	.0055	.0065	.0075
HIGH TEMP ALLOY A-286, Hastelloy, Incoloy, Inconel, Rene, Waspalloy	> 200 ≤ 300	Profile	65	60	60	50	.00030	.0008	.0015	.0020	.0025	.0030
		Light	105	100	100	80	.00070	.0017	.0035	.0045	.0050	.0060
	> 300 ≤ 400	Profile	50	50	45	40	.00021	.0006	.0011	.0014	.0017	.0020
		Light	85	80	75	65	.00045	.0012	.0022	.0030	.0036	.0042

60M Metric	HARDNESS BRINELL	CUT Type	SPEED (m/min)				FEED (mm/flute)					
			AlTiN	TiCN	TiN	non	3	6	10	12	20	25
STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 185	Profile	120	116	111	91	0.0120	0.036	0.067	0.084	0.107	0.113
		Light	198	191	183	152	0.0240	0.072	0.133	0.168	0.227	0.238
	> 185 ≤ 275	Profile	113	110	105	87	0.0120	0.036	0.067	0.084	0.107	0.113
		Light	187	180	172	143	0.0240	0.072	0.133	0.168	0.227	0.238
STAINLESS (difficult) 304, 316, 15-5PH, 17-4PH	≤ 185	Profile	96	91	88	73	0.0096	0.024	0.053	0.060	0.080	0.088
		Light	158	152	146	122	0.0204	0.048	0.107	0.132	0.173	0.188
	> 185 ≤ 325	Profile	72	69	67	55	0.0096	0.024	0.053	0.060	0.080	0.088
		Light	119	114	110	91	0.0204	0.048	0.107	0.132	0.173	0.188
TITANIUM Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Profile	55	52	50	43	0.0096	0.024	0.053	0.060	0.080	0.088
		Light	90	87	84	69	0.0204	0.048	0.107	0.132	0.173	0.188
	> 350 ≤ 380	Profile	44	43	40	34	0.0096	0.024	0.053	0.060	0.080	0.088
		Light	72	69	67	55	0.0204	0.048	0.107	0.132	0.173	0.188
HIGH TEMP ALLOY A-286, Hastelloy, Incoloy, Inconel, Rene, Waspalloy	> 200 ≤ 300	Profile	20	19	18	15	0.0072	0.019	0.040	0.048	0.067	0.075
		Light	33	31	30	24	0.0168	0.041	0.093	0.108	0.133	0.150
	> 300 ≤ 400	Profile	16	15	14	12	0.0050	0.014	0.029	0.034	0.045	0.050
		Light	25	24	23	20	0.0108	0.029	0.059	0.072	0.096	0.105





CUT TYPE	
PROFILE	LIGHT*
Rw = .3 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Rw = .05 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>
	



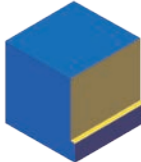
$rpm = sfm \times 3.82 / D_1$   
 $rpm = (1000 \times m/min) / (3.14 \times D_1)$   
 $ipm = (inch/flute) \times no. \text{ of flutes} \times rpm$   
 $mm/min = (mm/flute) \times no. \text{ of flutes} \times rpm$

- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- \* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))



# Speed & Feed Recommendations

61 Fractional	HARDNESS	SERIES	CUT	SPEED (sfm)				FEED (inch/flute)				
	BRINELL			Type	AlTiN	TiCN	TiN	non	1/4	3/8	1/2	3/4
 CARBON STEEL 1018, 1040, 1080, 10L50, 1525, 1536	≤ 175	61	Slot	400	385	370	–	.0006	.0011	.0014	.0017	.0020
			Profile	500	480	460	–	.0006	.0011	.0014	.0017	.0020
			Light	550	530	505	–	.0007	.0012	.0016	.0019	.0023
	> 175 ≤ 275		Slot	330	315	300	–	.0006	.0011	.0014	.0017	.0020
			Profile	415	400	380	–	.0006	.0011	.0014	.0017	.0020
			Light	480	460	445	–	.0007	.0012	.0016	.0019	.0023
 ALLOY STEEL 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275	61	Slot	295	280	270	–	.0004	.0008	.0011	.0013	.0015
			Profile	365	355	340	–	.0004	.0008	.0011	.0013	.0015
			Light	400	390	370	–	.0005	.0010	.0012	.0015	.0018
	> 275 ≤ 375		Slot	200	190	185	–	.0004	.0008	.0011	.0013	.0015
			Profile	250	240	230	–	.0004	.0008	.0011	.0013	.0015
			Light	275	265	255	–	.0005	.0010	.0012	.0015	.0018
 TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	61	Slot	275	265	255	–	.0006	.0009	.0015	.0018	.0021
			Profile	345	330	315	–	.0006	.0009	.0015	.0018	.0021
			Light	380	365	350	–	.0007	.0011	.0017	.0021	.0024
	> 250 ≤ 375		Slot	170	160	155	–	.0005	.0009	.0012	.0014	.0017
			Profile	210	205	195	–	.0005	.0009	.0012	.0014	.0017
			Light	230	225	215	–	.0006	.0010	.0014	.0017	.0019
 CAST IRON Gray, Malleable, Ductile	≤ 220	61	Slot	295	280	270	–	.0008	.0015	.0020	.0024	.0028
			Profile	365	355	340	–	.0008	.0015	.0020	.0024	.0028
			Light	405	390	370	–	.0009	.0017	.0023	.0028	.0032
	> 220 ≤ 260		Slot	225	215	210	–	.0006	.0009	.0015	.0018	.0021
			Profile	280	270	260	–	.0006	.0009	.0015	.0018	.0021
			Light	310	300	285	–	.0007	.0011	.0017	.0021	.0024





CUT TYPE		
SLOT	PROFILE	LIGHT
Rw = D <sub>1</sub> Ad = D <sub>1</sub>	Rw = .5 x D <sub>1</sub> Ad = D <sub>1</sub>	Rw = .25 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>
		



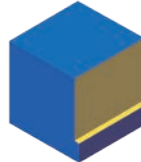
$$\text{rpm} = \text{sfm} \times 3.82 / D_1$$

$$\text{ipm} = (\text{inch/flute}) \times \text{no. of flutes} \times \text{rpm}$$

- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))

# Speed & Feed Recommendations

61M Metric	HARDNESS	SERIES	CUT Type	SPEED (m/min)				FEED (mm/flute)				
	BRINELL			AlTiN	TiCN	TiN	non	6	10	12	20	25
 CARBON STEEL 1018, 1040, 1080, 10L50, 1525, 1536	≤ 175	61M	Slot	122	117	113	–	0.014	0.029	0.034	0.045	0.050
			Profile	152	146	140	–	0.014	0.029	0.034	0.045	0.050
			Light	168	162	154	–	0.017	0.032	0.038	0.051	0.058
	> 175 ≤ 275		Slot	101	96	91	–	0.014	0.029	0.034	0.045	0.050
			Profile	126	122	116	–	0.014	0.029	0.034	0.045	0.050
			Light	146	140	136	–	0.017	0.032	0.038	0.051	0.058
 ALLOY STEEL 4140, 4150, 4320, 5120, 5150, 8630, 86L20, 50100	≤ 275	61M	Slot	90	85	82	–	0.010	0.021	0.026	0.035	0.038
			Profile	111	108	104	–	0.010	0.021	0.026	0.035	0.038
			Light	122	119	113	–	0.012	0.027	0.029	0.040	0.045
	> 275 ≤ 375		Slot	61	58	56	–	0.010	0.021	0.026	0.035	0.038
			Profile	76	73	70	–	0.010	0.021	0.026	0.035	0.038
			Light	84	81	78	–	0.012	0.027	0.029	0.040	0.045
 TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	61M	Slot	84	81	78	–	0.014	0.024	0.036	0.048	0.053
			Profile	105	101	96	–	0.014	0.024	0.036	0.048	0.053
			Light	116	111	107	–	0.017	0.029	0.041	0.056	0.060
	> 250 ≤ 375		Slot	52	49	47	–	0.012	0.024	0.029	0.037	0.043
			Profile	64	62	59	–	0.012	0.024	0.029	0.037	0.043
			Light	70	69	66	–	0.014	0.027	0.034	0.045	0.048
 CAST IRON Gray, Malleable, Ductile	≤ 220	61M	Slot	90	85	82	–	0.019	0.040	0.048	0.064	0.070
			Profile	111	108	104	–	0.019	0.040	0.048	0.064	0.070
			Light	123	119	113	–	0.022	0.045	0.055	0.075	0.080
	> 220 ≤ 260		Slot	69	66	64	–	0.014	0.024	0.036	0.048	0.053
			Profile	85	82	79	–	0.014	0.024	0.036	0.048	0.053
			Light	94	91	87	–	0.017	0.029	0.041	0.056	0.060

CUT TYPE		
SLOT	PROFILE	LIGHT
Rw = D <sub>1</sub> Ad = D <sub>1</sub>	Rw = .5 x D <sub>1</sub> Ad = D <sub>1</sub>	Rw = .25 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>
		


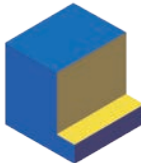
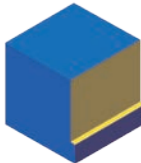
$$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$$

$$\text{mm/min} = (\text{mm/flute}) \times 2 \times \text{rpm}$$

- maximum recommended depths shown
- reduce speed and feed for materials harder than listed
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))

# Speed & Feed Recommendations


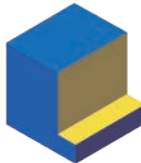
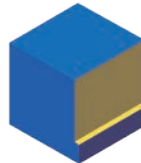
MK2 Fractional	HARDNESS BRINELL	CUT Type	SPEED sfm	FEED (inch/flute)				
				.008	.016	.031	.040	.060
CARBON STEEL 1018, 1040, 1080, 10L50, 1525, 1536	≤ 175	Slot	255	0.000016	0.00003	0.00006	0.00009	0.00013
		Profile	320	0.000018	0.00004	0.00007	0.00011	0.00014
		Finish	415	0.000037	0.00007	0.00014	0.00022	0.00029
ALLOY STEEL 4140, 4150, 4340, 5150, 8630	≤ 275	Slot	190	0.000012	0.00002	0.00005	0.00007	0.00009
		Profile	235	0.000014	0.00003	0.00005	0.00008	0.00011
		Finish	305	0.000028	0.00005	0.00011	0.00016	0.00022
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Slot	175	0.000012	0.00002	0.00005	0.00007	0.00009
		Profile	220	0.000014	0.00003	0.00005	0.00008	0.00011
		Finish	285	0.000028	0.00005	0.00011	0.00016	0.00022
CAST IRON Gray, Malleable, Ductile	≤ 220	Slot	190	0.000016	0.00003	0.00006	0.00009	0.00013
		Profile	235	0.000018	0.00004	0.00007	0.00011	0.00014
		Finish	305	0.000037	0.00007	0.00014	0.00022	0.00029
STAINLESS (free machining) 303, 420F, 440F	≤ 275	Slot	210	0.000012	0.00002	0.00005	0.00007	0.00009
		Profile	260	0.000014	0.00003	0.00005	0.00008	0.00011
		Finish	340	0.000028	0.00005	0.00011	0.00016	0.00022
STAINLESS (difficult) 304, 316, 17-4PH	≤ 275	Slot	145	0.000010	0.00002	0.00004	0.00006	0.00008
		Profile	180	0.000011	0.00002	0.00004	0.00006	0.00009
		Finish	235	0.000022	0.00004	0.00009	0.00013	0.00017
TITANIUM Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Slot	100	0.000010	0.00002	0.00004	0.00006	0.00008
		Profile	125	0.000011	0.00002	0.00004	0.00006	0.00009
		Finish	160	0.000022	0.00004	0.00009	0.00013	0.00017
HIGH TEMP ALLOY Incoloy, Inconel, Rene, Waspalloy	≤ 300	Slot	35	0.000008	0.00002	0.00003	0.00005	0.00006
		Profile	45	0.000009	0.00002	0.00004	0.00005	0.00007
		Finish	60	0.000018	0.00004	0.00007	0.00011	0.00014
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 150	Slot	640	0.000032	0.00006	0.00013	0.00019	0.00025
		Profile	800	0.000037	0.00007	0.00014	0.00022	0.00029
		Finish	1040	0.000073	0.00014	0.00029	0.00043	0.00057
COPPER ALLOY Aluminum Bronze, C110, Muntz Brass	≤ 140	Slot	190	0.000016	0.00003	0.00006	0.00009	0.00013
		Profile	240	0.000018	0.00004	0.00007	0.00011	0.00014
		Finish	310	0.000037	0.00007	0.00014	0.00022	0.00029
PLASTIC Polycarbonate, PVC, Polypropylene		Slot	640	0.000032	0.00006	0.00013	0.00019	0.00025
		Profile	800	0.000037	0.00007	0.00014	0.00022	0.00029
		Finish	1040	0.000073	0.00014	0.00029	0.00043	0.00057
GRAPHITE		Slot	480	0.000032	0.00006	0.00013	0.00019	0.00025
		Profile	600	0.000037	0.00007	0.00014	0.00022	0.00029
		Finish	780	0.000073	0.00014	0.00029	0.00043	0.00057

CUT TYPE			rpm = sfm x 3.82 / D <sub>1</sub> ipm = (inch/flute) x 2 x rpm
SLOT	PROFILE	LIGHT*	
Rw = D <sub>1</sub> Ad = D <sub>1</sub>	Rw = .5 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Rw = .05 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	<ul style="list-style-type: none"> <li>• maximum recommended depths shown</li> <li>• reduce speed to meet machine limitations</li> <li>• reduce speed and feed for materials harder than listed</li> <li>* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum</li> <li>• refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a>)</li> </ul>
			



# Speed & Feed Recommendations

MK2M Metric	HARDNESS BRINELL	CUT Type	SPEED m/min	FEED (mm/flute)				
				.20	.41	.79	1.02	1.52
CARBON STEEL 1018, 1040, 1080, 10L50, 1525, 1536	≤ 175	Slot	78	0.00041	0.0008	0.0015	0.0023	0.0033
		Profile	98	0.00046	0.0010	0.0018	0.0028	0.0036
		Finish	127	0.00094	0.0018	0.0036	0.0056	0.0074
ALLOY STEEL 4140, 4150, 4340, 5150, 8630	≤ 275	Slot	57	0.00030	0.0005	0.0013	0.0018	0.0023
		Profile	72	0.00036	0.0008	0.0013	0.0020	0.0028
		Finish	93	0.00071	0.0013	0.0028	0.0041	0.0056
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	Slot	54	0.00030	0.0005	0.0013	0.0018	0.0023
		Profile	67	0.00036	0.0008	0.0013	0.0020	0.0028
		Finish	87	0.00071	0.0013	0.0028	0.0041	0.0056
CAST IRON Gray, Malleable, Ductile	≤ 220	Slot	57	0.00041	0.0008	0.0015	0.0023	0.0033
		Profile	72	0.00046	0.0010	0.0018	0.0028	0.0036
		Finish	93	0.00094	0.0018	0.0036	0.0056	0.0074
STAINLESS (free machining) 303, 420F, 440F	≤ 275	Slot	63	0.00030	0.0005	0.0013	0.0018	0.0023
		Profile	79	0.00036	0.0008	0.0013	0.0020	0.0028
		Finish	103	0.00071	0.0013	0.0028	0.0041	0.0056
STAINLESS (difficult) 304, 316, 17-4PH	≤ 275	Slot	44	0.00025	0.0005	0.0010	0.0015	0.0020
		Profile	55	0.00028	0.0005	0.0010	0.0015	0.0023
		Finish	71	0.00056	0.0010	0.0023	0.0033	0.0043
TITANIUM Ti5Al-5V-5Mo, Ti6Al4V, Ti-7Al4Mo	≤ 350	Slot	30	0.00025	0.0005	0.0010	0.0015	0.0020
		Profile	38	0.00028	0.0005	0.0010	0.0015	0.0023
		Finish	49	0.00056	0.0010	0.0023	0.0033	0.0043
HIGH TEMP ALLOY Incoloy, Inconel, Rene, Waspalloy	≤ 300	Slot	11	0.00020	0.0005	0.0008	0.0013	0.0015
		Profile	14	0.00023	0.0005	0.0010	0.0013	0.0018
		Finish	18	0.00046	0.0010	0.0018	0.0028	0.0036
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 150	Slot	195	0.00081	0.0015	0.0033	0.0048	0.0064
		Profile	244	0.00094	0.0018	0.0036	0.0056	0.0074
		Finish	317	0.00185	0.0036	0.0074	0.0109	0.0145
COPPER ALLOY Aluminum Bronze, C110, Muntz Brass	≤ 140	Slot	59	0.00041	0.0008	0.0015	0.0023	0.0033
		Profile	73	0.00046	0.0010	0.0018	0.0028	0.0036
		Finish	95	0.00094	0.0018	0.0036	0.0056	0.0074
PLASTIC Polycarbonate, PVC, Polypropylene		Slot	195	0.00081	0.0015	0.0033	0.0048	0.0064
		Profile	244	0.00094	0.0018	0.0036	0.0056	0.0074
		Finish	317	0.00185	0.0036	0.0074	0.0109	0.0145
GRAPHITE		Slot	146	0.00081	0.0015	0.0033	0.0048	0.0064
		Profile	183	0.00094	0.0018	0.0036	0.0056	0.0074
		Finish	238	0.00185	0.0036	0.0074	0.0109	0.0145

CUT TYPE		
SLOT	PROFILE	LIGHT*
Rw = D <sub>1</sub> Ad = D <sub>1</sub>	Rw = .5 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Rw = .05 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>
		

$$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$$

$$\text{mm/min} = (\text{mm/flute}) \times 2 \times \text{rpm}$$

- maximum recommended depths shown
- reduce speed to meet machine limitations
- reduce speed and feed for materials harder than listed
- \* finish cuts typically require reduced feed and cutting depths of .02 x D<sub>1</sub> maximum
- refer to the SGS Tool Wizard for more complete technical information (available at [www.sgstool.com](http://www.sgstool.com))

<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

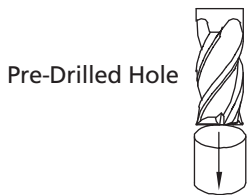
$D_1$  = cutting diameter       $L_2$  = flute length

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

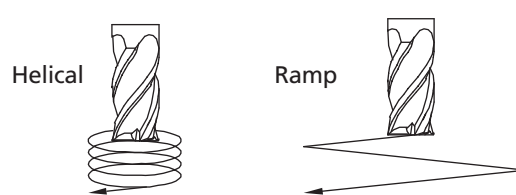
Reductions to Speeds and Feeds may be necessary when:

- $R_w$  and  $A_d$  exceed recommendations
- Using long flute or extended reach tools
- Using long tool holders
- Machining materials harder than listed

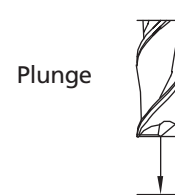
## ENTRY METHODS



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



Alternative methods are helical and ramping. Use slotting speeds and 25% to 50% slotting feeds. Engage at about  $5^\circ$  for General Purpose tools and  $5^\circ$  to  $10^\circ$  for High Performance tools.



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

<b>Herramientas</b>	<ul style="list-style-type: none"> <li>• 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.</li> <li>• 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</li> <li>• Las herramientas de alto desempeño minimizan el tiempo de ciclo del maquinado y extienden la vida útil de la herramienta</li> </ul>
<b>Portaherramientas</b>	<ul style="list-style-type: none"> <li>• Los Portaherramientas deberán tener buena presión de agarre para la sujeción de la herramienta y una concentricidad máxima indicada (TIR)</li> <li>• Se recomienda usar portaherramientas de agarre directo cortos, o de boquilla con longitud cero para lograr un máximo arranque de viruta</li> <li>• 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</li> </ul>
<b>Pieza a maquinar</b>	<ul style="list-style-type: none"> <li>• La buena sujeción de la pieza a maquinar reducirá la vibración y la desviación de la herramienta</li> </ul>
<b>Máquina</b>	<ul style="list-style-type: none"> <li>• El usillo de la maquina debe estar en condiciones optimas, para asegurar la concentricidad de giro (TIR) y asegurar el máximo rendimiento de la herramienta</li> <li>• Para lograr los avances y velocidades recomendados, se necesita suficiente potencia (HP) en la maquina</li> <li>• Reducir los parámetros de corte en maquinas de baja potencia (HP) para prevenir el daño en la herramienta o pieza de trabajo</li> </ul>
<b>Refrigerante</b>	<ul style="list-style-type: none"> <li>• Evite el re-maquinado de virutas usando aire a presión o líquido refrigerante según sea necesario</li> <li>• Mantener limpio el refrigerante con su concentración adecuada</li> <li>• Recomendaciones generales:             <ul style="list-style-type: none"> <li>–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</li> <li>–Para el maquinado de Aleaciones Inoxidables, Aleaciones de Alta Temperatura, Titanio y Aleaciones No Ferrosas, utilice solamente Aceite Soluble en Agua</li> </ul> </li> </ul>
<b>Métodos</b>	<ul style="list-style-type: none"> <li>• Se recomienda el maquinado en sentido ascendente o trepado</li> <li>• El cuidado en los detalles de la programación, la concentricidad 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</li> </ul>

## 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 ( $-\overline{Rw}$ ), y profundidad axial ( $\overline{Ad}$ )

Reducciones en velocidades y avances serán necesarias cuando:

- $Rw$  y  $Ad$  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**

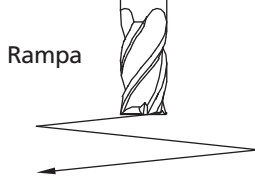


Preferentemente usar un barreno previo como método de entrada para la mayor parte de las aplicaciones.

**Interpolado Helicoidal**




**Rampa**



El corte en rampa y el interpolado helicoidal son métodos alternativos. Usar los parámetros de 25% a 50% de la velocidad de corte usada en una ranura. Con avances alrededor de 5" para herramientas de uso en general y de 5" a 10" en herramientas de alto desempeño.

**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

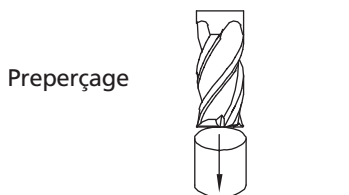
$D_1$  = diamètre de coupe       $L_2$  = longueur de coupe

Vitesses & avances pour ces cas d'usinage sont basées sur l'engagement radial ( $-\left|ae\right|$ ), et axial ( $\overline{ap}$ )

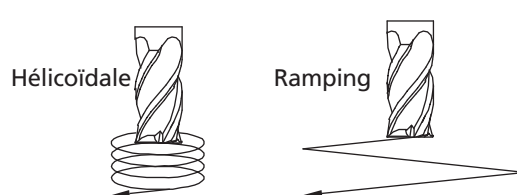
La réduction de la vitesse et de l'avance doit être nécessaire quand:

- 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

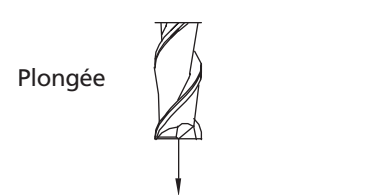
## TYPES D'ENTREE MATIERE



Le pré-perçage est la méthode préférable dans la plupart de applications.



Méthodes alternatives, entrée hélicoïdale et ramping. Utiliser vitesse de rainurage et les avance réduite de 25 à 50%. Angle de plongée environ 5° pour les outils standards. 5 à 10° pour les outils hautes performance.



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



**DRILLS**





# Hole Making

HIGH PERFORMANCE DRILLS	SERIES	PAGE
Hi-PerCarb Double Margin Drills	135 3xD, 135 5xD	133–139
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Slow Spiral Drills	101	158–163
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INFORMATIONS TECHNIQUES		
Recommandations de vitesse et avance		194–195



# Drill Icon Legend

# Leyenda del icono de los taladros

# Légende d'icone de perçage

## END CONFIGURATIONS CONFIGURACIONES DE LA PUNTA CONFIGURATIONS TERMINALES



Drill  
Fresa  
Fraise

## SHANK TYPE TIPO DE VÁSTAGO TYPE DE TIGE



Common  
Normal  
Commune



Straight  
Recto  
Droite

## REACH TRANSLATION TRANSLATION

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

## ADDITIONAL GEOMETRY CARACTERÍSTICAS GEOMÉTRICAS ADICIONALES GÉOMÉTRIE SUPPLÉMENTAIRE



Right Cut Direction  
Fresado sentido derecha  
Coupe vers la droite

## COOLANT OPTIONS OPCIONES DE REFRIGERACIÓN OPTIONS DE REFOIDISSEMENT



Internal Coolant  
Refrigerante externo  
Refrroidissement interne



External Coolant  
Refrigerante interno  
Refrroidissement externe

## COATINGS REVESTIMIENTOS REVÊTEMENTS



Uncoated

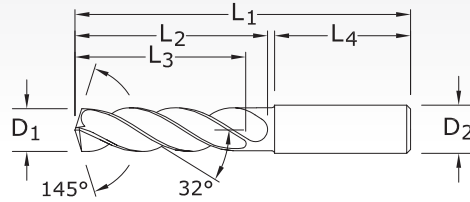


Ti-NAMITE-A  
(AlTiN)



Di-NAMITE  
(Diamond)





### 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>

## 135 3xD

FRACTIONAL & METRIC SERIES

TECH INFO 149-150

CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIAMETER	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AITiN)	EDP NO.
D <sub>1</sub>			D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>		
1/64*	0.0156		1/8	1-1/2	1/8	5/64	1		51752
1/32*	0.0312		1/8	1-1/2	1/4	3/16	1		51269
3/64*	0.0469	1/16-64	1/8	1-1/2	3/8	5/16	1		51270
1/16*	0.0625	5/64-60	1/8	2	7/16	3/8	1-1/4		51271
5/64*	0.0781		1/8	2	1/2	7/16	1-1/4		51272
3/32	0.0938	1/8-32	1/8	2	1/2	7/16	1-1/4		51273
#40	0.0980		1/8	2	9/16	1/2	1-1/4		51274
#39	0.0995		1/8	2	9/16	1/2	1-1/4		51753
#38	0.1015	5-40	1/8	2	9/16	1/2	1-1/4		51754
#37	0.1040	5-44	1/8	2	9/16	1/2	1-1/4		51755
#36	0.1065	6-32	1/8	2	9/16	1/2	1-1/4		51756
7/64	0.1094		1/8	2	5/8	9/16	1-1/4		51275
#35	0.1100		1/8	2	5/8	9/16	1-1/4		51276
#34	0.1110		1/8	2	5/8	9/16	1-1/4		51277
#33	0.1130	6-40	1/8	2	5/8	9/16	1-1/4		51757
#32	0.1160		1/8	2	5/8	9/16	1-1/4		51758
3,0mm	0.1181		6,0mm	62,0mm	20,1mm	17,0	36,0mm		63155
#31	0.1200		1/8	2	5/8	9/16	1-1/4		51759
3.1mm	0.1220		6,0mm	62,0mm	20,0mm	17,0	36,0mm		63741
1/8	0.1250		1/4	2-9/16	3/4	21/32	1-7/16		51330
3.2mm	0.1260	M3,5 X 0,35	6,0mm	62,0mm	20,0mm	17,0	36,0mm		63156
#30	0.1285		1/4	2-9/16	3/4	21/32	1-7/16		51278
3.3mm	0.1299	M4 X 0,7	6,0mm	62,0mm	20,0mm	17,0	36,0mm		63157
3.4mm	0.1339		6,0mm	62,0mm	20,0mm	17,0	36,0mm		63158
#29	0.1360	8-32,8-36	1/4	2-1/2	3/4	21/32	1-7/16		51331
3.5mm	0.1378	M4 X 0,5	6,0mm	62,0mm	20,0mm	17,0	36,0mm		63159
#28	0.1405	8-40	1/4	2-1/2	3/4	21/32	1-7/16		51760
9/64	0.1406		1/4	2-1/2	3/4	21/32	1-7/16		51332
3.6mm	0.1417	M4 X 0,35	6,0mm	62,0mm	20,0mm	17,0	36,0mm		63160
#27	0.1440		1/4	2-1/2	3/4	21/32	1-7/16		51761
3.7mm	0.1457	M4.5 X 0,75	6,0mm	62,0mm	20,0mm	17,0	36,0mm		63161
#26	0.1470	3/16-24	1/4	2-1/2	3/4	21/32	1-7/16		51762
#25	0.1495	10-24	1/4	2-5/8	7/8	23/32	1-7/16		51333
3.8mm	0.1496		6,0	66,0	24,0	21,0	36,0		63472
#24	0.1520	10-28	1/4	2-5/8	7/8	23/32	1-7/16		51763
3.9mm	0.1535		6,0mm	66,0mm	20,0mm	21,0	43,5mm		63743
#23	0.1540		1/4	2-5/8	7/8	23/32	1-7/16		51764
5/32	0.1562		1/4	2-5/8	7/8	23/32	1-7/16		51334
#22	0.1570	10-30	1/4	2-5/8	7/8	23/32	1-7/16		51765
4.0mm	0.1575	M4,5 X 0,5	6,0mm	66,0mm	24,1mm	21,0	36,0mm		63162
#21	0.1590	10-32	1/4	2-5/8	7/8	23/32	1-7/16		51335
#20	0.1610	13/64-24	1/4	2-5/8	7/8	23/32	1-7/16		51279
4.1mm	0.1614		6,0mm	66,0mm	20,0mm	21,0	36,0mm		63744
4.2mm	0.1654	M5 / M5 X 0,75	6,0mm	66,0mm	24,1mm	21,0	36,0mm		63163

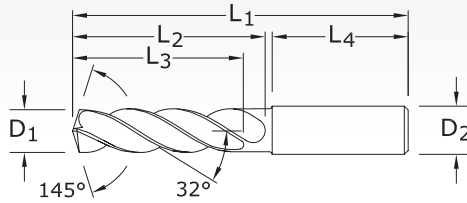
\*Single Margin

continued on next page

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



# Hi-PerCarb Double Margin Drills



## 135 3xD

FRACTIONAL & METRIC SERIES

TECH INFO 149-150

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

CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIAMETER	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.
#19	0.1660		1/4	2-5/8	7/8	23/32	1-7/16	51766
4.3mm	0.1693		6,0mm	66,0mm	24,1mm	21,0	36,0mm	63164
#18	0.1695		1/4	2-5/8	7/8	23/32	1-7/16	51767
11/64	0.1719		1/4	2-5/8	7/8	23/32	1-7/16	51336
#17	0.1730		1/4	2-5/8	7/8	23/32	1-7/16	51768
4.4mm	0.1732		6,0mm	66,0mm	20,0mm	21,0	36,0mm	63745
#16	0.1770	12-24	1/4	2-5/8	7/8	23/32	1-7/16	51769
4.5mm	0.1772	M5 X 0,5	6,0mm	66,0mm	24,1mm	21,0	36,0mm	63165
#15	0.1800		1/4	2-5/8	7/8	23/32	1-7/16	51770
4.6mm	0.1811	12-28	6,0mm	66,0mm	24,1mm	21,0	36,0mm	63166
#14	0.1820		1/4	2-5/8	7/8	23/32	1-7/16	51771
#13	0.1850	12-32	1/4	2-5/8	7/8	23/32	1-7/16	51772
4.7mm	0.1850		6,0mm	66,0mm	20,0mm	21,0	36,0mm	63746
3/16	0.1875		1/4	2-5/8	1	53/64	1-7/16	51337
#12	0.1890	7/32-32	1/4	2-5/8	1	53/64	1-7/16	51773
4.8mm	0.1890		6,0mm	66,0mm	28,0mm	24,0	36,0mm	63167
#11	0.1910		1/4	2-5/8	1	53/64	1-7/16	51774
4.9mm	0.1929		6,0mm	66,0mm	28,0mm	24,0	36,0mm	63747
#10	0.1935	14-20	1/4	2-5/8	1	53/64	1-7/16	51775
#09	0.1960		1/4	2-5/8	1	53/64	1-7/16	51776
5mm	0.1969	M6 X 1	6,0mm	66,0mm	28,0mm	24,0	36,0mm	63168
#08	0.1990		1/4	2-5/8	1	53/64	1-7/16	51777
5.1mm	0.2008		6,0mm	66,0mm	28,0mm	24,0	36,0mm	63748
#07	0.2010	1/4-20	1/4	2-5/8	1	53/64	1-7/16	51338
13/64	0.2031		1/4	2-5/8	1	53/64	1-7/16	51339
#06	0.2040		1/4	2-5/8	1	53/64	1-7/16	51778
5.2mm	0.2047	M6 X 0,75	6,0mm	66,0mm	28,0mm	24,0	36,0mm	63749
#05	0.2055		1/4	2-5/8	1	53/64	1-7/16	51779
5.25mm	0.2067		6,0mm	66,0mm	28,0mm	24,0	36,0mm	63169
5.3mm	0.2087		6,0mm	66,0mm	28,0mm	24,0	36,0mm	63170
#04	0.2090	1/4-24	1/4	2-5/8	1	53/64	1-7/16	51780
5.4mm	0.2126		6,0mm	66,0mm	28,0mm	24,0	36,0	63750
#03	0.2130	1/4-28	1/4	2-5/8	1	53/64	1-7/16	51340
5.5mm	0.2165	M6 X 0,5	6,0mm	68,0mm	28,0mm	24,0	36,0mm	63171
7/32	0.2188	1/4-32	1/4	2-5/8	1	53/64	1-7/16	51341
5.6mm	0.2205		6,0mm	66,0mm	28,0mm	24,0	36,0	63751
#02	0.2210		1/4	2-5/8	1	53/64	1-7/16	51781
5.7mm	0.2244		6,0mm	66,0mm	28,0mm	24,0	36,0	63752
#01	0.2280		1/4	2-5/8	1	53/64	1-7/16	51782
5.8mm	0.2283		6,0mm	66,0mm	28,0mm	24,0	36,0mm	63172
5.9mm	0.2323		6,0mm	66,0mm	28,0mm	24,0	36,0	63753
A	0.2340		1/4	2-5/8	1	53/64	1-7/16	51601
15/64	0.2344		1/4	2-5/8	1	53/64	1-7/16	51342
6mm	0.2362	M7 X 1	6,0mm	66,0mm	28,0mm	24,0	36,0mm	63173

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>
- >18-30 DIAMETER  
D<sub>1</sub> = +0,008/+0,029  
D<sub>2</sub> = h<sub>6</sub>





## 135 3xD

FRACTIONAL & METRIC SERIES

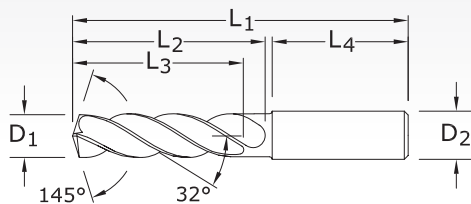
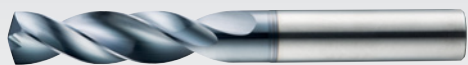
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CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIAMETER	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AlTiN)
D <sub>1</sub>			D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.
B	0.2380		1/4	3-1/8	1-5/16	1-3/64	1-7/16	51602
6.1mm	0.2402		8,0mm	79,0mm	34,0mm	28,0	36,0	63754
C	0.2420		1/4	3-1/8	1-5/16	1-3/64	1-7/16	51603
6.2mm	0.2441		8,0mm	79,0mm	34,0mm	28,0	36,0	63755
D	0.2460		1/4	3-1/8	1-5/16	1-3/64	1-7/16	51604
6.25mm	0.2461	M7 X 0, 75	8,0mm	79,0mm	34,0mm	28,0	36,0mm	63174
6.3mm	0.2480		8,0mm	79,0mm	34,0mm	28,0	36,0	63756
1/4	0.2500		1/4	3-1/8	1-5/16	1-3/64	1-7/16	51343
E	0.2500		1/4	3-1/8	1-5/16	1-3/64	1-7/16	51605
6.4mm	0.2520		8,0mm	79,0mm	34,0mm	28,0	36,0mm	63175
6.5mm	0.2559		8,0mm	79,0mm	34,0mm	28,0	36,0mm	63213
F	0.2570	5/16-18	5/16	3-1/8	1-5/16	1-3/64	1-7/16	51344
6.6mm	0.2598		8,0mm	79,0mm	34,0mm	28,0	36,0	63757
G	0.2610		5/16	3-1/8	1-5/16	1-3/64	1-7/16	51606
6.7mm	0.2638		8,0mm	79,0mm	28,0	28,0	36,0	63758
17/64	0.2656	5/16-20	5/16	3-1/8	1-5/16	1-3/64	1-7/16	51345
H	0.2660		5/16	3-1/8	1-5/16	1-3/64	1-7/16	51607
6.8mm	0.2677	M8 X 1,25	8,0mm	79,0mm	34,0mm	28,0	36,0mm	63176
6.9mm	0.2717		8,0mm	79,0mm	34,0mm	28,0	36,0	63759
I	0.2720	5/16-24	5/16	3-1/8	1-5/16	1-3/64	1-7/16	51346
7mm	0.2756	M8 X 1	8,0mm	79,0mm	34,0mm	28,0	36,0mm	63177
J	0.2770		5/16	3-1/8	1-5/16	1-3/64	1-7/16	51608
7.1mm	0.2795		8,0mm	79,0mm	41,0mm	34,0	36,0	63760
K	0.2810		5/16	3-1/8	1-9/16	1-3/16	1-7/16	51609
9/32	0.2812	5/16-32	5/16	3-1/8	1-9/16	1-3/16	1-7/16	51347
7.2mm	0.2835		8,0mm	79,0mm	41,0mm	34,0	36,0	63761
7.25mm	0.2854	M8 X 0, 75	8,0mm	79,0mm	41,0mm	34,0	36,0mm	63178
7.3mm	0.2874		8,0mm	79,0mm	41,0mm	34,0	36,0	63762
L	0.2900		5/16	3-1/8	1-9/16	1-3/16	1-7/16	51610
7.4mm	0.2913		8,0mm	79,0mm	41,0	34,0	36,0	63763
M	0.2950		5/16	3-1/8	1-9/16	1-3/16	1-7/16	51611
7.5mm	0.2953	M8 X 0,5	8,0mm	79,0mm	41,0mm	34,0	36,0mm	63179
19/64	0.2969		5/16	3-1/8	1-9/16	1-3/16	1-7/16	51348
7.6mm	0.2992		8,0mm	79,0mm	41,0	34,0	30,0mm	63764
N	0.3020		5/16	3-1/8	1-9/16	1-3/16	1-7/16	51612
7.7mm	0.3031		8,0mm	79,0mm	41,0	34,0	36,0	63765
7.8mm	0.3071	M9 X 1,25	8,0mm	79,0mm	41,0mm	34,0	36,0mm	63180
7.9mm	0.3110		8,0mm	79,0mm	41,0	34,0	36,0	63766
5/16	0.3125	3/8-16	5/16	3-1/8	1-9/16	1-3/16	1-7/16	51349
8mm	0.3150	M9 X 1	8,0mm	79,0mm	41,0mm	34,0	36,0mm	63181
O	0.3160		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51613
8.1mm	0.3189		10,0mm	89,0mm	47,0mm	40,0	40,0	63767
8.2mm	0.3228		10,0mm	89,0mm	47,0mm	40,0	40,0	63768
P	0.3230		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51614
8.3mm	0.3268		10,0mm	89,0mm	41,0	40,0	40,0	63769
21/64	0.3281	3/8-20	3/8	3-1/2	1-27/32	1-37/64	1-9/16	51350
8.4mm	0.3307		10,0mm	89,0	47,0mm	40,0	40,0mm	63182
Q	0.3320	3/8-24	3/8	3-1/2	1-27/32	1-37/64	1-9/16	51351
8.5mm	0.3346	M10 X 1,5	10,0mm	89,0	47,0mm	40,0	40,0mm	63183
8.6mm	0.3386		10,0mm	89,0mm	47,0	40,0	40,0	63770

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# Hi-PerCarb Double Margin Drills



## 135 3xD

FRACTIONAL & METRIC SERIES

TECH INFO 149-150

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

CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIAMETER	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.
R	0.3390		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51615
8.7mm	0.3425		10,0mm	89,0mm	47,0	40,0	40,0	63771
11/32	0.3438	3/8-32	3/8	3-1/2	1-27/32	1-37/64	1-9/16	51352
8.8mm	0.3465	M10 X 1,25	10,0mm	89,0	47,0mm	40,0	40,0mm	63184
S	0.3480		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51616
8.9mm	0.3504		10,0mm	89,0mm	47,0	40,0	40,0	63772
9mm	0.3543	M10 X 1	10,0mm	89,0	47,0mm	40,0	40,0mm	63185
T	0.3580		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51617
9.1mm	0.3583		10,0mm	89,0mm	47,0	40,0	40,0	63773
23/64	0.3594		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51353
9.2mm	0.3622	M10 X 0,75	10,0mm	89,0mm	47,0	40,0	40,0	63774
9.25mm	0.3642		10,0mm	89,0	47,0mm	40,0	40,0mm	63186
9.3mm	0.3661		10,0mm	89,0mm	47,0	40,0	40,0	63775
U	0.3680	7/16-14	3/8	3-1/2	1-27/32	1-37/64	1-9/16	51354
9.4mm	0.3701		10,0mm	89,0mm	47,0	40,0	40,0	63776
9.5mm	0.3740	M10 X 0,5	10,0mm	89,0	47,0mm	40,0	40,0mm	63187
3/8	0.3750		3/8	3-1/2	1-27/32	1-37/64	1-9/16	51355
V	0.3770		1/2	3-1/2	1-27/32	1-37/64	1-9/16	51618
9.6mm	0.3780		10,0mm	89,0mm	47,0	40,0	40,0	63777
9.7mm	0.3819		10,0mm	89,0mm	47,0	40,0	40,0	63778
9.8mm	0.3858		10,0mm	89,0mm	47,0	40,0	40,0	63779
W	0.3860		1/2	3-1/2	1-27/32	1-37/64	2-9/16	51619
9.9mm	0.3898		10,0mm	89,0mm	47,0	40,0	40,0	63780
25/64	0.3906	7/16-20	1/2	3-1/2	1-27/32	1-37/64	1-9/16	51356
10mm	0.3937		10,0mm	89,0	47,0mm	40,0	40,0mm	63188
X	0.3970	7/16-24	1/2	4-1/16	2-3/11	1-51/64	1-49/64	51620
10.1mm	0.3976		12,0mm	102,0mm	33,0mm	55,0	45,0	63781
10.2mm	0.4016	M12 X 1,75	12,0mm	102,0	55,0mm	45,0	45,0mm	63189
Y	0.4040	7/16-28	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51621
10.3mm	0.4055		12,0mm	102,0mm	55,0	45,0	45,0	63782
13/32	0.4062		1/2	4-1/16	2-3/16	1-51/64	1-49/64	51357
10.4mm	0.4095		12,0mm	102,0mm	40,0mm	45,0	45,0	63783
Z	0.4130		1/2	4-1/16	2-3/16	1-51/64	1-49/64	51622
10.5mm	0.4134	M12 X 1,5	12,0mm	102,0	55,0mm	45,0	45,0mm	63190
10.6mm	0.4173		12,0mm	102,0mm	55,0	45,0	45,0	63784
10.7mm	0.4213		12,0mm	102,0mm	55,0	45,0	45,0	63785
27/64	0.4219	1/2-13	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51358
10.8mm	0.4252	M12 X 1,25	12,0mm	102,0	55,0mm	45,0	45,0mm	63191
10.9mm	0.4291		12,0mm	102,0mm	55,0	45,0	45,0	63786
11mm	0.4331	M12 X 1	12,0mm	102,0	55,0mm	45,0	45,0mm	63192
11.1mm	0.4370		12,0mm	102,0mm	55,0	45,0	45,0	63787
7/16	0.4375	1/4-18 NPT	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51359
11.2mm	0.4409		12,0mm	102,0mm	55,0	45,0	45,0	63788
11.25mm	0.4429		12,0mm	102,0	55,0mm	45,0	45,0	63193

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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>
- >18-30 DIAMETER**  
D<sub>1</sub> = +0,008/+0,029  
D<sub>2</sub> = h<sub>6</sub>







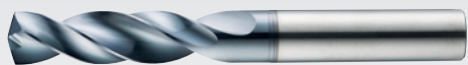
## 135 3xD

FRACTIONAL & METRIC SERIES

CONTINUED

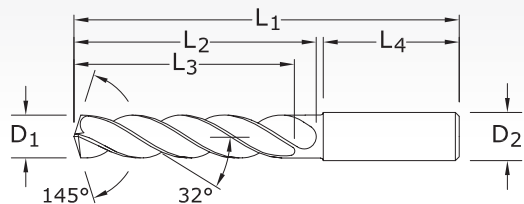
CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	SHANK DIAMETER	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	Ti-NAMITE-A (AlTiN)
D <sub>1</sub>			D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	EDP NO.
11.3mm	0.4449		12,0mm	102,0mm	55,0	45,0	45,0	63789
11.4mm	0.4488		12,0mm	102,0mm	55,0	45,0	45,0	63790
11.5mm	0.4528	M12 X 0,5	12,0mm	102,0	55,0mm	45,0	45,0mm	63194
29/64	0.4531	1/2-20	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51360
11.6mm	0.4567		12,0mm	102,0mm	55,0	45,0	45,0	63791
11.7mm	0.4606		12,0mm	102,0mm	55,0	45,0	45,0	63792
11.8mm	0.4646		12,0mm	102,0mm	55,0	45,0	45,0	63793
11.9mm	0.4685		12,0mm	102,0mm	55,0	45,0	45,0	63794
15/32	0.4688	1/2-28	1/2	4-1/16	2-3/16	1-51/64	1-49/64	51361
12mm	0.4724	M14 X 2	12,0mm	102,0	55,0mm	45,0	45,0mm	63195
31/64	0.4844	9/16-12	1/2	4-1/4	2-5/16	1-7/8	1-49/64	51362
12.5mm	0.4921	M14 X 1,5	14,0mm	107,0	60,0mm	45,0	45,0mm	63196
1/2	0.5000		1/2	4-1/4	2-5/16	1-7/8	1-49/64	51363
12.8mm	0.5039	M14 X 1,25	14,0mm	107,0	60,0mm	45,0	45,0mm	63197
13mm	0.5118	M14 X 1	14,0mm	107,0	60,0mm	45,0	45,0mm	63198
33/64	0.5156	9/16-18	5/8	4-1/4	2-5/16	1-7/8	1-49/64	51364
17/32	0.5312	5/8-11	5/8	4-1/4	2-5/16	1-7/8	1-49/64	51365
13.5mm	0.5315		14,0mm	107,0	60,0mm	45,0	45,0mm	63199
35/64	0.5469	5/8-12	5/8	4-1/4	2-5/16	1-7/8	1-49/64	51783
14mm	0.5512	M16 X 2	14,0mm	107,0mm	60,0mm	49,0	45,0mm	63200
9/16	0.5625		5/8	4-9/16	2-1/2	2	1-57/64	51366
14.5mm	0.5709	M16 X 1,5	16,0mm	115,0mm	65,0mm	51,0	48,0mm	63201
37/64	0.5781	5/8-18	5/8	4-9/16	2-1/2	2	1-57/64	51367
15mm	0.5906	M16 X 1	16,0mm	115,0mm	65,0mm	51,0	48,0mm	63202
19/32	0.5938	11/16-11	5/8	4-9/16	2-1/2	2	1-57/64	51784
39/64	0.6094	11/16-12	5/8	4-9/16	2-1/2	2	1-57/64	51785
15.5mm	0.6102	M18 X 2,5	16,0mm	115,0mm	65,0mm	51,0	48,0mm	63203
5/8	0.6250	11/16-16	5/8	4-9/16	2-1/2	2	1-57/64	51368
16mm	0.6299		16,0mm	115,0mm	65,0mm	51,0	48,0mm	63204
41/64	0.6406	11/16-24	3/4	4-7/8	2-3/4	2-5/16	1-57/64	51786
16.5mm	0.6496	M18 X 1,5	18,0mm	123,0mm	73,0mm	58,0	48,0mm	63205
21/32	0.6562	3/4-10	3/4	4-7/8	2-3/4	2-5/16	1-57/64	51369
17mm	0.6693		18,0mm	123,0mm	73,0mm	58,0	48,0mm	63206
43/64	0.6719	3/4-12	3/4	4-7/8	2-3/4	2-5/16	1-57/64	51787
11/16	0.6875	3/4-16	3/4	4-7/8	2-3/4	2-5/16	1-57/64	51370
17.5mm	0.6890	M20 X 2,5	18,0mm	123,0mm	73,0mm	58,0	48,0mm	63207
45/64	0.7031	3/4-20, 1/2-14	3/4	4-7/8	2-3/4	2-5/16	1-57/64	51788
18mm	0.7087		18,0mm	131,0mm	73,0mm	58,0	48,0mm	63208
23/32	0.7188		3/4	4-7/8	2-3/4	2-5/16	1-57/64	51789
18.5mm	0.7283	M20 X 1,5	20,0mm	131,0mm	79,0mm	63,0	50,0mm	63209
47/64	0.7344	13/16-12	3/4	4-7/8	2-3/4	2-5/16	1-57/64	51790
19mm	0.7480		20,0mm	131,0mm	79,0mm	63,0	50,0mm	63210
3/4	0.7500	13/16-16	3/4	5-1/4	3-1/16	2-7/16	1-31/32	51371
49/64	0.7656	7/8-9	7/8	5-1/4	3-1/16	2-7/16	1-31/32	51372
19.5mm	0.7677	M22 X 2,5	20,0mm	131,0mm	79,0mm	63,0	50,0mm	63211
25/32	0.7812		7/8	6	3-11/16	2-11/16	2-1/8	51791
20mm	0.7874		20,0mm	131,0mm	79,0mm	63,0	50,0mm	63212
51/64	0.7969	7/8-12	7/8	6	3-11/16	2-11/16	2-1/8	51792
13/16	0.8125	7/8-14	7/8	6	3-11/16	2-11/16	2-1/8	51373
7/8	0.8750	15/16-16, 1-8	7/8	6	3-11/16	2-11/16	2-1/8	51374
59/64	0.9219	1-12	1	6	3-11/16	2-11/16	2-1/8	51375

# Hi-PerCarb Double Margin Drills



## 135 5xD

FRACTIONAL SERIES



TECH INFO 151

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

CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	inch					EDP NO. Ti-NAMITE-A (AITiN)
			SHANK DIAMETER	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	
D <sub>1</sub>			D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	
1/8	0.1250		1/4	3	1	53/64	1-15/16	51580
#30	0.1285		1/4	3	1	53/64	1-15/16	51581
#29	0.1360	8-32,8-36	1/4	3	1	53/64	1-15/16	51582
9/64	0.1406		1/4	3	1	53/64	1-15/16	51583
#25	0.1495	10-24	1/4	3-1/4	1-1/4	1-5/64	1-15/16	51584
5/32	0.1562		1/4	3-1/4	1-1/4	1-5/64	1-15/16	51585
#21	0.1590	10-32	1/4	3-1/4	1-1/4	1-5/64	1-15/16	51586
#20	0.1610	13/64-24	1/4	3-1/4	1-1/4	1-5/64	1-15/16	51587
11/64	0.1719		1/4	3-1/4	1-1/4	1-5/64	1-15/16	51588
3/16	0.1875		1/4	3-1/4	1-3/4	1-37/64	1-7/16	51589
#07	0.2010	1/4-20	1/4	3-1/4	1-3/4	1-37/64	1-7/16	51506
13/64	0.2031		1/4	3-1/4	1-3/4	1-37/64	1-7/16	51507
#05	0.2055		1/4	3-1/4	1-3/4	1-37/64	1-7/16	51590
#04	0.2090	1/4-24	1/4	3-1/4	1-3/4	1-37/64	1-7/16	51508
#03	0.2090	1/4-28	1/4	3-1/4	1-3/4	1-37/64	1-7/16	51509
7/32	0.2188	1/4-32	1/4	3-1/4	1-3/4	1-37/64	1-7/16	51510
15/64	0.2344		1/4	3-1/4	1-3/4	1-37/64	1-7/16	51591
1/4	0.2500		1/4	3-5/8	2-5/64	1-51/64	1-7/16	51511
F	0.2570	5/16-18	5/16	3-5/8	2-5/64	1-51/64	1-7/16	51512
17/64	0.2656	5/16-20	5/16	3-5/8	2-5/64	1-51/64	1-7/16	51513
I	0.2720	5/16-24	5/16	3-5/8	2-5/64	1-51/64	1-7/16	51514
9/32	0.2812	5/16-32	5/16	3-5/8	2-5/64	1-51/64	1-7/16	51515
19/64	0.2969		5/16	3-5/8	2-5/64	1-51/64	1-7/16	51516
5/16	0.3125	3/8-16	5/16	3-5/8	2-5/64	1-51/64	1-7/16	51517
P	0.3230		3/8	4	2-13/32	2-1/8	1-9/16	51518
21/64	0.3281	3/8-20	3/8	4	2-13/32	2-1/8	1-9/16	51519
Q	0.3320	3/8-24	3/8	4	2-13/32	2-1/8	1-9/16	51520
11/32	0.3438	3/8-32	3/8	4	2-13/32	2-1/8	1-9/16	51521
S	0.3480		3/8	4	2-13/32	2-1/8	1-9/16	51522
23/64	0.3594		3/8	4	2-13/32	2-1/8	1-9/16	51523

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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>





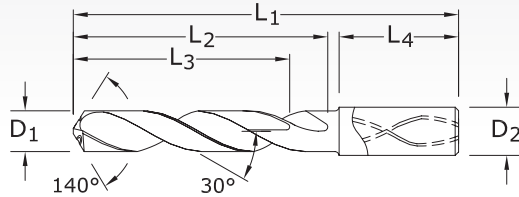
## 135 5xD

FRACTIONAL SERIES

CONTINUED

CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	inch					EDP NO. Ti-NAMITE-A (AlTiN)
			SHANK DIAMETER	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	
D <sub>1</sub>			D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	
U	0.3680	7/16-14	3/8	4	2-13/32	2-1/8	1-9/16	51524
3/8	0.3750		3/8	4	2-13/32	2-1/8	1-9/16	51525
W	0.3860		1/2	4	2-13/32	2-1/8	1-9/16	51526
25/64	0.3906	7/16-20	1/2	4	2-13/32	2-1/8	1-9/16	51527
13/32	0.4062		1/2	4-11/16	2-3/4	2-23/64	1-49/64	51528
27/64	0.4219	1/2-13	1/2	4-11/16	2-3/4	2-23/64	1-49/64	51529
7/16	0.4375	1/4-18 NPT	1/2	4-11/16	2-3/4	2-23/64	1-49/64	51530
29/64	0.4531	1/2-20	1/2	4-11/16	2-3/4	2-23/64	1-49/64	51531
15/32	0.4688	1/2-28	1/2	4-11/16	2-3/4	2-23/64	1-49/64	51532
31/64	0.4844	9/16-12	1/2	4-7/8	3-1/32	2-19/32	1-49/64	51533
1/2	0.5000		1/2	4-7/8	3-1/32	2-19/32	1-49/64	51534
33/64	0.5156	9/16-18	5/8	4-7/8	3-1/32	2-19/32	1-49/64	51535
17/32	0.5312	5/8-11	5/8	4-7/8	3-1/32	2-19/32	1-49/64	51536
35/64	0.5469	5/8-12	5/8	4-7/8	3-1/32	2-19/32	1-49/64	51537
9/16	0.5625		5/8	5-1/4	3-1/4	2-3/4	1-57/64	51538
37/64	0.5781	5/8-18	5/8	5-1/4	3-1/4	2-3/4	1-57/64	51539
19/32	0.5938	11/16-11	5/8	5-1/4	3-1/4	2-3/4	1-57/64	51592
39/64	0.6094	11/16-12	5/8	5-1/4	3-1/4	2-3/4	1-57/64	51593
5/8	0.6250	11/16-16	5/8	5-1/4	3-1/4	2-3/4	1-57/64	51540
41/64	0.6406	11/16-24	3/4	5-5/8	3-5/8	3-3/16	1-57/64	51594
21/32	0.6562	3/4-10	3/4	5-5/8	3-5/8	3-3/16	1-57/64	51541
43/64	0.6719	3/4-12	3/4	5-5/8	3-5/8	3-3/16	1-57/64	51595
11/16	0.6875	3/4-16	3/4	5-5/8	3-5/8	3-3/16	1-57/64	51542
45/64	0.7031	3/4-20, 1/2-14 NPT	3/4	5-5/8	3-5/8	3-3/16	1-57/64	51543
23/32	0.7188		3/4	6	4	3-3/8	1-31/32	51596
47/64	0.7344	13/16-12	3/4	6	4	3-3/8	1-31/32	51544
3/4	0.7500	13/16-16	3/4	6	4	3-3/8	1-31/32	51545

# ICe-Carb Internal Coolant Drills



## 140 5xD

FRACTIONAL & METRIC SERIES

TECH INFO 152-153

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

CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO.
			SHANK DIAMETER	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	
D <sub>1</sub>			D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	Ti-NAMITE-A (AITIN)
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		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	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		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		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	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		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	12-28,0	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		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		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

### 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>

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# ICe-Carb Internal Coolant Drills



## 140 5xD

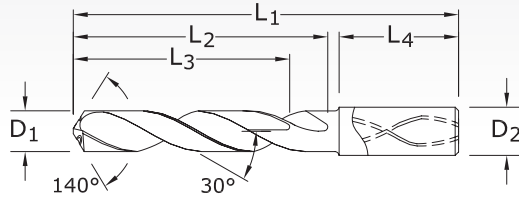
FRACTIONAL & METRIC SERIES

CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO. Ti-NAMITE-A (AITiN)
			SHANK DIAMETER	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	
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	63998
5,5 mm	0.2165	M6 X 0,5	6,0	82,0	44,0	35,0	36,0	63923
7/32	0.2188	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		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	63928,0
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		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	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	0.2657	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	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		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	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

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# ICe-Carb Internal Coolant Drills



## 140 5xD

FRACTIONAL & METRIC SERIES

TECH INFO 152-153

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

CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO.
			SHANK DIAMETER	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	
D <sub>1</sub>			D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	Ti-NAMITE-A (AlTiN)
21/64	0.3281	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	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
11/32	0.3438	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		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	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		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	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		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

### 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>

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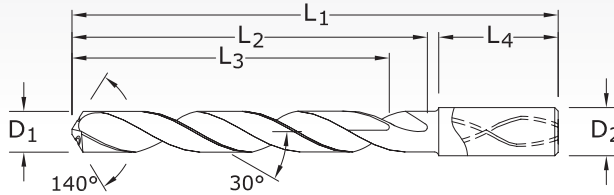
## 140 5xD

FRACTIONAL & METRIC SERIES

CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO. Ti-NAMITE-A (AITiN)
			SHANK DIAMETER	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	
D <sub>1</sub>			D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	
27/64	0.4219	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	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
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	1/2-28,0	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	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		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	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		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	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	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	3/4-10	18,0	143,0	93,0	71,0	48,0	51940
11/16	0.6875	3/4-16	18,0	143,0	93,0	71,0	48,0	51941
3/4	0.7500	13/16-16	20,0	153,0	101,0	77,0	50,0	51942

CONTINUED

# ICe-Carb Internal Coolant Drills



## 140 8xD

FRACTIONAL & METRIC SERIES

TECH INFO 154-155

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

CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	mm				EDP NO.	
			SHANK DIAMETER	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH		SHANK LENGTH
D <sub>1</sub>			D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	Ti-NAMITE-A (AITiN)
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		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	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		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		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	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		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		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		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

### 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>

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## 140 8xD

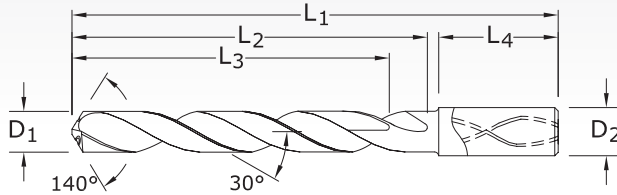
FRACTIONAL & METRIC SERIES

CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO. Ti-NAMITE-A (AlTiN)
			SHANK DIAMETER	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	
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	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
7/32	0.2188	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		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		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	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	0.2657	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	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		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	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

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# ICe-Carb Internal Coolant Drills



## 140 8xD

FRACTIONAL & METRIC SERIES

TECH INFO 154-155

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

CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO.
			SHANK DIAMETER	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	
D <sub>1</sub>			D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	Ti-NAMITE-A (AITiN)
21/64	0.3281	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	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
11/32	0.3438	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		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	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		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	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		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

### 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>

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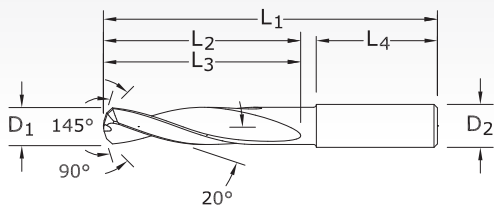
## 140 8xD

FRACTIONAL & METRIC SERIES

CUTTING DIAMETER	DECIMAL EQUIV.	TAP SIZE REFERENCE ONLY	mm					EDP NO. Ti-NAMITE-A (AlTiN)
			SHANK DIAMETER	OVERALL LENGTH	FLUTE LENGTH	CLEARED LENGTH	SHANK LENGTH	
D <sub>1</sub>			D <sub>2</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	
27/64	0.4219	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	1/4-18NPT	12,0	162,0	114,0	96,0	45,0	51826
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	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	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		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	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		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	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 1,5	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	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	3/4-10	18,0	222,0	171,0	144,0	48,0	51834
11/16	0.6875	3/4-16	18,0	222,0	171,0	144,0	48,0	51835
3/4	0.7500	13/16-16	20,0	243,0	190,0	160,0	50,0	51836

CONTINUED

# CFRP 8 Facet Drills



## 120

FRACTIONAL & METRIC SERIES

TECH INFO 156

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

CUTTING DIAMETER D <sub>1</sub>	DECIMAL 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.
#40	0.0980	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	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	0.1290	1/4	2-1/2	3/4	1-7/16	50005
#28	0.1410	1/4	2-1/2	3/4	1-7/16	50006
#22	0.1570	1/4	2-5/8	7/8	1-7/16	50007
#21	0.1590	1/4	2-5/8	7/8	1-7/16	50008
4,1 mm	0.1610	6,0	66,0	24,0	36,0	50009
#19	0.1660	1/4	2-5/8	7/8	1-7/16	50010
11/64	0.1720	1/4	2-5/8	7/8	1-7/16	50011
3/16	0.1880	1/4	2-5/8	1	1-7/16	50012
#11	0.1910	1/4	2-5/8	1	1-7/16	50013
#8	0.1990	1/4	2-5/8	1	1-7/16	50014
#7	0.2010	1/4	2-5/8	1	1-7/16	50015
#2	0.2210	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	1/4	3-1/8	1-5/16	1-7/16	50018
.2510	0.2510	5/16	3-1/8	1-5/16	1-7/16	50019
F	0.2570	5/16	3-1/8	1-5/16	1-7/16	50020
I	0.2720	5/16	3-1/8	1-5/16	1-7/16	50021
J	0.2770	5/16	3-1/8	1-5/16	1-7/16	50022
K	0.2810	5/16	3-1/8	1-9/16	1-7/16	50023
5/16	0.3130	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	3/8	3-1/2	1-27/32	1-9/16	50026
V	0.3770	1/2	3-1/2	1-27/32	1-9/16	50027
10,0 mm	0.3940	10,0	89,0	47,0	40,0	50028
7/16	0.4380	1/2	4-1/4	2-3/16	1-9/16	50029
12,0 mm	0.4720	12,0	102,0	55,0	45,0	50030
1/2	0.5000	1/2	4-1/4	2-5/16	1-3/4	50031

### TOLERANCES (inch)

D<sub>1</sub> = +.0000/-0.0005

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











### TOLERANCES (mm)

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

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



# Speed & Feed Recommendations

Series 135 3xD Fractional	HARDNESS		SPEED		FEED (inch/rev)						
	BRINELL	sfm	1/64	1/32	1/16	1/8	1/4	3/8	1/2	5/8	7/8
 CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	400	0.00050	0.0010	0.0020	0.0040	0.0080	0.0120	0.0160	0.0200	0.0280
	> 200 ≤ 300	350	0.00045	0.0009	0.0018	0.0035	0.0070	0.0105	0.0140	0.0175	0.0245
	> 300 ≤ 420	160	0.00035	0.0008	0.0015	0.0030	0.0060	0.0090	0.0120	0.0150	0.0210
 ALLOY STEEL 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	300	0.00035	0.0008	0.0015	0.0030	0.0060	0.0090	0.0120	0.0150	0.0210
	> 270 ≤ 370	220	0.00030	0.0006	0.0013	0.0025	0.0050	0.0075	0.0100	0.0125	0.0175
	> 370 ≤ 450	120	0.00020	0.0005	0.0009	0.0018	0.0035	0.0055	0.0070	0.0090	0.0125
 TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	220	0.00030	0.0006	0.0013	0.0025	0.0050	0.0075	0.0100	0.0125	0.0175
	> 250 ≤ 330	150	0.00020	0.0005	0.0009	0.0018	0.0035	0.0055	0.0070	0.0090	0.0125
	> 330 ≤ 450	70	0.00010	0.0003	0.0005	0.0010	0.0020	0.0030	0.0040	0.0050	0.0070
 CAST IRON Gray, Malleable, Ductile	≤ 200	400	0.00060	0.0013	0.0025	0.0050	0.0100	0.0150	0.0200	0.0250	0.0350
	> 200 ≤ 330	250	0.00055	0.0011	0.0023	0.0045	0.0090	0.0135	0.0180	0.0225	0.0315
 STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 250	200	0.00030	0.0006	0.0013	0.0025	0.0050	0.0075	0.0100	0.0125	0.0175
	> 250 ≤ 330	150	0.00025	0.0005	0.0010	0.0020	0.0040	0.0060	0.0080	0.0100	0.0140
 STAINLESS (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	90	0.00020	0.0005	0.0009	0.0018	0.0035	0.0055	0.0070	0.0090	0.0125
	> 270 ≤ 370	70	0.00020	0.0004	0.0008	0.0015	0.0030	0.0045	0.0060	0.0075	0.0105
 TITANIUM TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	120	0.00020	0.0005	0.0009	0.0018	0.0035	0.0055	0.0070	0.0090	0.0125
	> 280 ≤ 350	100	0.00020	0.0004	0.0008	0.0015	0.0030	0.0045	0.0060	0.0075	0.0105
	> 350 ≤ 440	70	0.00015	0.0003	0.0007	0.0013	0.0025	0.0040	0.0050	0.0065	0.0090
 HIGH TEMPERATURE ALLOY A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	60	0.00010	0.0003	0.0005	0.0010	0.0020	0.0030	0.0040	0.0050	0.0070
	> 220 ≤ 330	40	0.00010	0.0002	0.0004	0.0008	0.0015	0.0025	0.0030	0.0040	0.0055
	> 330 ≤ 420	30	0.00005	0.0001	0.0003	0.0005	0.0010	0.0015	0.0020	0.0025	0.0035
 ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	700	0.00070	0.0014	0.0028	0.0055	0.0110	0.0165	0.0220	0.0275	0.0385
	> 80	600	0.00060	0.0013	0.0025	0.0050	0.0100	0.0150	0.0200	0.0250	0.0350
 COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	500	0.00025	0.0005	0.0010	0.0020	0.0040	0.0060	0.0080	0.0100	0.0140
	> 140	400	0.00025	0.0005	0.0010	0.0020	0.0040	0.0060	0.0080	0.0100	0.0140
Reduce speed & feed for materials harder than listed			rpm = sfm × 3.82 / D <sub>1</sub>			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )					
			ipm = (inch/rev) × rpm								











# Speed & Feed Recommendations



Series 135 3xD Metric	HARDNESS		SPEED		FEED (mm/rev)				
	BRINELL	m/min	3	6	8	10	12	16	20
CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	122	0.095	0.195	0.255	0.320	0.385	0.515	0.640
	> 200 ≤ 300	107	0.085	0.170	0.225	0.280	0.340	0.450	0.560
	> 300 ≤ 420	49	0.070	0.145	0.190	0.240	0.290	0.385	0.480
ALLOY STEEL 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	91	0.070	0.145	0.190	0.240	0.290	0.385	0.480
	> 270 ≤ 370	67	0.060	0.120	0.160	0.200	0.240	0.320	0.400
	> 370 ≤ 450	37	0.040	0.085	0.115	0.145	0.170	0.230	0.285
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	67	0.060	0.120	0.160	0.200	0.240	0.320	0.400
	> 250 ≤ 330	46	0.040	0.085	0.115	0.145	0.170	0.230	0.285
	> 330 ≤ 450	21	0.025	0.050	0.065	0.080	0.095	0.130	0.160
CAST IRON Gray, Malleable, Ductile	≤ 200	122	0.120	0.240	0.320	0.400	0.485	0.640	0.800
	> 200 ≤ 330	76	0.110	0.215	0.290	0.360	0.435	0.575	0.720
STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 250	61	0.060	0.120	0.160	0.200	0.240	0.320	0.400
	> 250 ≤ 330	46	0.050	0.095	0.130	0.160	0.195	0.255	0.320
STAINLESS (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	27	0.040	0.085	0.115	0.145	0.170	0.230	0.285
	> 270 ≤ 370	21	0.035	0.070	0.095	0.120	0.145	0.190	0.240
TITANIUM TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	37	0.040	0.085	0.115	0.145	0.170	0.230	0.285
	> 280 ≤ 350	30	0.035	0.070	0.095	0.120	0.145	0.190	0.240
	> 350 ≤ 440	21	0.030	0.060	0.085	0.105	0.120	0.165	0.205
HIGH TEMPERATURE ALLOY A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	18	0.025	0.050	0.065	0.080	0.095	0.130	0.160
	> 220 ≤ 330	12	0.020	0.035	0.050	0.065	0.070	0.105	0.125
	> 330 ≤ 420	9	0.010	0.025	0.030	0.040	0.050	0.065	0.080
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	213	0.135	0.265	0.355	0.440	0.530	0.705	0.880
	> 80	183	0.120	0.240	0.320	0.400	0.485	0.640	0.800
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	152	0.050	0.095	0.130	0.160	0.195	0.255	0.320
	> 140	122	0.050	0.095	0.130	0.160	0.195	0.255	0.320
Reduce speed & feed for materials harder than listed		rpm = (1000 × m/min) / (3.14 × D <sub>1</sub> )			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
		mm/min = (mm/rev) × rpm							



# Speed & Feed Recommendations

Series 135 5xD Fractional	HARDNESS		FEED (inch/rev)						
	BRINELL	SPEED sfm	1/8	3/16	1/4	3/8	1/2	5/8	3/4
 CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	360	0.00400	0.0060	0.0080	0.0120	0.0160	0.0200	0.0280
	> 200 ≤ 300	310	0.00350	0.0053	0.0070	0.0105	0.0140	0.0175	0.0245
	> 300 ≤ 420	150	0.00300	0.0045	0.0060	0.0090	0.0120	0.0150	0.0210
 ALLOY STEEL 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	270	0.00300	0.0045	0.0060	0.0090	0.0120	0.0150	0.0210
	> 270 ≤ 370	200	0.00250	0.0038	0.0050	0.0075	0.0100	0.0125	0.0175
	> 370 ≤ 450	110	0.00175	0.0026	0.0035	0.0055	0.0070	0.0090	0.0125
 TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	200	0.00250	0.0038	0.0050	0.0075	0.0100	0.0125	0.0175
	> 250 ≤ 330	130	0.00175	0.0027	0.0035	0.0055	0.0070	0.0090	0.0125
	> 330 ≤ 450	60	0.00100	0.0015	0.0020	0.0030	0.0040	0.0050	0.0070
 CAST IRON Gray, Malleable, Ductile	≤ 200	360	0.00500	0.0075	0.0100	0.0150	0.0200	0.0250	0.0350
	> 200 ≤ 330	230	0.00450	0.0068	0.0090	0.0135	0.0180	0.0225	0.0315
 STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 250	180	0.00250	0.0038	0.0050	0.0075	0.0100	0.0125	0.0175
	> 250 ≤ 330	130	0.00200	0.0030	0.0040	0.0060	0.0080	0.0100	0.0140
 STAINLESS (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	80	0.00175	0.0026	0.0035	0.0055	0.0070	0.0090	0.0125
	> 270 ≤ 370	60	0.00150	0.0023	0.0030	0.0045	0.0060	0.0075	0.0105
 TITANIUM TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	100	0.00175	0.0027	0.0035	0.0055	0.0070	0.0090	0.0125
	> 280 ≤ 350	80	0.00150	0.0023	0.0030	0.0045	0.0060	0.0075	0.0105
	> 350 ≤ 440	60	0.00125	0.0019	0.0025	0.0040	0.0050	0.0065	0.0090
 HIGH TEMPERATURE ALLOY A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	50	0.00100	0.0015	0.0020	0.0030	0.0040	0.0050	0.0070
	> 220 ≤ 330	30	0.00075	0.0012	0.0015	0.0025	0.0030	0.0040	0.0055
	> 330 ≤ 420	20	0.00050	0.0008	0.0010	0.0015	0.0020	0.0025	0.0035
 ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	630	0.00550	0.0083	0.0110	0.0165	0.0220	0.0275	0.0385
	> 80	540	0.00500	0.0075	0.0100	0.0150	0.0200	0.0250	0.0350
 COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	450	0.00200	0.0030	0.0040	0.0060	0.0080	0.0100	0.0140
	> 140	360	0.00200	0.0030	0.0040	0.0060	0.0080	0.0100	0.0140
Reduce speed & feed for materials harder than listed		rpm = sfm × 3.82 / D <sub>1</sub>			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
		ipm = (inch/rev) × rpm							

# Speed & Feed Recommendations



Series 140 5xD Fractional	HARDNESS		FEED (inch/rev)						
	BRINELL	SPEED sfm	1/8	3/16	1/4	3/8	1/2	5/8	3/4
CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	440	0.0040	0.0060	0.0080	0.0120	0.0160	0.0200	0.0240
	> 200 ≤ 300	380	0.0035	0.0053	0.0070	0.0105	0.0140	0.0175	0.0210
	> 300 ≤ 420	180	0.0030	0.0045	0.0060	0.0090	0.0120	0.0150	0.0180
ALLOY STEEL 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	330	0.0030	0.0045	0.0060	0.0090	0.0120	0.0150	0.0180
	> 270 ≤ 370	240	0.0025	0.0038	0.0050	0.0075	0.0100	0.0125	0.0150
	> 370 ≤ 450	140	0.0018	0.0027	0.0035	0.0055	0.0070	0.0090	0.0110
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	240	0.0025	0.0038	0.0050	0.0075	0.0100	0.0125	0.0150
	> 250 ≤ 330	180	0.0018	0.0026	0.0035	0.0055	0.0070	0.0090	0.0110
	> 330 ≤ 450	90	0.0010	0.0015	0.0020	0.0030	0.0040	0.0050	0.0060
CAST IRON Gray, Malleable, Ductile	≤ 200	440	0.0050	0.0075	0.0100	0.0150	0.0200	0.0250	0.0300
	> 200 ≤ 330	280	0.0045	0.0068	0.0090	0.0135	0.0180	0.0225	0.0270
STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 250	220	0.0025	0.0038	0.0050	0.0075	0.0100	0.0125	0.0150
	> 250 ≤ 330	170	0.0020	0.0030	0.0040	0.0060	0.0080	0.0100	0.0120
STAINLESS (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	150	0.0018	0.0027	0.0035	0.0055	0.0070	0.0090	0.0110
	> 270 ≤ 370	120	0.0015	0.0023	0.0030	0.0045	0.0060	0.0075	0.0090
TITANIUM TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	200	0.0018	0.0027	0.0035	0.0055	0.0070	0.0090	0.0110
	> 280 ≤ 350	160	0.0015	0.0023	0.0030	0.0045	0.0060	0.0075	0.0090
	> 350 ≤ 440	120	0.0013	0.0019	0.0025	0.0040	0.0050	0.0065	0.0080
HIGH TEMPERATURE ALLOY A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	100	0.0010	0.0015	0.0020	0.0030	0.0040	0.0050	0.0060
	> 220 ≤ 330	70	0.0008	0.0012	0.0015	0.0025	0.0030	0.0040	0.0050
	> 330 ≤ 420	50	0.0005	0.0008	0.0010	0.0015	0.0020	0.0025	0.0030
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	770	0.0055	0.0083	0.0110	0.0165	0.0220	0.0275	0.0330
	> 80	660	0.0050	0.0075	0.0100	0.0150	0.0200	0.0250	0.0300
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	550	0.0020	0.0030	0.0040	0.0060	0.0080	0.0100	0.0120
	> 140	440	0.0020	0.0030	0.0040	0.0060	0.0080	0.0100	0.0120

Reduce speed & feed for materials  
harder than listed











$$\text{rpm} = \text{sfm} \times 3.82 / D_1$$

$$\text{ipm} = (\text{inch/rev}) \times \text{rpm}$$

Refer to the SGS Tool Wizard for more complete technical  
information (available at [www.sgstool.com](http://www.sgstool.com))



# Speed & Feed Recommendations

Series 140 5xD Metric	HARDNESS		SPEED		FEED (mm/rev)					
	BRINELL	m/min	3	6	8	10	12	14	16	
 CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	134	0.145	0.195	0.255	0.320	0.385	0.450	0.515	
	> 200 ≤ 300	116	0.125	0.170	0.225	0.280	0.340	0.395	0.450	
	> 300 ≤ 420	55	0.110	0.145	0.190	0.240	0.290	0.335	0.385	
 ALLOY STEEL 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	101	0.110	0.145	0.190	0.240	0.290	0.335	0.385	
	> 270 ≤ 370	73	0.090	0.120	0.160	0.200	0.240	0.280	0.320	
	> 370 ≤ 450	43	0.065	0.085	0.115	0.145	0.170	0.200	0.230	
 TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	73	0.090	0.120	0.160	0.200	0.240	0.280	0.320	
	> 250 ≤ 330	55	0.065	0.085	0.115	0.145	0.170	0.200	0.230	
	> 330 ≤ 450	27	0.035	0.050	0.065	0.080	0.095	0.110	0.130	
 CAST IRON Gray, Malleable, Ductile	≤ 200	134	0.180	0.240	0.320	0.400	0.485	0.560	0.640	
	> 200 ≤ 330	85	0.165	0.215	0.290	0.360	0.435	0.505	0.575	
 STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 250	67	0.090	0.120	0.160	0.200	0.240	0.280	0.320	
	> 250 ≤ 330	52	0.070	0.095	0.130	0.160	0.195	0.225	0.255	
 STAINLESS (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	46	0.065	0.085	0.115	0.145	0.170	0.200	0.230	
	> 270 ≤ 370	37	0.055	0.070	0.095	0.120	0.145	0.170	0.190	
 TITANIUM TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	61	0.065	0.085	0.115	0.145	0.170	0.200	0.230	
	> 280 ≤ 350	49	0.055	0.070	0.095	0.120	0.145	0.170	0.190	
	> 350 ≤ 440	37	0.045	0.060	0.085	0.105	0.120	0.145	0.165	
 HIGH TEMPERATURE ALLOY A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	30	0.035	0.050	0.065	0.080	0.095	0.110	0.130	
	> 220 ≤ 330	21	0.030	0.035	0.050	0.065	0.070	0.090	0.105	
	> 330 ≤ 420	15	0.020	0.025	0.030	0.040	0.050	0.055	0.065	
 ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	235	0.200	0.265	0.355	0.440	0.530	0.620	0.705	
	> 80	201	0.180	0.240	0.320	0.400	0.485	0.560	0.640	
 COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	168	0.070	0.095	0.130	0.160	0.195	0.225	0.255	
	> 140	134	0.070	0.095	0.130	0.160	0.195	0.225	0.255	
Reduce speed & feed for materials harder than listed	rpm = (1000 × m/min) / (3.14 × D <sub>1</sub> )		Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )							
	mm/min = (mm/rev) × rpm									

# Speed & Feed Recommendations



Series 140 8xD Fractional	HARDNESS		SPEED		FEED (inch/rev)				
	BRINELL	sfm	1/8	3/16	1/4	3/8	1/2	5/8	3/4
CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	420	0.0035	0.0053	0.0070	0.0105	0.0140	0.0175	0.0210
	> 200 ≤ 300	370	0.0030	0.0045	0.0060	0.0090	0.0120	0.0150	0.0180
	> 300 ≤ 420	170	0.0025	0.0038	0.0050	0.0075	0.0100	0.0125	0.0150
ALLOY STEEL 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	320	0.0025	0.0038	0.0050	0.0075	0.0100	0.0125	0.0150
	> 270 ≤ 370	230	0.0020	0.0030	0.0040	0.0060	0.0080	0.0100	0.0120
	> 370 ≤ 450	130	0.0015	0.0023	0.0030	0.0045	0.0060	0.0075	0.0090
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	230	0.0020	0.0030	0.0040	0.0060	0.0080	0.0100	0.0120
	> 250 ≤ 330	160	0.0015	0.0023	0.0030	0.0045	0.0060	0.0075	0.0090
	> 330 ≤ 450	80	0.0008	0.0013	0.0015	0.0025	0.0030	0.0040	0.0045
CAST IRON Gray, Malleable, Ductile	≤ 200	420	0.0045	0.0068	0.0090	0.0135	0.0180	0.0225	0.0270
	> 200 ≤ 330	270	0.0040	0.0060	0.0080	0.0120	0.0160	0.0200	0.0240
STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 250	210	0.0020	0.0030	0.0040	0.0060	0.0080	0.0100	0.0120
	> 250 ≤ 330	160	0.0018	0.0028	0.0035	0.0055	0.0070	0.0090	0.0105
STAINLESS (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	130	0.0018	0.0028	0.0035	0.0055	0.0070	0.0090	0.0105
	> 270 ≤ 370	100	0.0015	0.0023	0.0030	0.0045	0.0060	0.0075	0.0090
TITANIUM TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	180	0.0015	0.0023	0.0030	0.0045	0.0060	0.0075	0.0090
	> 280 ≤ 350	140	0.0013	0.0020	0.0025	0.0040	0.0050	0.0065	0.0075
	> 350 ≤ 440	110	0.0010	0.0015	0.0020	0.0030	0.0040	0.0050	0.0060
HIGH TEMPERATURE ALLOY A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	80	0.0008	0.0013	0.0015	0.0025	0.0030	0.0040	0.0045
	> 220 ≤ 330	50	0.0005	0.0008	0.0010	0.0015	0.0020	0.0025	0.0030
	> 330 ≤ 420	35	0.0005	0.0008	0.0010	0.0015	0.0020	0.0025	0.0030
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	730	0.0050	0.0075	0.0100	0.0150	0.0200	0.0250	0.0300
	> 80	630	0.0045	0.0068	0.0090	0.0135	0.0180	0.0225	0.0270
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	520	0.0018	0.0028	0.0035	0.0055	0.0070	0.0090	0.0105
	> 140	420	0.0018	0.0028	0.0035	0.0055	0.0070	0.0090	0.0105
Reduce speed & feed for materials harder than listed		$rpm = sfm \times 3.82 / D_1$			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
		$ipm = (inch/rev) \times rpm$							



# Speed & Feed Recommendations

Series 140 8xD Metric	HARDNESS		SPEED		FEED (mm/rev)				
	BRINELL	m/min	3	6	8	10	12	14	16
■ CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	128	0.125	0.170	0.225	0.280	0.340	0.395	0.450
	> 200 ≤ 300	113	0.110	0.145	0.190	0.240	0.290	0.335	0.385
	> 300 ≤ 420	52	0.090	0.120	0.160	0.200	0.240	0.280	0.320
■ ALLOY STEEL 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	98	0.090	0.120	0.160	0.200	0.240	0.280	0.320
	> 270 ≤ 370	70	0.070	0.095	0.130	0.160	0.195	0.225	0.255
	> 370 ≤ 450	40	0.055	0.070	0.095	0.120	0.145	0.170	0.190
■ TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	70	0.070	0.095	0.130	0.160	0.195	0.225	0.255
	> 250 ≤ 330	49	0.055	0.070	0.095	0.120	0.145	0.170	0.190
	> 330 ≤ 450	24	0.030	0.035	0.050	0.065	0.070	0.090	0.105
■ CAST IRON Gray, Malleable, Ductile	≤ 200	128	0.165	0.215	0.290	0.360	0.435	0.505	0.575
	> 200 ≤ 330	82	0.145	0.195	0.255	0.320	0.385	0.450	0.515
■ STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 250	64	0.070	0.095	0.130	0.160	0.195	0.225	0.255
	> 250 ≤ 330	49	0.065	0.085	0.115	0.145	0.170	0.200	0.230
■ STAINLESS (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	40	0.065	0.085	0.115	0.145	0.170	0.200	0.230
	> 270 ≤ 370	30	0.055	0.070	0.095	0.120	0.145	0.170	0.190
■ TITANIUM TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	55	0.055	0.070	0.095	0.120	0.145	0.170	0.190
	> 280 ≤ 350	43	0.050	0.060	0.085	0.105	0.120	0.145	0.165
	> 350 ≤ 440	34	0.035	0.050	0.065	0.080	0.095	0.110	0.130
■ HIGH TEMPERATURE ALLOY A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	24	0.030	0.035	0.050	0.065	0.070	0.090	0.105
	> 220 ≤ 330	15	0.020	0.025	0.030	0.040	0.050	0.055	0.065
	> 330 ≤ 420	11	0.020	0.025	0.030	0.040	0.050	0.055	0.065
■ ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	223	0.180	0.240	0.320	0.400	0.485	0.560	0.640
	> 80	192	0.165	0.215	0.290	0.360	0.435	0.505	0.575
■ COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	158	0.065	0.085	0.115	0.145	0.170	0.200	0.230
	> 140	128	0.065	0.085	0.115	0.145	0.170	0.200	0.230
Reduce speed & feed for materials harder than listed		$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
		$\text{mm/min} = (\text{mm/rev}) \times \text{rpm}$							

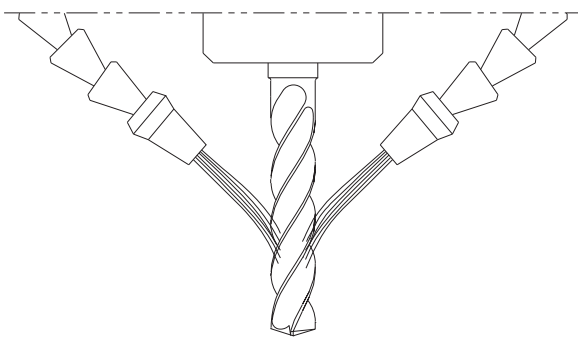
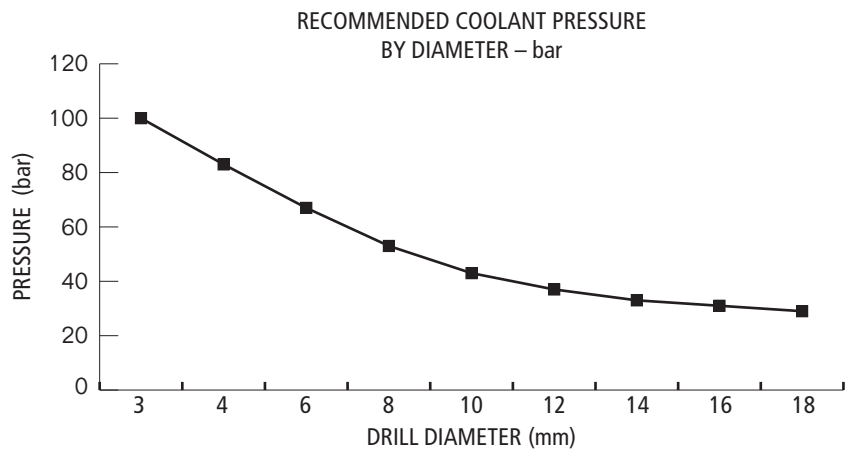
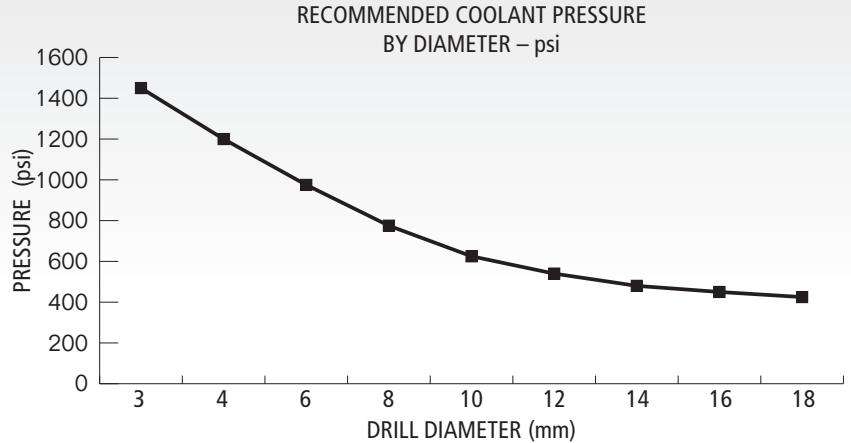
# Speed & Feed Recommendations

Series 120 Fractional	SPEED (sfm)			FEED (inch/rev)				
	CVD	1/8	3/16	1/4	5/16	3/8	7/16	1/2
CFRP, AFRP Carbon Fiber, Aramid Fiber	320	0.0006	0.0008	0.0012	0.0015	0.0018	0.0021	0.0024
GFRP Fiberglass	240	0.0006	0.0008	0.0012	0.0015	0.0018	0.0021	0.0024
CARBON, GRAPHITE	400	0.0008	0.0012	0.0016	0.0020	0.0024	0.0028	0.0032
Adjust speed and/or feed based upon resin type and/or fiber structure	$\text{rpm} = \text{sfm} \times 3.82 / D_1$			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
	$\text{ipm} = (\text{inch/rev}) \times \text{rpm}$							

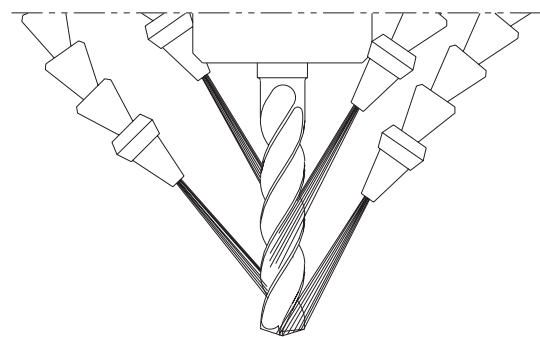
Series 120 Metric	SPEED (m/min)			FEED (mm/rev)				
	CVD	2.5	3	4.1	6	8	10	12
CFRP, AFRP Carbon Fiber, Aramid Fiber	100	0.015	.018	0.020	0.030	0.038	0.046	0.053
GFRP Fiberglass	75	0.015	.018	0.020	0.030	0.038	0.046	0.053
CARBON, GRAPHITE	120	0.020	.024	0.030	0.041	0.051	0.061	0.071
Adjust speed and/or feed based upon resin type and/or fiber structure	$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
	$\text{mm/min} = (\text{mm/rev}) \times \text{rpm}$							

# 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.



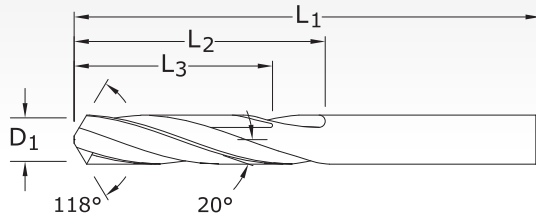
LARGE TIP – LOW VELOCITY  
NO COVERAGE AT MAXIMUM DEPTH



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.

# Slow Spiral Drills



**101**

FRACTIONAL & METRIC SERIES

TECH INFO 178-179

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

CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.	
					UNCOATED	Ti-NAMITE-A (AlTiN)
#80	0.0135	3/4	3/16	5/32	51080	57076
#79	0.0145	3/4	3/16	5/32	51079	57077
1/64	0.0156	3/4	3/16	5/32	51101	57078
#78	0.0160	3/4	3/16	5/32	51078	57079
#77	0.0180	3/4	3/16	5/32	51077	57080
#76	0.0200	7/8	1/4	13/64	51076	57081
#75	0.0210	7/8	1/4	13/64	51075	57082
#74	0.0225	7/8	1/4	13/64	51074	57083
#73	0.0240	7/8	1/4	13/64	51073	57084
#72	0.0250	1	5/16	1/4	51072	57085
#71	0.0260	1	5/16	1/4	51071	57086
0,7 mm	0.0276	28,0	9,0	7,0	61001	68268
#70	0.0280	1-1/4	1/2	13/32	51070	57087
#69	0.0292	1-1/4	1/2	13/32	51069	57088
#68	0.0310	1-1/4	1/2	13/32	51068	57089
1/32	0.0312	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	1-1/4	1/2	13/32	51067	57091
#66	0.0330	1-1/4	1/2	13/32	51066	57092
#65	0.0350	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	1-3/8	5/8	1/2	51064	57094
#63	0.0370	1-3/8	5/8	1/2	51063	57095
#62	0.0380	1-3/8	5/8	1/2	51062	57096
#61	0.0390	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	1-1/2	3/4	39/64	51060	57098
#59	0.0410	1-1/2	3/4	39/64	51059	57099
#58	0.0420	1-1/2	3/4	39/64	51058	57100
#57	0.0430	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	1-1/2	3/4	39/64	51056	57102
3/64	0.0469	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	1-1/2	3/4	39/64	51055	57104
#54	0.0550	1-1/2	3/4	39/64	51054	57105
1,4 mm	0.0551	40,0	18,0	14,0	61055	68297

TOLERANCES (inch)

D<sub>1</sub> = +.0000/-0.0005

TOLERANCES (mm)

D<sub>1</sub> = +0,0000/-0,0127

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# Slow Spiral Drills



## 101

FRACTIONAL & METRIC SERIES

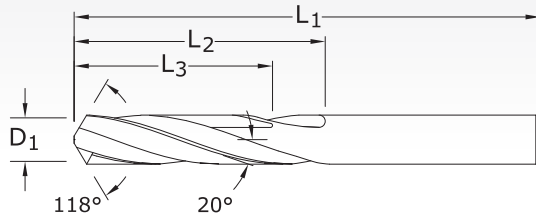
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CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.	
					UNCOATED	Ti-NAMITE-A (AITIN)
1,5 mm	0.0591	40,0	18,0	14,0	61009	68272
#53	0.0595	1-1/2	3/4	39/64	51053	57106
*1/16	0.0625	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	1-1/2	3/4	39/64	51052	57108
1,7 mm	0.0669	43,0	20,0	17,0	61057	68299
#51	0.0670	1-1/2	3/4	39/64	51051	57109
#50	0.0700	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	1-3/4	7/8	45/64	51049	57111
1,9 mm	0.0748	46,0	22,0	17,0	61059	68301
#48	0.0760	1-3/4	7/8	45/64	51048	57112
5/64	0.0781	1-3/4	7/8	45/64	51105	57113
#47	0.0785	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	1-3/4	7/8	45/64	51046	57115
#45	0.0820	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	1	51/64	51044	57117
2,2 mm	0.0866	53,0	27,0	21,0	61061	68303
#43	0.0890	2	1	51/64	51043	57118
2,3 mm	0.0906	53,0	27,0	21,0	61062	68304
#42	0.0935	2	1	51/64	51042	57119
3/32 mm	0.0938	2	1	51/64	51106	57120
2,4 mm	0.0945	57,0	30,0	24,0	61063	68305
#41	0.0960	2	1	51/64	51041	57121
#40	0.0980	2	1	51/64	51040	57122
2,5 mm	0.0984	57,0	30,0	24,0	61013	68274
#39	0.0995	2-1/4	1-1/4	1	51039	57123
#38	0.1015	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	2-1/4	1-1/4	1	51037	57125
2,7 mm	0.1063	61,0	33,0	26,0	61065	68307
#36	0.1065	2-1/4	1-1/4	1	51036	57126
7/64	0.1094	2-1/4	1-1/4	1	51107	57127
#35	0.1100	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	2-1/4	1-1/4	1	51034	57129
#33	0.1130	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	2-1/4	1-1/4	1	51032	57131
3,0 mm	0.1181	61,0	33,0	26,0	61015	68275
#31	0.1200	2-1/4	1-1/4	1	51031	57132
3,1 mm	0.1220	65,0	36,0	28,0	61068	68310

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# Slow Spiral Drills



**101**

FRACTIONAL & METRIC SERIES

TECH INFO 178-179

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

CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.	
					UNCOATED	Ti-NAMITE-A (AlTiN)
*1/8	0.1250	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	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	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	2-1/2	1-3/8	1-7/64	51028	57136
9/64	0.1406	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	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	2-1/2	1-3/8	1-7/64	51026	57139
#25	0.1495	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	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	2-1/2	1-3/8	1-7/64	51023	57142
5/32	0.1562	2-1/2	1-3/8	1-7/64	51110	57143
#22	0.1570	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	2-1/2	1-3/8	1-7/64	51021	57145
#20	0.1610	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	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	2-3-4	1-5/8	1-19/64	51018	57148
11/64	0.1719	2-3-4	1-5/8	1-19/64	51111	57149
#17	0.1730	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	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	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	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	2-3-4	1-5/8	1-19/64	51013	57154

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TOLERANCES (inch)

D<sub>1</sub> = +.0000/-0.0005

TOLERANCES (mm)

D<sub>1</sub> = +0,0000/-0,0127





# Slow Spiral Drills



**101**

FRACTIONAL & METRIC SERIES

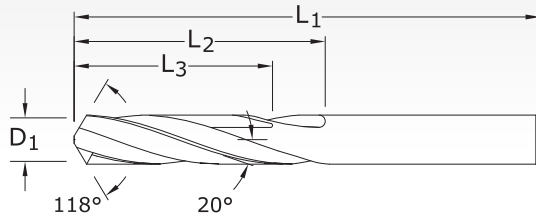
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CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.	
					UNCOATED	TI-NAMITE-A (AITIN)
*3/16	0.1875	2-3-4	1-5/8	1-19/64	51112	57155
4,8 mm	0.1890	86,0	52,0	41,0	61082	68324
#12	0.1890	2-3-4	1-5/8	1-19/64	51012	57156
#11	0.1910	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	2-3-4	1-5/8	1-19/64	51010	57158
#9	0.1960	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	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	3	1-3/4	1-13/32	51007	57161
13/64	0.2031	3	1-3/4	1-13/32	51113	57162
#6	0.2040	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	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	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	3	1-3/4	1-13/32	51003	57166
5,5 mm	0.2165	94,5	57,0	1-13/32	61025	68280
7/32	0.2188	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	3	1-3/4	1-13/32	51002	57168
5,7 mm	0.2244	93,0	57,0	45,0	61089	68331
#1	0.2280	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	3-1/4	2	1-39/64	51201	57170
15/64	0.2344	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	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	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	3-1/4	2	1-39/64	51204	57174
6,3 mm	0.2480	101,0	63,0	50,0	61094	68336
*E	0.2500	3-1/4	2	1-39/64	51116	57175
1/4	0.2500	3-1/4	2	1-39/64	51205	57176
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	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	3-1/2	2-1/8	1-45/64	51207	57178
6,7 mm	0.2638	101,0	63,0	50,0	61097	68339

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# Slow Spiral Drills



**101**

FRACTIONAL & METRIC SERIES

TECH INFO 178-179

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

CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.	
					UNCOATED	Ti-NAMITE-A (AlTiN)
17/64	0.2656	3-1/2	2-1/8	1-45/64	51117	57179
H	0.2660	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	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	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	3-1/2	2-1/8	1-45/64	51211	57183
9/32	0.2812	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	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	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	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	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	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	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	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	4	2-1/2	2	51121	57192
8,4 mm	0.3307	117,0	75,0	60,0	61111	68353
Q	0.3320	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	4	2-1/2	2	51218	57194
8,7 mm	0.3425	125,0	81,0	64,0	61113	68355
11/32	0.3438	4	2-1/2	2	51122	57195
8,8 mm	0.3465	125,0	81,0	64,0	61114	68356

TOLERANCES (inch)

D<sub>1</sub> = +.0000/-0.0005

TOLERANCES (mm)

D<sub>1</sub> = +0,0000/-0,0127

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# Slow Spiral Drills



## 101

FRACTIONAL & METRIC SERIES

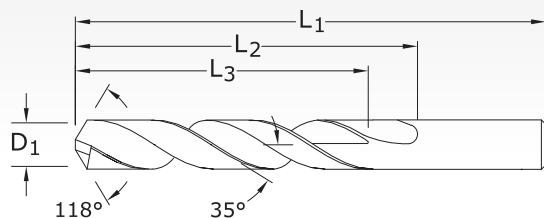
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CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.	
					UNCOATED	TI-NAMITE-A (AITIN)
S	0.3480	4	2-1/2	2	51219	57196
8,9 mm	0.3504	125,0	81,0	64,0	61115	68357
9,0 mm	0.3543	125,0	81,0	64,0	61039	68287
T	0.3580	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	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	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	4-1/4	2-3/4	2-13/64	51124	57200
V	0.3770	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	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	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	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	4-1/2	2-7/8	2-19/64	51225	57205
13/32	0.4062	4-1/2	2-7/8	2-19/64	51126	57206
Z	0.4130	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	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	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	4-3/4	3	2-13/32	51129	57210
15/32	0.4688	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	4-3/4	3	2-13/32	51131	57212
1/2	0.5000	4-3/4	3	2-13/32	51132	57213
					61175	57351

\*Series 101 Set



# Fast Spiral Drills



## 125

FRACTIONAL SERIES

TECH INFO 178

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

CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	inch			EDP NO.	
		OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	UNCOATED	Ti-NAMITE-A (AlTiN)
#80	0.0135	3/4	3/16	5/32	52080	57214
#79	0.0145	3/4	3/16	5/32	52079	57215
#78	0.0160	3/4	3/16	5/32	52078	57216
#77	0.0180	3/4	3/16	5/32	52077	57217
#76	0.0200	7/8	1/4	13/64	52076	57218
#75	0.0210	7/8	1/4	13/64	52075	57219
#74	0.0225	7/8	1/4	13/64	52074	57220
#73	0.0240	7/8	1/4	13/64	52073	57221
#72	0.0250	1	5/16	1/4	52072	57222
#71	0.0260	1	5/16	1/4	52071	57223
#70	0.0280	1-1/4	1/2	13/32	52070	57224
#69	0.0292	1-1/4	1/2	13/32	52069	57225
#68	0.0310	1-1/4	1/2	13/32	52068	57226
1/32	0.0312	1-1/4	1/2	13/32	52102	57227
#67	0.0320	1-1/4	1/2	13/32	52067	57228
#66	0.0330	1-1/4	1/2	13/32	52066	57229
#65	0.0350	1-3/8	5/8	1/2	52065	57230
#64	0.0360	1-3/8	5/8	1/2	52064	57231
#63	0.0370	1-3/8	5/8	1/2	52063	57232
#62	0.0380	1-3/8	5/8	1/2	52062	57233
#61	0.0390	1-3/8	5/8	1/2	52061	57234
#60	0.0400	1-1/2	3/4	39/64	52060	57235
#59	0.0410	1-1/2	3/4	39/64	52059	57236
#58	0.0420	1-1/2	3/4	39/64	52058	57237
#57	0.0430	1-1/2	3/4	39/64	52057	57238
#56	0.0465	1-1/2	3/4	39/64	52056	57239
3/64	0.0469	1-1/2	3/4	39/64	52103	57240
#55	0.0520	1-1/2	3/4	39/64	52055	57241
#54	0.0550	1-1/2	3/4	39/64	52054	57242
#53	0.0595	1-1/2	3/4	39/64	52053	57243
*1/16	0.0625	1-1/2	3/4	39/64	52104	57244
#52	0.0635	1-1/2	3/4	39/64	52052	57245
#51	0.0670	1-1/2	3/4	39/64	52051	57246
#50	0.0700	1-3/4	7/8	45/64	52050	57247
#49	0.0730	1-3/4	7/8	45/64	52049	57248
#48	0.0760	1-3/4	7/8	45/64	52048	57249
5/64	0.0781	1-3/4	7/8	45/64	52105	57250
#47	0.0785	1-3/4	7/8	45/64	52047	57251
#46	0.0810	1-3/4	7/8	45/64	52046	57252
#45	0.0820	1-3/4	7/8	45/64	52045	57253
#44	0.0860	2	1	51/64	52044	57254
#43	0.0890	2	1	51/64	52043	57255
#42	0.0935	2	1	51/64	52042	57256
3/32	0.0938	2	1	51/64	52106	57257

TOLERANCES (inch)

D<sub>1</sub> = +.0000/-0.0005

TOLERANCES (mm)

D<sub>1</sub> = +0,0000/-0,0127

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# Fast Spiral Drills



**125**  
FRACTIONAL SERIES

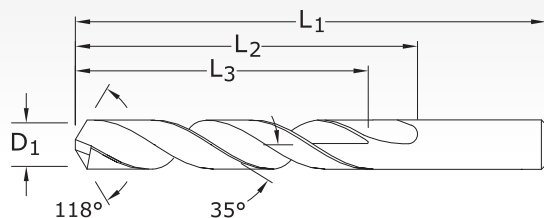
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CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	inch			EDP NO.	
		OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	UNCOATED	TI-NAMITE-A (AITIN)
#41	0.0960	2	1	51/64	52041	57258
#40	0.0980	2	1	51/64	52040	57259
#39	0.0995	2-1/4	1-1/4	1	52039	57260
#38	0.1015	2-1/4	1-1/4	1	52038	57261
#37	0.1040	2-1/4	1-1/4	1	52037	57262
#36	0.1065	2-1/4	1-1/4	1	52036	57263
7/64	0.1094	2-1/4	1-1/4	1	52107	57264
#35	0.1100	2-1/4	1-1/4	1	52035	57265
#34	0.1110	2-1/4	1-1/4	1	52034	57266
#33	0.1130	2-1/4	1-1/4	1	52033	57267
#32	0.1160	2-1/4	1-1/4	1	52032	57268
#31	0.1200	2-1/4	1-1/4	1	52031	57269
*1/8	0.1250	2-1/4	1-1/4	1	52108	57270
#30	0.1285	2-1/4	1-1/4	1	52030	57271
#29	0.1360	2-1/2	1-3/8	1-7/64	52029	57272
#28	0.1405	2-1/2	1-3/8	1-7/64	52028	57273
9/64	0.1406	2-1/2	1-3/8	1-7/64	52109	57274
#27	0.1440	2-1/2	1-3/8	1-7/64	52027	57275
#26	0.1470	2-1/2	1-3/8	1-7/64	52026	57276
#25	0.1495	2-1/2	1-3/8	1-7/64	52025	57277
#24	0.1520	2-1/2	1-3/8	1-7/64	52024	57278
#23	0.1540	2-1/2	1-3/8	1-7/64	52023	57279
5/32	0.1562	2-1/2	1-3/8	1-7/64	52110	57280
#22	0.1570	2-1/2	1-3/8	1-7/64	52022	57281
#21	0.1590	2-1/2	1-3/8	1-7/64	52021	57282
#20	0.1610	2-1/2	1-3/8	1-7/64	52020	57283
#19	0.1660	2-3/4	1-5/8	1-19/64	52019	57284
#18	0.1695	2-3/4	1-5/8	1-19/64	52018	57285
11/64	0.1719	2-3/4	1-5/8	1-19/64	52111	57286
#17	0.1730	2-3/4	1-5/8	1-19/64	52017	57287
#16	0.1770	2-3/4	1-5/8	1-19/64	52016	57288
#15	0.1800	2-3/4	1-5/8	1-19/64	52015	57289
#14	0.1820	2-3/4	1-5/8	1-19/64	52014	57290
#13	0.1850	2-3/4	1-5/8	1-19/64	52013	57291
*3/16	0.1875	2-3/4	1-5/8	1-19/64	52112	57292
#12	0.1890	2-3/4	1-5/8	1-19/64	52012	57293
#11	0.1910	2-3/4	1-5/8	1-19/64	52011	57294
#10	0.1935	2-3/4	1-5/8	1-19/64	52010	57295
#9	0.1960	3	1-3/4	1-13/32	52009	57296
#8	0.1990	3	1-3/4	1-13/32	52008	57297
#7	0.2010	3	1-3/4	1-13/32	52007	57298
13/64	0.2031	3	1-3/4	1-13/32	52113	57299
#6	0.2040	3	1-3/4	1-13/32	52006	57300
#5	0.2055	3	1-3/4	1-13/32	52005	57301
#4	0.2090	3	1-3/4	1-13/32	52004	57302
#3	0.2130	3	1-3/4	1-13/32	52003	57303
7/32	0.2188	3	1-3/4	1-13/32	52114	57304
#2	0.2210	3	1-3/4	1-13/32	52002	57305
#1	0.2280	3	1-3/4	1-13/32	52001	57306
A	0.2340	3-1/4	2	1-39/64	52201	57307

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# Fast Spiral Drills



## 125

FRACTIONAL SERIES

TECH INFO 178

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

CUTTING DIAMETER D <sub>1</sub>	DECIMAL EQUIV.	inch			EDP NO.	
		OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	UNCOATED	Ti-NAMITE-A (AlTiN)
15/64	0.2344	3-1/4	2	1-39/64	52115	57308
B	0.2380	3-1/4	2	1-39/64	52202	57309
C	0.2420	3-1/4	2	1-39/64	52203	57310
1/4	0.2500	3-1/4	2	1-39/64	52116	57313
*E	0.2500	3-1/4	2	1-39/64	52205	57312
F	0.2570	3-1/4	2	1-39/64	52206	57314
G	0.2610	3-1/2	2-1/8	1-45/64	52207	57315
17/64	0.2656	3-1/2	2-1/8	1-45/64	52117	57316
H	0.2660	3-1/2	2-1/8	1-45/64	52208	57317
I	0.2720	3-1/2	2-1/8	1-45/64	52209	57318
J	0.2770	3-1/2	2-1/8	1-45/64	52210	57319
K	0.2810	3-1/2	2-1/8	1-45/64	52211	57320
9/32	0.2812	3-1/2	2-1/8	1-45/64	52118	57321
L	0.2900	3-1/2	2-1/8	1-45/64	52212	57322
M	0.2950	3-3/4	2-3/8	1-29/32	52213	57323
19/64	0.2969	3-3/4	2-3/8	1-29/32	52119	57324
N	0.3020	3-3/4	2-3/8	1-29/32	52214	57325
*5/16	0.3125	3-3/4	2-3/8	1-29/32	52120	57326
O	0.3160	3-3/4	2-3/8	1-29/32	52215	57327
P	0.3230	3-3/4	2-3/8	1-29/32	52216	57328
21/64	0.3281	4	2-1/2	2	52121	57329
Q	0.3320	4	2-1/2	2	52217	57330
R	0.3390	4	2-1/2	2	52218	57331
11/32	0.3438	4	2-1/2	2	52122	57332
S	0.3480	4	2-1/2	2	52219	57333
T	0.3580	4-1/4	2-3/4	2-13/64	52220	57334
23/64	0.3594	4-1/4	2-3/4	2-13/64	52123	57335
U	0.3680	4-1/4	2-3/4	2-13/64	52221	57336
*3/8	0.3750	4-1/4	2-3/4	2-13/64	52124	57337
V	0.3770	4-1/4	2-3/4	2-13/64	52222	57338
W	0.3860	4-1/2	2-7/8	2-19/64	52223	57339
25/64	0.3906	4-1/2	2-7/8	2-19/64	52125	57340
X	0.3970	4-1/2	2-7/8	2-19/64	52224	57341
Y	0.4040	4-1/2	2-7/8	2-19/64	52225	57342
13/32	0.4062	4-1/2	2-7/8	2-19/64	52126	57343
Z	0.4130	4-1/2	2-7/8	2-19/64	52226	57344
27/64	0.4219	4-1/2	2-7/8	2-19/64	52127	57345
7/16	0.4375	4-1/2	2-7/8	2-19/64	52128	57346
29/64	0.4531	4-3/4	3	2-13/32	52129	57347
15/32	0.4688	4-3/4	3	2-13/32	52130	57348
31/64	0.4844	4-3/4	3	2-13/32	52131	57349
1/2	0.5000	4-3/4	3	2-13/32	52132	57350
*Series 125 Set					62175	57352

TOLERANCES (inch)

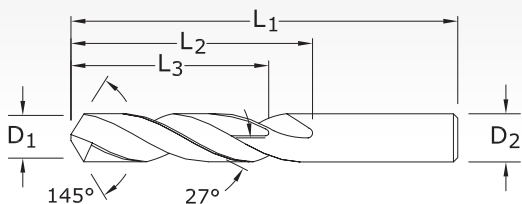
D<sub>1</sub> = +.0000/-0.0005

TOLERANCES (mm)

D<sub>1</sub> = +0,0000/-0,0127



# Short Length Self Centering Drills • DIN 6539



## TOLERANCES $h_6$ (mm)

### ≤3 DIAMETER

$D_1 = +0,000/-0,010$

$D_2 = h_6$

### >3–6 DIAMETER

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

$D_2 = h_6$

### >6–10 DIAMETER

$D_1 = +0,000/-0,015$

$D_2 = h_6$

### >10–18 DIAMETER

$D_1 = +0,000/-0,018$

$D_2 = h_6$

### >18–30 DIAMETER

$D_1 = +0,000/-0,021$

$D_2 = h_6$

## 108M Plus

METRIC SERIES

TECH INFO 179

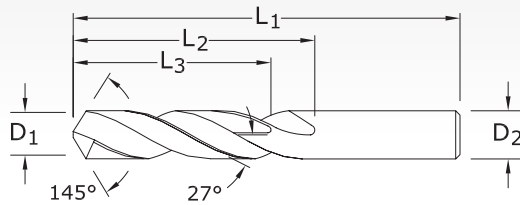
CUTTING DIAMETER $D_1 / D_2$	OVERALL LENGTH $L_1$	FLUTE LENGTH $L_2$	CLEARED LENGTH $L_3$	EDP NO.	
				UNCOATED	Ti-NAMITE-A (AITIN)
0,5	20,0	3,0	2,1	62001	68643
0,55	21,0	3,5	2,5	62003	68644
0,6	21,0	3,5	2,5	62005	68645
0,65	22,0	4,0	2,9	62007	68646
0,7	23,0	4,5	3,2	62009	68647
0,75	23,0	4,5	3,2	62011	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
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

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

continued on next page



# Short Length Self Centering Drills • DIN 6539



## 108M Plus

METRIC SERIES

TECH INFO 179

- 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,	
	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	UNCOATED	Ti-NAMITE-A (AlTiN)
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
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

### TOLERANCES h<sub>6</sub> (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>

#### >18-30 DIAMETER

D<sub>1</sub> = +0,000/-0,021

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

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# Short Length Self Centering Drills • DIN 6539



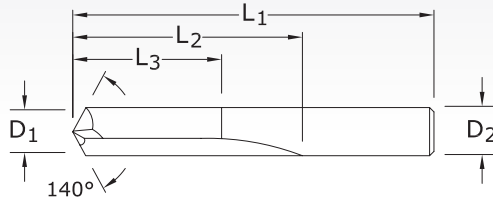
## 108M Plus

METRIC SERIES

CUTTING DIAMETER D <sub>1</sub> / D <sub>2</sub>	mm			EDP NO.		CONTINUED
	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	UNCOATED	TI-NAMITE-A (AITIN)	
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	



# Straight Flute Drills



## 106

FRACTIONAL & METRIC SERIES

TECH INFO 180

- CAST IRON
- HARDENED STEELS

CUTTING DIAMETER D <sub>1</sub> / D <sub>2</sub>	DECIMAL EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.	
					UNCOATED	Ti-NAMITE-A (AlTiN)
1,0 mm	0.0394	26,0	6,0	4,5	66001	66002
#60	0.0400	1-1/2	1/2	13/32	56060	56269
#59	0.0410	1-1/2	1/2	13/32	56059	56268
#58	0.0420	1-1/2	1/2	13/32	56058	56267
#57	0.0430	1-1/2	1/2	13/32	56057	56266
#56	0.0465	1-1/2	1/2	13/32	56056	56265
3/64	0.0469	1-1/2	1/2	13/32	56103	56135
#55	0.0520	1-1/2	1/2	13/32	56055	56264
#54	0.0550	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	1-1/2	1/2	13/32	56053	56262
1/16	0.0625	1-1/2	5/8	1/2	56104	56136
#52	0.0635	1-11/16	11/16	35/64	56052	56261
#51	0.0670	1-11/16	11/16	35/64	56051	56260
#50	0.0700	1-11/16	11/16	35/64	56050	56259
#49	0.0730	1-11/16	11/16	35/64	56049	56258
#48	0.0760	1-11/16	11/16	35/64	56048	56257
5/64	0.0781	1-11/16	11/16	35/64	56105	56137
#47	0.0785	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	1-3/4	3/4	39/64	56046	56255
#45	0.0820	1-3/4	3/4	39/64	56045	56254
#44	0.0860	1-3/4	3/4	39/64	56044	56253
#43	0.0890	1-3/4	3/4	39/64	56043	56252
#42	0.0935	1-3/4	3/4	39/64	56042	56251
3/32	0.0938	1-3/4	3/4	39/64	56106	56138
#41	0.0960	1-13/16	13/16	21/32	56041	56250
#40	0.0980	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	1-13/16	13/16	21/32	56039	56248
#38	0.1015	1-13/16	13/16	21/32	56038	56247
#37	0.1040	1-13/16	13/16	21/32	56037	56246
#36	0.1065	1-13/16	13/16	21/32	56036	56245
7/64	0.1094	1-13/16	13/16	21/32	56107	56139
#35	0.1100	1-7/8	7/8	45/64	56035	56244
#34	0.1110	1-7/8	7/8	45/64	56034	56243
#33	0.1130	1-7/8	7/8	45/64	56033	56242
#32	0.1160	1-7/8	7/8	45/64	56032	56241
3,0 mm	0.1181	46,0	16,0	12,0	66009	66010

TOLERANCES (inch)

D<sub>1</sub> = +.0000/-0.0005

TOLERANCES (mm)

D<sub>1</sub> = +0,0000/-0,0127

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# Straight Flute Drills



## 106

FRACTIONAL & METRIC SERIES

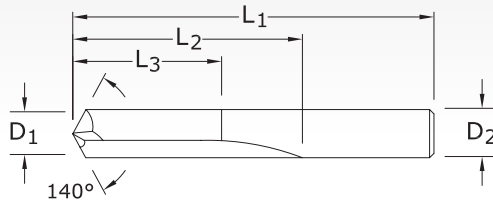
CONTINUED

CUTTING DIAMETER D <sub>1</sub> / D <sub>2</sub>	DECIMAL EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.	
					UNCOATED	Ti-NAMITE-A (ALTiN)
#31	0.1200	1-7/8	7/8	45/64	56031	56240
1/8	0.1250	1-7/8	7/8	45/64	56108	56140
#30	0.1285	1-15/16	15/16	3/4	56030	56239
#29	0.1360	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	1-15/16	15/16	3/4	56028	56237
9/64	0.1406	1-15/16	15/16	3/4	56109	56141
#27	0.1440	2-1/16	1	51/64	56027	56236
#26	0.1470	2-1/16	1	51/64	56026	56235
#25	0.1495	2-1/16	1	51/64	56025	56234
#24	0.1520	2-1/16	1	51/64	56024	56233
#23	0.1540	2-1/16	1	51/64	56023	56232
5/32	0.1562	2-1/16	1	51/64	56110	56142
#22	0.1570	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	2-1/8	1-1/16	55/64	56021	56230
#20	0.1610	2-1/8	1-1/16	55/64	56020	56229
#19	0.1660	2-1/8	1-1/16	55/64	56019	56228
#18	0.1695	2-1/8	1-1/16	55/64	56018	56227
11/64	0.1719	2-1/8	1-1/16	55/64	56111	56143
#17	0.1730	2-3/16	1-1/8	29/32	56017	56226
#16	0.1770	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	2-3/16	1-1/8	29/32	56015	56224
#14	0.1820	2-3/16	1-1/8	29/32	56014	56223
#13	0.1850	2-3/16	1-1/8	29/32	56013	56222
3/16	0.1875	2-3/16	1-1/8	29/32	56112	56144
#12	0.1890	2-3/16	1-1/8	29/32	56012	56221
#11	0.1910	2-3/16	1-1/8	29/32	56011	56220
#10	0.1935	2-3/16	1-1/8	29/32	56010	56219
#9	0.1960	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	2-1/4	1-3/16	61/64	56008	56217
#7	0.2010	2-1/4	1-3/16	61/64	56007	56216
13/64	0.2031	2-1/4	1-3/16	61/64	56113	56145
#6	0.2040	2-3/8	1-1/4	1	56006	56215
#5	0.2055	2-3/8	1-1/4	1	56005	56214
#4	0.2090	2-3/8	1-1/4	1	56004	56213
#3	0.2130	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	2-3/8	1-1/4	1	56114	56146
#2	0.2210	2-7/16	1-5/16	1-3/64	56002	56211
#1	0.2280	2-7/16	1-5/16	1-3/64	56001	56210
15/64	0.2344	2-7/16	1-5/16	1-3/64	56115	56147
6,0 mm	0.2362	66,0	28,0	21,0	66021	66045

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# Straight Flute Drills



## 106

FRACTIONAL & METRIC SERIES

TECH INFO 180

- CAST IRON
- HARDENED STEELS

CUTTING DIAMETER D <sub>1</sub> / D <sub>2</sub>	DECIMAL EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.	
					UNCOATED	Ti-NAMITE-A (AlTiN)
1/4	0.2500	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	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	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	2-3/4	1-9/16	1-1/4	56119	56151
5/16	0.3125	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	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	3-11/64	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	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	3-1/8	1-13/16	1-29/64	56124	56156
25/64	0.3906	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	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	3-3/8	2	1-39/64	56127	56159
11,0 mm	0.4331	95,0	47,0	33,0	66039	66040
7/16	0.4375	3-7/16	2-1/16	1-21/32	56128	56160
11,5 mm	0.4528	95,0	47,0	33,0	66041	66042
29/64	0.4531	3-9/16	2-1/8	1-45/64	56129	56161
15/32	0.4688	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	3-11/16	2-3/16	1-3/4	56131	56163
1/2	0.5000	3-3/4	2-1/4	1-51/64	56132	56164

TOLERANCES (inch)

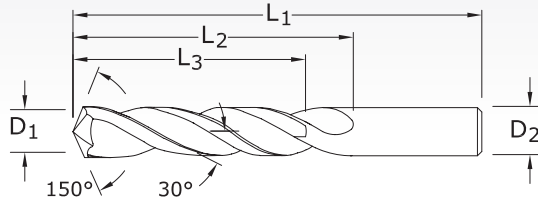
D<sub>1</sub> = +0.0000/-0.0005

TOLERANCES (mm)

D<sub>1</sub> = +0,0000/-0,0127



# 3 Flute Drills with 150 Point Geometry



**103**

FRACTIONAL & METRIC SERIES

TECH INFO 181-182

**TOLERANCES (inch)**

$D_1 = +.0000/-0.0005$

$D_2 = h_6$

**TOLERANCES (mm)**

$D_1 = +0,0000/-0,0127$

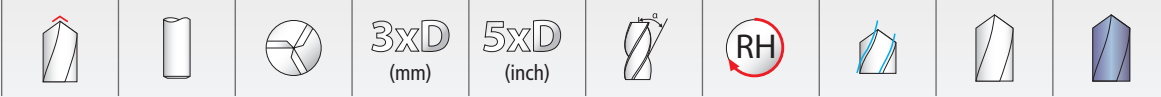
$D_2 = h_6$

CUTTING DIAMETER $D_1 / D_2$	DECIMAL EQUIV.	OVERALL LENGTH $L_1$	FLUTE LENGTH $L_2$	CLEARED LENGTH $L_3$	EDP NO.	
					UNCOATED	Ti-NAMITE-A (AITIN)
#36	0.1065	2-1/4	1-1/4	1	53036	58011
7/64	0.1094	2-1/4	1-1/4	1	53107	58012
#35	0.1100	2-1/4	1-1/4	1	53035	58013
#34	0.1110	2-1/4	1-1/4	1	53034	58014
#33	0.1130	2-1/4	1-1/4	1	53033	58015
#32	0.1160	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	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	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	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	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	2-1/2	1-3/8	1-7/64	53028	58021
9/64	0.1406	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	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	2-1/2	1-3/8	1-7/64	53026	58024
#25	0.1495	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	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	2-1/2	1-3/8	1-7/64	53023	58027
5/32	0.1562	2-1/2	1-3/8	1-7/64	53110	58028
#22	0.1570	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	2-1/2	1-3/8	1-7/64	53021	58030
#20	0.1610	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	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	2-3/4	1-5/8	1-19/64	53018	58033
11/64	0.1719	2-3/4	1-5/8	1-19/64	53111	58034

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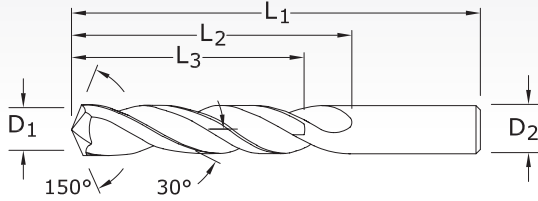


# 3 Flute Drills with 150 Point Geometry



## 103

FRACTIONAL & METRIC SERIES



TOLERANCES (inch)

D<sub>1</sub> = +.0000/-0.0005

TOLERANCES (mm)

D<sub>1</sub> = +0,0000/-0,0127

TECH INFO 181-182

- STEELS
- CAST IRON
- NON-FERROUS

CUTTING DIAMETER D <sub>1</sub> / D <sub>2</sub>	DECIMAL EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.	
					UNCOATED	Ti-NAMITE-A (AlTiN)
#17	0.1730	2-3/4	1-5/8	1-19/64	53017	58035
4,4 mm	0.1732	58,0	24,0	18,0	63052	68979
#16	0.1770	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	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	2-3/4	1-5/8	1-19/64	53014	58038
#13	0.1850	2-3/4	1-5/8	1-19/64	53013	58039
4,7 mm	0.1850	62,0	26,0	18,0	63054	68982
3/16	0.1875	2-3/4	1-5/8	1-19/64	53112	58040
#12	0.1890	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	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	2-3/4	1-5/8	1-19/64	53010	58043
#9	0.1960	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	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	3	1-3/4	1-13/32	53007	58046
13/64	0.2031	3	1-3/4	1-13/32	53113	58047
#6	0.2040	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	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	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	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	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	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	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	3-1/4	2	1-39/64	53201	58055
15/64	0.2344	3-1/4	2	1-39/64	53115	58056

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# 3 Flute Drills with 150 Point Geometry



**103**

FRACTIONAL & METRIC SERIES

CONTINUED

CUTTING DIAMETER D <sub>1</sub> / D <sub>2</sub>	DECIMAL EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.	
					UNCOATED	Ti-NAMITE-A (AITIN)
6,0 mm	0.2362	66,0	28,0	21,0	63010	68995
B	0.2380	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	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	3-1/4	2	1-39/64	53204	58059
6,3 mm	0.2480	70,0	31,0	23,0	63065	68998
E	0.2500	3-1/4	2	1-39/64	53205	58060
1/4	0.2500	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	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	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	3-1/2	2-1/8	1-45/64	53117	58064
H	0.2660	3-1/2	2-1/8	1-45/64	53208	58065
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	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	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	3-1/2	2-1/8	1-45/64	53211	58068
9/32	0.2812	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	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	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	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	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	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	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	3-3/4	2-3/8	1-29/32	53216	58076
8,3 mm	0.3268	79,0	37,0	27,0	63078	69018

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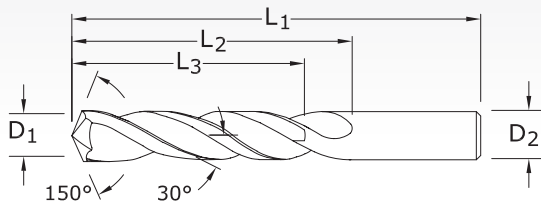


# 3 Flute Drills with 150 Point Geometry



## 103

FRACTIONAL & METRIC SERIES



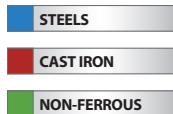
TOLERANCES (inch)

$D_1 = +.0000/-0.0005$

TOLERANCES (mm)

$D_1 = +0,0000/-0,0127$

TECH INFO 181-182



CUTTING DIAMETER $D_1 / D_2$	DECIMAL EQUIV.	OVERALL LENGTH $L_1$	FLUTE LENGTH $L_2$	CLEARED LENGTH $L_3$	EDP NO.	
					UNCOATED	Ti-NAMITE-A (AlTiN)
21/64	0.3281	4	2-1/2	2	53121	58077
8,4 mm	0.3307	79,0	37,0	27,0	63019	69019
Q	0.3320	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	4	2-1/2	2	53218	58079
8,7 mm	0.3425	89,0	40,0	29,0	63079	69022
11/32	0.3438	4	2-1/2	2	53122	58080
8,8 mm	0.3465	89,0	40,0	29,0	63022	69023
S	0.3480	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	4-1/4	2-3/4	2-13/64	53220	58082
9,1 mm	0.3583	84,0	40,0	29,0	63081	69026
23/64	0.3594	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	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	4-1/4	2-3/4	2-13/64	53124	58085
V	0.3770	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	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	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	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	4-1/2	2-7/8	2-19/64	53225	58090
13/32	0.4062	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	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

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# 3 Flute Drills with 150 Point Geometry



## 103

FRACTIONAL & METRIC SERIES

CONTINUED

CUTTING DIAMETER D <sub>1</sub> / D <sub>2</sub>	DECIMAL EQUIV.	OVERALL LENGTH L <sub>1</sub>	FLUTE LENGTH L <sub>2</sub>	CLEARED LENGTH L <sub>3</sub>	EDP NO.	
					UNCOATED	Ti-NAMITE-A (AlTiN)
27/64	0.4219	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	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	4-3/4	3	2-13/32	53129	58095
15/32	0.4688	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	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	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	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	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	5-3/4	3-1/2	2-51/64	53133	58101
11/16	0.6875	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	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



# Speed & Feed Recommendations

101, 125 Fractional	HARDNESS			SPEED (sfm)		FEED (inch/rev)				
	BRINELL	AlTiN	Uncoated	1/64	1/32	1/16	1/8	1/4	3/8	1/2
CARBON STEEL* 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	265	220	0.00020	0.0004	0.0009	0.0017	0.0034	0.0050	0.0070
	> 200 ≤ 300	125	105	0.00020	0.0004	0.0008	0.0016	0.0031	0.0045	0.0060
	> 300 ≤ 420	85	70	0.00010	0.0002	0.0005	0.0009	0.0018	0.0025	0.0035
ALLOY STEEL* 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	230	190	0.00020	0.0004	0.0008	0.0016	0.0031	0.0045	0.0060
	> 270 ≤ 370	145	120	0.00020	0.0004	0.0008	0.0015	0.0030	0.0045	0.0060
	> 370 ≤ 450	60	50	0.00010	0.0002	0.0004	0.0007	0.0013	0.0020	0.0025
TOOL STEEL* A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	85	70	0.00010	0.0002	0.0005	0.0009	0.0018	0.0025	0.0035
	> 250 ≤ 330	55	45	0.00005	0.0001	0.0002	0.0004	0.0008	0.0010	0.0015
	> 330 ≤ 450	40	35	0.00005	0.0001	0.0002	0.0004	0.0008	0.0010	0.0015
CAST IRON* Gray, Malleable, Ductile	≤ 200	280	235	0.00025	0.0005	0.0011	0.0021	0.0041	0.0060	0.0080
	> 200 ≤ 330	250	210	0.00025	0.0005	0.0011	0.0021	0.0041	0.0060	0.0080
STAINLESS* (free machining) 303, 416, 420F, 430F, 440F	≤ 250	210	175	0.00015	0.0003	0.0006	0.0012	0.0024	0.0035	0.0050
	> 250 ≤ 330	110	90	0.00010	0.0002	0.0004	0.0007	0.0014	0.0020	0.0030
STAINLESS* (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	65	55	0.00010	0.0002	0.0005	0.0009	0.0018	0.0025	0.0035
	> 270 ≤ 370	55	45	0.00010	0.0002	0.0004	0.0008	0.0015	0.0025	0.0030
TITANIUM* TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	85	70	0.00020	0.0004	0.0008	0.0016	0.0032	0.0050	0.0065
	> 280 ≤ 350	65	55	0.00010	0.0002	0.0005	0.0009	0.0018	0.0025	0.0035
	> 350 ≤ 440	55	45	0.00010	0.0002	0.0004	0.0008	0.0015	0.0025	0.0030
HIGH TEMPERATURE ALLOY* A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	40	35	0.00010	0.0002	0.0005	0.0009	0.0018	0.0025	0.0035
	> 220 ≤ 330	25	20	0.00010	0.0002	0.0004	0.0008	0.0016	0.0025	0.0030
	> 330 ≤ 420	20	15	0.00005	0.0001	0.0002	0.0004	0.0007	0.0010	0.0015
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	540	450	0.00030	0.0006	0.0013	0.0025	0.0050	0.0075	0.0100
	> 80	455	380	0.00030	0.0006	0.0013	0.0025	0.0050	0.0075	0.0100
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	190	160	0.00015	0.0003	0.0006	0.0012	0.0024	0.0035	0.0050
	> 140	175	145	0.00015	0.0003	0.0006	0.0012	0.0024	0.0035	0.0050
PLASTICS Polycarbonate, PVC		490	410	0.00030	0.0006	0.0013	0.0025	0.0049	0.0075	0.0100
* AlTiN coating recommended Reduce speed & feed for materials harder than listed			rpm = sfm × 3.82 / D <sub>1</sub>			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
			ipm = (inch/rev) × rpm							

# Speed & Feed Recommendations

101M, 108M Metric	HARDNESS			SPEED (m/min)		FEED (mm/rev)				
	BRINELL	AlTiN	Uncoated	1	3	6	8	10	12	16
CARBON STEEL* 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	80	67	0.0150	0.040	0.080	0.110	0.135	0.170	0.230
	> 200 ≤ 300	38	32	0.0150	0.035	0.075	0.095	0.120	0.145	0.190
	> 300 ≤ 420	26	21	0.0050	0.020	0.045	0.055	0.065	0.085	0.115
ALLOY STEEL* 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	69	58	0.0150	0.035	0.075	0.095	0.120	0.145	0.190
	> 270 ≤ 370	44	37	0.0100	0.035	0.070	0.095	0.120	0.145	0.190
	> 370 ≤ 450	18	15	0.0050	0.015	0.030	0.040	0.055	0.060	0.075
TOOL STEEL* A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	26	21	0.0050	0.020	0.045	0.055	0.065	0.085	0.115
	> 250 ≤ 330	16	14	0.0050	0.010	0.020	0.025	0.025	0.035	0.050
	> 330 ≤ 450	13	11	0.0050	0.010	0.020	0.025	0.025	0.035	0.050
CAST IRON* Gray, Malleable, Ductile	≤ 200	86	72	0.0150	0.050	0.100	0.130	0.160	0.195	0.255
	> 200 ≤ 330	77	64	0.0150	0.050	0.100	0.130	0.160	0.195	0.255
STAINLESS* (free machining) 303, 416, 420F, 430F, 440F	≤ 250	64	53	0.0100	0.030	0.060	0.075	0.095	0.120	0.165
	> 250 ≤ 330	33	27	0.0050	0.015	0.035	0.045	0.055	0.070	0.105
STAINLESS* (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	20	17	0.0050	0.020	0.045	0.055	0.065	0.085	0.115
	> 270 ≤ 370	16	14	0.0050	0.020	0.035	0.050	0.065	0.070	0.105
TITANIUM* TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	26	21	0.0150	0.040	0.075	0.105	0.135	0.155	0.205
	> 280 ≤ 350	20	17	0.0050	0.020	0.045	0.055	0.065	0.085	0.115
	> 350 ≤ 440	16	14	0.0050	0.020	0.035	0.050	0.065	0.070	0.105
HIGH TEMPERATURE ALLOY* A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	13	11	0.0050	0.020	0.045	0.055	0.065	0.085	0.115
	> 220 ≤ 330	7	6	0.0050	0.020	0.040	0.055	0.065	0.070	0.105
	> 330 ≤ 420	6	5	0.0050	0.010	0.015	0.020	0.025	0.035	0.050
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	165	137	0.0200	0.060	0.120	0.160	0.200	0.240	0.320
	> 80	139	116	0.0200	0.060	0.120	0.160	0.200	0.240	0.320
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	59	49	0.0100	0.030	0.060	0.075	0.095	0.120	0.165
	> 140	53	44	0.0100	0.030	0.060	0.075	0.095	0.120	0.165
PLASTICS Polycarbonate, PVC		150	125	0.0200	0.060	0.120	0.160	0.200	0.240	0.320
* AlTiN coating recommended Reduce speed & feed for materials harder than listed			$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
			$\text{mm/min} = (\text{mm/rev}) \times \text{rpm}$							



# Speed & Feed Recommendations

106 Fractional	HARDNESS			SPEED (sfm)		FEED (inch/rev)				
	BRINELL	AlTiN	Uncoated	1/16	1/8	3/16	1/4	3/8	1/2	
ALLOY STEEL 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	> 420 ≤ 500	33	28	0.0003	0.0006	0.0008	0.0012	0.0018	0.0024	
	> 500 ≤ 615	33	28	0.0002	0.0004	0.0005	0.0007	0.001	0.0014	
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	> 420 ≤ 500	34	28	0.0003	0.0006	0.0008	0.0012	0.0018	0.0023	
	> 500 ≤ 615	33	28	0.0002	0.0003	0.0004	0.0006	0.0008	0.0014	
CAST IRON Gray, Malleable, Ductile	≤ 200	252	210	0.001	0.002	0.003	0.004	0.006	0.0081	
	> 200 ≤ 330	185	154	0.001	0.002	0.003	0.004	0.006	0.0081	
AlTiN coating recommended		$\text{rpm} = \text{sfm} \times 3.82 / D_1$ $\text{ipm} = (\text{inch/rev}) \times \text{rpm}$			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )					

106M Metric	HARDNESS			SPEED (m/min)			FEED (mm/rev)			
	BRINELL	AlTiN	Uncoated	1	3	6	8	10	12	
ALLOY STEEL 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	> 420 ≤ 500	10	9	0.006	0.017	0.034	0.045	0.057	0.068	
	> 500 ≤ 615	10	9	0.003	0.009	0.018	0.024	0.03	0.036	
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	> 420 ≤ 500	10	9	0.003	0.009	0.018	0.024	0.03	0.036	
	> 500 ≤ 615	8	6	0.002	0.007	0.014	0.019	0.023	0.028	
CAST IRON Gray, Malleable, Ductile	≤ 200	77	64	0.016	0.048	0.096	0.128	0.16	0.192	
	> 200 ≤ 330	56	47	0.016	0.048	0.096	0.128	0.16	0.192	
AlTiN coating recommended		$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$ $\text{mm/min} = (\text{mm/rev}) \times \text{rpm}$			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )					

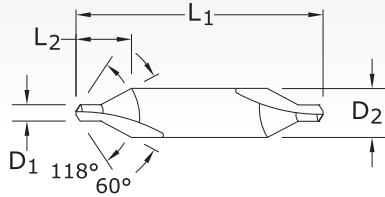
# Speed & Feed Recommendations

103 Fractional	HARDNESS		SPEED (sfm)		FEED (inch/rev)				
	BRINELL	AlTiN	Uncoated	1/8	1/4	3/8	1/2	5/8	3/4
CARBON STEEL* 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	265	220	0.00020	0.0004	0.0009	0.0017	0.0034	0.0050
	> 200 ≤ 300	125	105	0.00020	0.0004	0.0008	0.0016	0.0031	0.0045
	> 300 ≤ 420	85	70	0.00010	0.0002	0.0005	0.0009	0.0018	0.0025
ALLOY STEEL* 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	230	190	0.00020	0.0004	0.0008	0.0016	0.0031	0.0045
	> 270 ≤ 370	145	120	0.00020	0.0004	0.0008	0.0015	0.0030	0.0045
	> 370 ≤ 450	60	50	0.00010	0.0002	0.0004	0.0007	0.0013	0.0020
TOOL STEEL* A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	85	70	0.00010	0.0002	0.0005	0.0009	0.0018	0.0025
	> 250 ≤ 330	55	45	0.00005	0.0001	0.0002	0.0004	0.0008	0.0010
	> 330 ≤ 450	40	35	0.00005	0.0001	0.0002	0.0004	0.0008	0.0010
CAST IRON* Gray, Malleable, Ductile	≤ 200	280	235	0.00025	0.0005	0.0011	0.0021	0.0041	0.0060
	> 200 ≤ 330	250	210	0.00025	0.0005	0.0011	0.0021	0.0041	0.0060
TITANIUM* TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	85	70	0.00020	0.0004	0.0008	0.0016	0.0032	0.0050
	> 280 ≤ 350	65	55	0.00010	0.0002	0.0005	0.0009	0.0018	0.0025
	> 350 ≤ 440	55	45	0.00010	0.0002	0.0004	0.0008	0.0015	0.0025
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	540	450	0.00030	0.0006	0.0013	0.0025	0.0050	0.0075
	> 80	455	380	0.00030	0.0006	0.0013	0.0025	0.0050	0.0075
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	190	160	0.00015	0.0003	0.0006	0.0012	0.0024	0.0035
	> 140	175	145	0.00015	0.0003	0.0006	0.0012	0.0024	0.0035
* AlTiN coating recommended Reduce speed & feed for materials harder than listed			rpm = sfm × 3.82 / D <sub>1</sub>		Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
			ipm = (inch/rev) × rpm						

# Speed & Feed Recommendations

103M Metric	HARDNESS			SPEED (m/min)		FEED (mm/rev)				
	BRINELL	AlTiN	Uncoated	3	6	10	12	16	20	
CARBON STEEL* 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	84	70	0.053	0.108	0.176	0.216	0.264	0.352	
	> 200 ≤ 300	45	37	0.048	0.096	0.160	0.192	0.240	0.320	
	> 300 ≤ 420	32	27	0.031	0.062	0.104	0.125	0.156	0.208	
ALLOY STEEL* 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	70	59	0.048	0.096	0.160	0.190	0.240	0.320	
	> 270 ≤ 370	43	36	0.048	0.094	0.160	0.185	0.240	0.320	
	> 370 ≤ 450	27	22	0.031	0.065	0.104	0.130	0.156	0.208	
TOOL STEEL* A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	26	22	0.031	0.065	0.104	0.132	0.156	0.208	
	> 250 ≤ 330	16	13	0.017	0.036	0.056	0.074	0.084	0.112	
	> 330 ≤ 450	13	11	0.012	0.024	0.040	0.046	0.060	0.080	
CAST IRON* Gray, Malleable, Ductile	≤ 200	77	64	0.060	0.125	0.200	0.247	0.300	0.400	
	> 200 ≤ 330	56	47	0.060	0.122	0.200	0.245	0.300	0.400	
TITANIUM* TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	26	22	0.048	0.098	0.160	0.197	0.240	0.320	
	> 280 ≤ 350	20	17	0.029	0.058	0.096	0.113	0.144	0.192	
	> 350 ≤ 440	16	13	0.029	0.055	0.096	0.110	0.144	0.192	
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	164	137	0.077	0.156	0.256	0.312	0.384	0.512	
	> 80	139	116	0.077	0.156	0.256	0.312	0.384	0.512	
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	70	58	0.038	0.077	0.128	0.156	0.192	0.256	
	> 140	58	48	0.038	0.077	0.128	0.156	0.192	0.256	
* AlTiN coating recommended Reduce speed & feed for materials harder than listed		rpm = (1000 × m/min) / (3.14 × D <sub>1</sub> )			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )					
		mm/min = (mm/rev) × rpm								

# Combined Drill & Countersink



## TOLERANCES (inch)

$D_1 = +.003/-0.000$   
 $D_2 = -.0001/-0.0005$

## 301 FRACTIONAL SERIES

TECH INFO 186

SIZE	inch			EDP NO.	
	BODY DIAMETER $D_2$	DRILL DIAMETER $D_1$	APPROX. OVERALL LENGTH $L_1$	UNCOATED	Ti-NAMITE-A (AlTiN)
00*	1/8	.025	1-1/2	57005	57015
0*	1/8	1/32	1-1/2	57006	57016
1*	1/8	3/64	1-1/2	57007	57017
2*	3/16	5/64	1-7/8	57008	57018
3*	1/4	7/64	2	57009	57019
4*	5/16	1/8	2-1/8	57010	57020
5*	7/16	3/16	2-3/4	57011	57021
6*	1/2	7/32	3	57012	57022
Series 301 Set	-	-	-	57075	-

\*Included in Series 301 Set

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

## TOLERANCES (mm)

### 0,5–2,5 DIAMETER

$D_1 = +0,140/-0,000$

### >2,5–5 DIAMETER

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

## TOLERANCES h9 (mm)

### 0,5–3 DIAMETER

$D_2 = +0,000/-0,025$

### >3–5 DIAMETER

$D_2 = +0,000/-0,030$

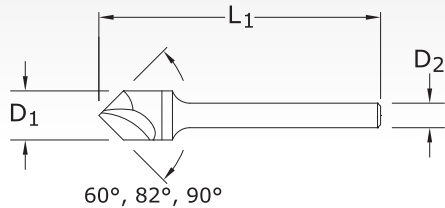
## 301M METRIC SERIES

TECH INFO 187

SIZE	mm		EDP NO.	
	BODY DIAMETER $D_2$	APPROX. OVERALL LENGTH $L_1$	UNCOATED	Ti-NAMITE-A (AlTiN)
0,5	3,15	20,0	67005	67035
0,8	3,15	20,0	67007	67037
1	3,15	31,5	67009	67039
1,25	3,15	31,5	67011	67041
1,6	4,0	35,5	67013	67043
2	5,0	40,0	67015	67045
2,5	6,3	45,0	67017	67047
3,15	8,0	50,0	67019	67049
4	10,0	56,0	67021	67051
5	12,5	63,0	67023	67053



# Single Flute Countersink



## 601

FRACTIONAL SERIES

TECH INFO 188

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

CUTTING DIAMETER D <sub>1</sub>	inch		OVERALL LENGTH L <sub>1</sub>	EDP NO.		
	SHANK DIAMETER D <sub>2</sub>			UNCOATED 60°	UNCOATED 82°	UNCOATED 90°
1/8	1/8		1-1/2	74001	74101	74201
3/16	3/16		2	74004	74104	74204
1/4	1/4		2	74007	74107	74207
3/8*	1/4		2-13/16	74010	74110	74210
1/2*	1/4		2-7/8	74013	74113	74213
5/8*	3/8		3	74016	74116	74216
3/4*	1/2		3	74019	74119	74219
1*	1/2		3-1/4	74022	74122	74222

\*Steel Shank / Con mango de acero / Avec queue en acier

TOLERANCES (inch)

1/8-1/4 DIAMETER

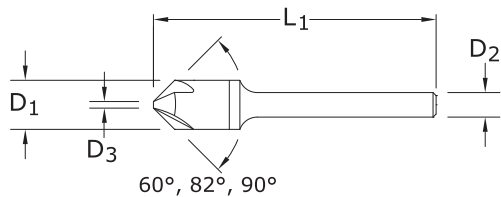
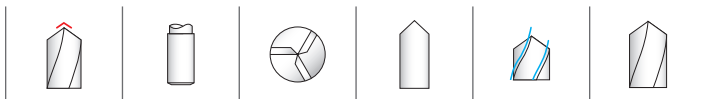
D<sub>1</sub> = +.0000/-0.0005

3/8-1 DIAMETER

D<sub>1</sub> = +.003/-0.000

Included Angle +1°-1°

# 3 Flute Countersink



## 603

FRACTIONAL SERIES

TECH INFO 189

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

CUTTING DIAMETER D <sub>1</sub>	inch		OVERALL LENGTH L <sub>1</sub>	EDP NO.		
	SHANK DIAMETER D <sub>2</sub>			UNCOATED 60°	UNCOATED 82°	UNCOATED 90°
1/8	1/8		1-1/2	74025	74125	74225
3/16	3/16		2	74028	74128	74228
1/4	1/4		2	74031	74131	74231
3/8*	1/4		2-13/16	74034	74134	74234
1/2*	1/4		2-7/8	74037	74137	74237
5/8*	3/8		3	74040	74140	74240
3/4*	1/2		3	74043	74143	74243
1*	1/2		3-1/4	74046	74146	74246

\*Steel Shank / Con mango de acero / Avec queue en acier

TOLERANCES (inch)

1/8-1/4 DIAMETER

D<sub>1</sub> = +.0000/-0.0005

3/8-1 DIAMETER

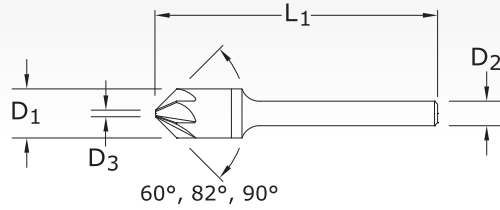
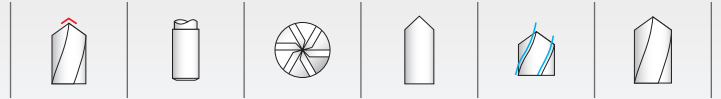
D<sub>1</sub> = +.003/-0.000

Included Angle +1°-1°





# 6 Flute Countersink



## TOLERANCES (inch)

**1/8-1/4 DIAMETER**  
D<sub>1</sub> = +.0000/-0.0005

**3/8-1 DIAMETER**  
D<sub>1</sub> = +.003/-0.000  
Included Angle +1°-1°

## 606 FRACTIONAL SERIES

TECH INFO 190

CUTTING DIAMETER D <sub>1</sub>	inch		EDP NO.		
	SHANK DIAMETER D <sub>2</sub>	OVERALL LENGTH L <sub>1</sub>	UNCOATED 60°	UNCOATED 82°	UNCOATED 90°
1/8	1/8	1-1/2	74049	74149	74249
3/16	3/16	2	74052	74152	74252
1/4	1/4	2	74055	74155	74255
3/8*	1/4	2-13/16	74058	74158	74258
1/2*	1/4	2-7/8	74061	74161	74261
5/8*	3/8	3	74064	74164	74264
3/4*	1/2	3	74067	74167	74267
1*	1/2	3-1/4	74070	74170	74270

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

\*Steel Shank / Con mango de acero / Avec queue en acier



# Speed & Feed Recommendations

301 Fractional	HARDNESS		SPEED (sfm)			FEED (inch/rev)			
	BRINELL	AlTiN	Uncoated	1/32	3/64	5/64	1/8	3/16	7/32
CARBON STEEL* 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	275	230	0.0003	0.0005	0.0007	0.0012	0.0018	0.0021
	> 200 ≤ 300	150	125	0.0003	0.0004	0.0007	0.0011	0.0016	0.0019
	> 300 ≤ 420	105	90	0.0002	0.0003	0.0005	0.0007	0.0011	0.0013
ALLOY STEEL* 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	230	190	0.0003	0.0004	0.0006	0.0010	0.0015	0.0018
	> 270 ≤ 370	140	120	0.0003	0.0004	0.0006	0.0010	0.0015	0.0018
	> 370 ≤ 450	90	75	0.0002	0.0003	0.0004	0.0007	0.0010	0.0012
TOOL STEEL* A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	85	70	0.0002	0.0003	0.0004	0.0007	0.0010	0.0012
	> 250 ≤ 330	50	45	0.0001	0.0002	0.0002	0.0004	0.0006	0.0007
	> 330 ≤ 450	40	35	0.0001	0.0002	0.0002	0.0004	0.0006	0.0007
CAST IRON* Gray, Malleable, Ductile	≤ 200	250	210	0.0004	0.0005	0.0009	0.0014	0.0021	0.0025
	> 200 ≤ 330	185	155	0.0003	0.0005	0.0009	0.0014	0.0021	0.0024
STAINLESS* (free machining) 303, 416, 420F, 430F, 440F	≤ 250	155	125	0.0002	0.0002	0.0004	0.0006	0.0009	0.0011
	> 250 ≤ 330	110	90	0.0001	0.0002	0.0004	0.0006	0.0009	0.0010
STAINLESS* (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	70	55	0.0001	0.0002	0.0004	0.0006	0.0009	0.0010
	> 270 ≤ 370	50	45	0.0001	0.0002	0.0002	0.0004	0.0006	0.0007
TITANIUM* TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	85	70	0.0003	0.0004	0.0007	0.0011	0.0017	0.0020
	> 280 ≤ 350	65	55	0.0001	0.0002	0.0004	0.0006	0.0009	0.0010
	> 350 ≤ 440	50	45	0.0001	0.0002	0.0002	0.0004	0.0006	0.0007
HIGH TEMPERATURE ALLOY* A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	25	20	0.0002	0.0003	0.0005	0.0007	0.0011	0.0013
	> 220 ≤ 330	25	20	0.0001	0.0001	0.0002	0.0003	0.0005	0.0006
	> 330 ≤ 420	15	25	0.0001	0.0001	0.0001	0.0002	0.0003	0.0004
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	540	450	0.0004	0.0007	0.0011	0.0018	0.0027	0.0031
	> 80	455	380	0.0004	0.0007	0.0011	0.0018	0.0027	0.0031
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	230	190	0.0002	0.0003	0.0005	0.0009	0.0013	0.0015
	> 140	195	160	0.0002	0.0003	0.0005	0.0009	0.0013	0.0015
* AlTiN coating recommended Reduce speed & feed for materials harder than listed			$\text{rpm} = \text{sfm} \times 3.82 / D_1$		Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
			$\text{ipm} = (\text{inch/rev}) \times \text{rpm}$						

# Speed & Feed Recommendations

301M Metric	HARDNESS		SPEED (m/min)			FEED (mm/rev)			
	BRINELL	AlTiN	Uncoated	0.5	1	1.6	2.5	4	5
CARBON STEEL* 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	84	70	0.005	0.011	0.014	0.024	0.038	0.048
	> 200 ≤ 300	46	38	0.005	0.009	0.014	0.022	0.034	0.043
	> 300 ≤ 420	32	27	0.003	0.006	0.010	0.014	0.023	0.030
ALLOY STEEL* 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	70	58	0.005	0.009	0.012	0.020	0.032	0.041
	> 270 ≤ 370	43	37	0.005	0.009	0.012	0.020	0.032	0.041
	> 370 ≤ 450	27	23	0.003	0.006	0.008	0.014	0.021	0.027
TOOL STEEL* A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	26	21	0.003	0.006	0.008	0.014	0.021	0.027
	> 250 ≤ 330	15	14	0.048	0.126	0.097	0.207	0.315	0.407
	> 330 ≤ 450	12	11	0.002	0.004	0.004	0.008	0.013	0.016
CAST IRON* Gray, Malleable, Ductile	≤ 200	76	64	0.007	0.011	0.018	0.028	0.045	0.057
	> 200 ≤ 330	56	47	0.005	0.011	0.018	0.028	0.045	0.055
STAINLESS* (free machining) 303, 416, 420F, 430F, 440F	≤ 250	47	38	0.003	0.004	0.008	0.012	0.019	0.025
	> 250 ≤ 330	34	27	0.002	0.004	0.008	0.012	0.019	0.023
STAINLESS* (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	21	17	0.002	0.004	0.008	0.012	0.019	0.023
	> 270 ≤ 370	15	14	0.002	0.004	0.004	0.008	0.013	0.016
TITANIUM* TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	26	21	0.005	0.009	0.014	0.022	0.036	0.046
	> 280 ≤ 350	20	17	0.002	0.004	0.008	0.012	0.019	0.023
	> 350 ≤ 440	15	14	0.002	0.004	0.004	0.008	0.013	0.016
HIGH TEMPERATURE ALLOY* A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	8	6	0.003	0.006	0.010	0.014	0.023	0.030
	> 220 ≤ 330	8	6	0.002	0.002	0.004	0.006	0.011	0.014
	> 330 ≤ 420	5	8	0.002	0.002	0.002	0.004	0.006	0.009
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	165	137	0.007	0.015	0.023	0.036	0.057	0.071
	> 80	139	116	0.007	0.015	0.023	0.036	0.057	0.071
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	70	58	0.003	0.006	0.010	0.018	0.028	0.034
	> 140	59	49	0.003	0.006	0.010	0.018	0.028	0.034
* AlTiN coating recommended Reduce speed & feed for materials harder than listed		$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
		$\text{mm/min} = (\text{mm/rev}) \times \text{rpm}$							

# Speed & Feed Recommendations

601 Fractional	HARDNESS		SPEED		FEED (inch/rev)				
	BRINELL	sfm	1/8	3/16	1/4	3/8	1/2	3/4	1
CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	125	0.0005	0.0008	0.0011	0.0016	0.0021	0.0032	0.0042
	> 200 ≤ 300	60	0.0005	0.0007	0.0010	0.0014	0.0019	0.0029	0.0038
	> 300 ≤ 420	45	0.0003	0.0005	0.0006	0.0009	0.0012	0.0018	0.0024
ALLOY STEEL 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	95	0.0005	0.0007	0.0009	0.0014	0.0018	0.0027	0.0036
	> 270 ≤ 370	60	0.0005	0.0007	0.0009	0.0014	0.0018	0.0027	0.0036
	> 370 ≤ 450	35	0.0003	0.0004	0.0006	0.0008	0.0011	0.0017	0.0022
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	35	0.0003	0.0004	0.0006	0.0008	0.0011	0.0017	0.0022
	> 250 ≤ 330	20	0.0002	0.0002	0.0003	0.0005	0.0006	0.0009	0.0012
	> 330 ≤ 450	20	0.0002	0.0002	0.0003	0.0005	0.0006	0.0009	0.0012
CAST IRON Gray, Malleable, Ductile	≤ 200	105	0.0006	0.0009	0.0012	0.0018	0.0024	0.0036	0.0048
	> 200 ≤ 330	75	0.0006	0.0009	0.0012	0.0018	0.0024	0.0036	0.0048
STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 250	53	0.0003	0.0005	0.0006	0.0009	0.0012	0.0018	0.0024
	> 250 ≤ 330	46	0.0002	0.0003	0.0005	0.0007	0.0009	0.0014	0.0018
STAINLESS (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	28	0.0004	0.0005	0.0007	0.0011	0.0014	0.0021	0.0028
	> 270 ≤ 370	21	0.0002	0.0002	0.0003	0.0005	0.0006	0.0009	0.0012
TITANIUM TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	36	0.0005	0.0007	0.0009	0.0014	0.0018	0.0027	0.0036
	> 280 ≤ 350	28	0.0004	0.0005	0.0007	0.0011	0.0014	0.0021	0.0028
	> 350 ≤ 440	21	0.0002	0.0002	0.0003	0.0005	0.0006	0.0009	0.0012
HIGH TEMPERATURE ALLOY A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	18	0.0002	0.0003	0.0005	0.0007	0.0009	0.0014	0.0018
	> 220 ≤ 330	14	0.0002	0.0003	0.0005	0.0007	0.0009	0.0014	0.0018
	> 330 ≤ 420	12	0.0002	0.0003	0.0004	0.0006	0.0008	0.0012	0.0016
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	225	0.0008	0.0011	0.0015	0.0023	0.0030	0.0045	0.0060
	> 80	190	0.0008	0.0011	0.0015	0.0023	0.0030	0.0045	0.0060
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	95	0.0004	0.0006	0.0008	0.0011	0.0015	0.0023	0.0030
	> 140	80	0.0004	0.0006	0.0008	0.0011	0.0015	0.0023	0.0030
Coatings allow up to 20% increased speed Reduce speed & feed for materials harder than listed			$\text{rpm} = \text{sfm} \times 3.82 / D_1$		Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
			$\text{ipm} = (\text{inch/rev}) \times \text{rpm}$						

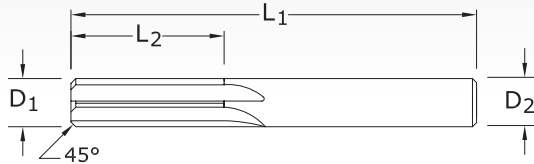
# Speed & Feed Recommendations

603 Fractional	HARDNESS		FEED (inch/rev)						
	BRINELL	SFM	1/8	3/16	1/4	3/8	1/2	3/4	1
CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	125	0.0008	0.0012	0.0016	0.0024	0.0032	0.0047	0.0063
	> 200 ≤ 300	60	0.0007	0.0011	0.0014	0.0021	0.0029	0.0043	0.0057
	> 300 ≤ 420	45	0.0005	0.0007	0.0009	0.0014	0.0018	0.0027	0.0036
ALLOY STEEL 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	95	0.0007	0.0010	0.0014	0.0020	0.0027	0.0041	0.0054
	> 270 ≤ 370	60	0.0007	0.0010	0.0014	0.0020	0.0027	0.0041	0.0054
	> 370 ≤ 450	35	0.0004	0.0006	0.0008	0.0012	0.0017	0.0025	0.0033
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	35	0.0004	0.0006	0.0008	0.0012	0.0017	0.0025	0.0033
	> 250 ≤ 330	20	0.0002	0.0003	0.0005	0.0007	0.0009	0.0014	0.0018
	> 330 ≤ 450	20	0.0002	0.0003	0.0005	0.0007	0.0009	0.0014	0.0018
CAST IRON Gray, Malleable, Ductile	≤ 200	105	0.0009	0.0014	0.0018	0.0027	0.0036	0.0054	0.0072
	> 200 ≤ 330	75	0.0009	0.0014	0.0018	0.0027	0.0036	0.0054	0.0072
STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 250	53	0.0005	0.0007	0.0009	0.0014	0.0018	0.0027	0.0036
	> 250 ≤ 330	46	0.0003	0.0005	0.0007	0.0010	0.0014	0.0020	0.0027
STAINLESS (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	28	0.0005	0.0008	0.0011	0.0016	0.0021	0.0032	0.0042
	> 270 ≤ 370	21	0.0002	0.0003	0.0005	0.0007	0.0009	0.0014	0.0018
TITANIUM TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	36	0.0007	0.0010	0.0014	0.0020	0.0027	0.0041	0.0054
	> 280 ≤ 350	28	0.0005	0.0008	0.0011	0.0016	0.0021	0.0032	0.0042
	> 350 ≤ 440	21	0.0002	0.0003	0.0005	0.0007	0.0009	0.0014	0.0018
HIGH TEMPERATURE ALLOY A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	18	0.0003	0.0005	0.0007	0.0010	0.0014	0.0020	0.0027
	> 220 ≤ 330	14	0.0003	0.0005	0.0007	0.0010	0.0014	0.0020	0.0027
	> 330 ≤ 420	12	0.0003	0.0005	0.0006	0.0009	0.0012	0.0018	0.0024
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	225	0.0011	0.0017	0.0023	0.0034	0.0045	0.0068	0.0090
	> 80	190	0.0011	0.0017	0.0023	0.0034	0.0045	0.0068	0.0090
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	95	0.0006	0.0008	0.0011	0.0017	0.0023	0.0034	0.0045
	> 140	80	0.0006	0.0008	0.0011	0.0017	0.0023	0.0034	0.0045
Coatings allow up to 20% increased speed Reduce speed & feed for materials harder than listed			$\text{rpm} = \text{sfm} \times 3.82 / D_1$		Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
			$\text{ipm} = (\text{inch/rev}) \times \text{rpm}$						

# Speed & Feed Recommendations

606 Fractional	HARDNESS		SPEED		FEED (inch/rev)				
	BRINELL	sfm	1/8	3/16	1/4	3/8	1/2	3/4	1
CARBON STEEL 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	125	0.0011	0.0016	0.0021	0.0032	0.0042	0.0063	0.0084
	> 200 ≤ 300	60	0.0010	0.0014	0.0019	0.0029	0.0038	0.0057	0.0076
	> 300 ≤ 420	45	0.0006	0.0009	0.0012	0.0018	0.0024	0.0036	0.0048
ALLOY STEEL 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	95	0.0009	0.0014	0.0018	0.0027	0.0036	0.0054	0.0072
	> 270 ≤ 370	60	0.0009	0.0014	0.0018	0.0027	0.0036	0.0054	0.0072
	> 370 ≤ 450	35	0.0006	0.0008	0.0011	0.0017	0.0022	0.0033	0.0044
TOOL STEEL A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	35	0.0006	0.0008	0.0011	0.0017	0.0022	0.0033	0.0044
	> 250 ≤ 330	20	0.0003	0.0005	0.0006	0.0009	0.0012	0.0018	0.0024
	> 330 ≤ 450	20	0.0003	0.0005	0.0006	0.0009	0.0012	0.0018	0.0024
CAST IRON Gray, Malleable, Ductile	≤ 200	105	0.0012	0.0018	0.0024	0.0036	0.0048	0.0072	0.0096
	> 200 ≤ 330	75	0.0012	0.0018	0.0024	0.0036	0.0048	0.0072	0.0096
STAINLESS (free machining) 303, 416, 420F, 430F, 440F	≤ 250	53	0.0006	0.0009	0.0012	0.0018	0.0024	0.0036	0.0048
	> 250 ≤ 330	46	0.0005	0.0007	0.0009	0.0014	0.0018	0.0027	0.0036
STAINLESS (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	28	0.0007	0.0011	0.0014	0.0021	0.0028	0.0042	0.0056
	> 270 ≤ 370	21	0.0003	0.0005	0.0006	0.0009	0.0012	0.0018	0.0024
TITANIUM TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	36	0.0009	0.0014	0.0018	0.0027	0.0036	0.0054	0.0072
	> 280 ≤ 350	28	0.0007	0.0011	0.0014	0.0021	0.0028	0.0042	0.0056
	> 350 ≤ 440	21	0.0003	0.0005	0.0006	0.0009	0.0012	0.0018	0.0024
HIGH TEMPERATURE ALLOY A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	18	0.0005	0.0007	0.0009	0.0014	0.0018	0.0027	0.0036
	> 220 ≤ 330	14	0.0005	0.0007	0.0009	0.0014	0.0018	0.0027	0.0036
	> 330 ≤ 420	12	0.0004	0.0006	0.0008	0.0012	0.0016	0.0024	0.0032
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	225	0.0015	0.0023	0.0030	0.0045	0.0060	0.0090	0.0120
	> 80	190	0.0015	0.0023	0.0030	0.0045	0.0060	0.0090	0.0120
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	95	0.0008	0.0011	0.0015	0.0023	0.0030	0.0045	0.0060
	> 140	80	0.0008	0.0011	0.0015	0.0023	0.0030	0.0045	0.0060
Coatings allow up to 20% increased speed Reduce speed & feed for materials harder than listed			$\text{rpm} = \text{sfm} \times 3.82 / D_1$		Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
			$\text{ipm} = (\text{inch/rev}) \times \text{rpm}$						

# Straight Flute Reamer



## TOLERANCES (mm)

1-6 DIAMETER

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

>6-10 DIAMETER

$D_1 = +0,011/-0,00$

## 201M

METRIC SERIES

TECH INFO 195

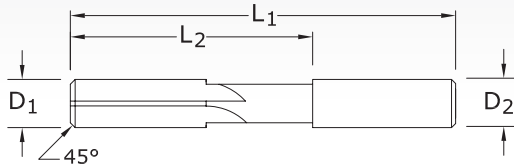
mm					EDP NO. UNCOATED
DIAMETER $D_1$	SHANK DIAMETER $D_2$	MAXIMUM REAM LENGTH $L_2$	OVERALL LENGTH $L_1$	NO. OF FLUTES $Z$	
1,0	1,0	6,0	32,0	4	81001
1,5	1,5	9,5	38,0	4	81003
2,0	2,0	12,7	44,0	4	81005
2,5	2,5	12,7	50,0	4	81007
3,0	3,0	16,0	57,0	4	81009
3,5	3,5	19,0	63,0	4	81011
4,0	4,0	19,0	63,0	4	81013
4,5	4,5	22,0	70,0	4	81015
5,0	5,0	25,0	75,0	4	81017
5,5	5,5	25,0	75,0	4	81019
6,0	6,0	25,0	75,0	4	81021
7,0	7,0	28,0	82,0	6	81023
8,0	8,0	28,0	82,0	6	81025
9,0	9,0	31,0	89,0	6	81027
10,0	10,0	31,0	89,0	6	81029

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

# Straight Flute Accu-Reamer



**200**  
FRACTIONAL SERIES



TOLERANCES (inch)

$D_1 = +.0002/-0.0000$

$D_2 = +.0002/-0.0000$

TECH INFO 194

inch

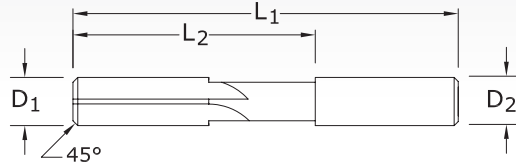
REAMER DIAMETER $D_1$	SHANK DIAMETER $D_2$	MAXIMUM REAM LENGTH $L_2$	OVERALL LENGTH $L_1$	NO. OF FLUTES $Z$	EDP NO. UNCOATED
3/64	3/64	3/4	1-1/2	4	70003
1/16	1/16	3/4	1-1/2	4	70004
5/64	5/64	1	2	4	70005
3/32	3/32	1-1/4	2-1/4	4	70006
7/64	7/64	1-1/4	2-1/4	4	70007
1/8	1/8	1-1/4	2-1/4	4	70008
9/64	9/64	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

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





# Straight Flute Accu-Reamer



## TOLERANCES (inch)

$D_1 = +.0002/-0.0000$

$D_2 = +.0002/-0.0000$

**200**  
FRACTIONAL SERIES

TECH INFO 194

inch				
REAMER DIAMETER $D_1$	SHANK DIAMETER $D_2$	MAXIMUM REAM LENGTH $L_2$	OVERALL LENGTH $L_1$	NO. OF FLUTES $Z$
.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



# Speed & Feed Recommendations

200 Fractional	HARDNESS		SPEED		FEED (inch/rev)				
	BRINELL	sfm	1/16	1/8	3/16	1/4	5/16	3/8	1/2
CARBON STEEL* 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	150	0.0018	0.0035	0.0053	0.0071	0.0088	0.0106	0.0141
	> 200 ≤ 300	75	0.0016	0.0031	0.0047	0.0062	0.0078	0.0093	0.0124
	> 300 ≤ 420	55	0.0009	0.0019	0.0028	0.0037	0.0046	0.0056	0.0074
ALLOY STEEL* 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	115	0.0015	0.0030	0.0045	0.0060	0.0075	0.0090	0.0120
	> 270 ≤ 370	70	0.0015	0.0030	0.0045	0.0060	0.0075	0.0090	0.0120
	> 370 ≤ 450	45	0.0009	0.0019	0.0028	0.0037	0.0046	0.0056	0.0074
TOOL STEEL* A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	40	0.0010	0.0020	0.0029	0.0039	0.0049	0.0059	0.0078
	> 250 ≤ 330	25	0.0006	0.0013	0.0019	0.0025	0.0031	0.0038	0.0050
	> 330 ≤ 450	20	0.0004	0.0008	0.0012	0.0016	0.0019	0.0023	0.0031
CAST IRON* Gray, Malleable, Ductile	≤ 200	125	0.0020	0.0040	0.0060	0.0081	0.0101	0.0121	0.0161
	> 200 ≤ 330	95	0.0020	0.0040	0.0060	0.0081	0.0101	0.0121	0.0161
STAINLESS* (free machining) 303, 416, 420F, 430F, 440F	≤ 250	75	0.0010	0.0019	0.0029	0.0039	0.0048	0.0058	0.0077
	> 250 ≤ 330	55	0.0008	0.0015	0.0023	0.0030	0.0038	0.0045	0.0060
STAINLESS* (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	35	0.0010	0.0019	0.0029	0.0039	0.0048	0.0058	0.0077
	> 270 ≤ 370	25	0.0006	0.0013	0.0019	0.0025	0.0031	0.0038	0.0050
TITANIUM* TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	45	0.0015	0.0031	0.0046	0.0061	0.0076	0.0092	0.0122
	> 280 ≤ 350	35	0.0010	0.0019	0.0029	0.0039	0.0048	0.0058	0.0077
	> 350 ≤ 440	25	0.0006	0.0013	0.0019	0.0025	0.0031	0.0038	0.0050
HIGH TEMPERATURE ALLOY* A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	20	0.0008	0.0016	0.0023	0.0031	0.0039	0.0047	0.0062
	> 220 ≤ 330	15	0.0006	0.0013	0.0019	0.0026	0.0032	0.0038	0.0051
	> 330 ≤ 420	10	0.0004	0.0007	0.0011	0.0015	0.0018	0.0022	0.0029
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	270	0.0025	0.0050	0.0075	0.0100	0.0125	0.0150	0.0200
	> 80	230	0.0025	0.0050	0.0075	0.0100	0.0125	0.0150	0.0200
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	115	0.0013	0.0026	0.0038	0.0051	0.0064	0.0077	0.0102
	> 140	95	0.0013	0.0026	0.0038	0.0051	0.0064	0.0077	0.0102
* AlTiN coating recommended Reduce speed & feed for materials harder than listed			$\text{rpm} = \text{sfm} \times 3.82 / D_1$		Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
			$\text{ipm} = (\text{inch/rev}) \times \text{rpm}$						

# Speed & Feed Recommendations

201M Metric	HARDNESS		FEED (mm/rev)						
	BRINELL	SPEED m/min	1	2	3	4	6	8	10
CARBON STEEL* 1018, 1040, 1080, 1090, 10L50, 1140, 1212, 12L15, 1525, 1536	≤ 200	45	0.028	0.056	0.085	0.113	0.169	0.226	0.282
	> 200 ≤ 300	23	0.025	0.050	0.074	0.099	0.149	0.198	0.248
	> 300 ≤ 420	16	0.015	0.030	0.044	0.059	0.089	0.118	0.148
ALLOY STEEL* 4140, 4150, 4320, 4340, 5120, 5150, 8630, 86L20, 50100, 52100	≤ 270	35	0.024	0.048	0.072	0.096	0.144	0.192	0.240
	> 270 ≤ 370	22	0.024	0.048	0.072	0.096	0.144	0.192	0.240
	> 370 ≤ 450	13	0.015	0.030	0.044	0.059	0.089	0.118	0.148
TOOL STEEL* A2, D2, H13, L2, M2, P20, S7, T15, W2	≤ 250	13	0.016	0.031	0.047	0.062	0.094	0.125	0.156
	> 250 ≤ 330	8	0.010	0.020	0.030	0.040	0.060	0.080	0.100
	> 330 ≤ 450	6	0.006	0.012	0.019	0.025	0.037	0.050	0.062
CAST IRON* Gray, Malleable, Ductile	≤ 200	38	0.032	0.064	0.097	0.129	0.193	0.258	0.322
	> 200 ≤ 330	28	0.032	0.064	0.097	0.129	0.193	0.258	0.322
STAINLESS* (free machining) 303, 416, 420F, 430F, 440F	≤ 250	23	0.015	0.031	0.046	0.062	0.092	0.123	0.154
	> 250 ≤ 330	17	0.012	0.024	0.036	0.048	0.072	0.096	0.120
STAINLESS* (difficult) 304, 316, 321, 15-5ph, 17-4PH, Nitronic 32	≤ 270	10	0.015	0.031	0.046	0.062	0.092	0.123	0.154
	> 270 ≤ 370	8	0.010	0.020	0.030	0.040	0.060	0.080	0.100
TITANIUM* TiCODE-12, Ti-6Al4V, Ti-5Al-5V-5Mo-3Cr, Ti-7Al4Mo, Ti8Al1Mo1V	≤ 280	13	0.024	0.049	0.073	0.098	0.146	0.195	0.244
	> 280 ≤ 350	10	0.015	0.031	0.046	0.062	0.092	0.123	0.154
	> 350 ≤ 440	8	0.010	0.020	0.030	0.040	0.060	0.080	0.100
HIGH TEMPERATURE ALLOY* A-286, Hastelloy, Haynes, Incoloy, Inconel, Rene, Waspalloy	≤ 220	6	0.012	0.025	0.037	0.050	0.074	0.099	0.124
	> 220 ≤ 330	4	0.010	0.020	0.031	0.041	0.061	0.082	0.102
	> 330 ≤ 420	3	0.006	0.012	0.017	0.023	0.035	0.046	0.058
ALUMINUM 2017, 2024, 356, 6061, 7075	≤ 80	82	0.040	0.080	0.120	0.160	0.240	0.320	0.400
	> 80	69	0.040	0.080	0.120	0.160	0.240	0.320	0.400
COPPER ALLOY Alum Bronze, C110, Muntz Brass	≤ 140	35	0.020	0.041	0.061	0.082	0.122	0.163	0.204
	> 140	29	0.020	0.041	0.061	0.082	0.122	0.163	0.204
* AlTiN coating recommended Reduce speed & feed for materials harder than listed		$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$			Refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a> )				
		$\text{mm/min} = (\text{mm/rev}) \times \text{rpm}$							

# ROUTERS



# Routing

HIGH PERFORMANCE ROUTERS	SERIES	PAGE
Carbon Composite Routers	20-CCR, 20M-CCR	200
Coarse Cut Carbon Composite Routers	31-CCR, 31M-CCR	201
Compression Routers	25, 25-M	202
GENERAL PURPOSE ROUTERS	SERIES	PAGE
Up Cut Routers	21, 21M	203
Down Cut Routers	22, 22M	204
TECHNICAL INFORMATION		
Speed & Feed Recommendations		205–209

## Ranurado

RANURADORES DE ALTO RENDIMIENTO	SERIE	PÁGINA
Ranuradores de compuesto de carbono	20-CCR, 20M-CCR	200
Ranuradores de compuesto de carbono de corte áspero	31-CCR, 31M-CCR	201
Ranuradores de compresión	25, 25-M	202
RANURADORES DE USO GENERAL	SERIE	PÁGINA
Ranuradores de corte ascendente	21, 21M	203
Ranuradores de corte descendente	22, 22M	204
INFORMACIÓN TÉCNICA		
Velocidades y avances recomendados		205-209

## Détourage

FRAISES A DETOURER HAUTE PERFORMANCE	SERIES	PAGE
Fraises à détourer pour composite carbone	20-CCR, 20M-CCR	200
Fraises à détourer pour composite carbone coupe grossière	31-CCR, 31M-CCR	201
Fraises à détourer compression	25, 25-M	202
FRAISES À DÉTOURER UNIVERSELLES	SERIES	PAGE
Fraises à détourer up cut	21, 21M	203
Fraises à détourer down cut	22, 22M	204
INFORMATIONS TECHNIQUES		
Recommandations de vitesse et avance		205-209

# Router Icon Legend

## Leyenda del icono de los ranuradores

## Légende des icônes de détourage

### END CONFIGURATIONS CONFIGURACIONES DE LA PUNTA CONFIGURATIONS TERMINALES



Square  
Plana  
Carrée

### 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 Cut Direction  
Fresado sentido izquierda  
Coupe vers la gauche



Right Cut Direction  
Fresado sentido derecha  
Coupe vers la droite



Chip Breaker  
Rompevirutas  
Brise-copeaux

### COATINGS REVESTIMIENTOS REVÊTEMENTS

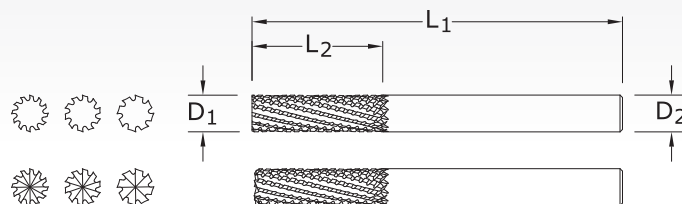


Uncoated



Di-NAMITE  
(Diamond)

# Carbon Composite Routers



## 20-CCR

FRACTIONAL SERIES

TECH INFO 205

TOLERANCES (inch)

$D_1 = +.000/-0.005$

$D_2 = h_6$

PLASTICS/COMPOSITES

inch						EDP NO.	
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	NO. OF FLUTES	END STYLE	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

## 20M-CCR

METRIC SERIES

TECH INFO 206

TOLERANCES (mm)

$D_1 = +0,00/-0,13$

$D_2 = h_6$

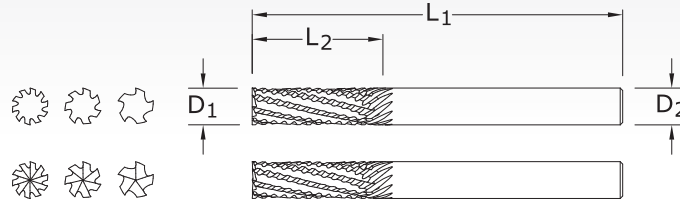
mm						EDP NO.	
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	NO. OF FLUTES	END STYLE	UNCOATED	Di-NAMITE (Diamond)
6,0	25,0	63,0	6,0	8	No End Cutting	82966	83027
6,0	25,0	63,0	6,0	8	End Cutting	82967	83026
8,0	25,0	63,0	8,0	10	No End Cutting	82968	83029
8,0	25,0	63,0	8,0	10	End Cutting	82969	83028
10,0	28,0	63,0	10,0	12	No End Cutting	82970	83042
10,0	28,0	63,0	10,0	12	End Cutting	82971	83041
12,0	38,0	89,0	12,0	12	No End Cutting	82972	83044
12,0	38,0	89,0	12,0	12	End Cutting	82973	83043







# Coarse Cut Carbon Composite Routers



## TOLERANCES (inch)

$D_1 = +.000/-0.005$

$D_2 = h_6$

## 31-CCR

FRACTIONAL SERIES

TECH INFO 205

inch						EDP NO.	
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	NO. OF FLUTES	END STYLE	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

PLASTICS/COMPOSITES

## TOLERANCES (mm)

$D_1 = +0,00/-0,13$

$D_2 = h_6$

## 31M-CCR

METRIC SERIES

TECH INFO 206

mm						EDP NO.	
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	NO. OF FLUTES	END STYLE	UNCOATED	Di-NAMITE (Diamond)
6,0	18,0	63,0	6,0	5	End Cutting	82974	82982
6,0	18,0	63,0	6,0	5	No End Cutting	82975	82983
8,0	25,0	63,0	8,0	7	End Cutting	82976	82984
8,0	25,0	63,0	8,0	7	No End Cutting	82977	82985
10,0	30,0	63,0	10,0	8	End Cutting	82978	82986
10,0	30,0	63,0	10,0	8	No End Cutting	82979	82987
12,0	38,0	89,0	12,0	10	End Cutting	82980	82988
12,0	38,0	89,0	12,0	10	No End Cutting	82981	82989

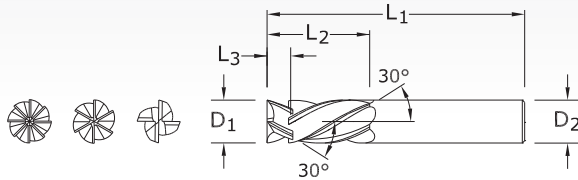


# Compression Routers



## 25

### FRACTIONAL SERIES



#### TOLERANCES (inch)

$D_1 = +0.000/-0.003$

$D_2 = h_6$

TECH INFO 207

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch			EDP NO.	
		OVERALL LENGTH $L_1$	REACH $L_3$	SHANK DIAMETER $D_2$	UNCOATED	Di-NAMITE (Diamond)
1/4	1	2-1/2	11/64	1/4	72970	72971
5/16	1	2-1/2	7/32	5/16	72972	72973
3/8	1-1/8	2-1/2	17/64	3/8	72974	72975
1/2	1-1/2	3-1/2	23/64	1/2	72976	72977

PLASTICS/COMPOSITES

## 25M

### METRIC SERIES

TECH INFO 208

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	mm			EDP NO.	
		OVERALL LENGTH $L_1$	REACH $L_3$	SHANK DIAMETER $D_2$	UNCOATED	Di-NAMITE (Diamond)
6,0	25,0	63,0	4,10	6,0	82990	82991
8,0	25,0	63,0	5,58	8,0	82992	82993
10,0	28,0	63,0	7,05	10,0	82994	82995
12,0	38,0	89,0	8,60	12,0	82996	82997

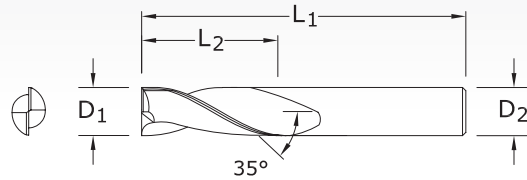
#### TOLERANCES (mm)

$D_1 = +0,00/-0,08$

$D_2 = h_6$



# Up Cut Routers



## TOLERANCES (inch)

$D_1 = +0.000/-0.003$

$D_2 = h_6$

## 21

FRACTIONAL SERIES

TECH INFO 209

inch				EDP NO.
CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	OVERALL LENGTH $L_1$	SHANK DIAMETER $D_2$	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

- NON-FERROUS
- PLASTICS/COMPOSITES

## TOLERANCES (mm)

$D_1 = +0,00/-0,08$

$D_2 = h_6$

## 21M

METRIC SERIES

TECH INFO 209

mm				EDP NO.
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

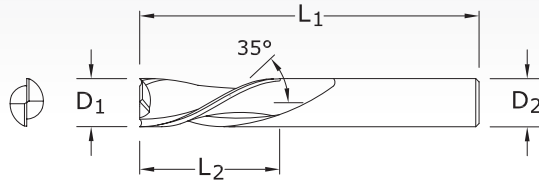


# Down Cut Routers



## 22

FRACTIONAL SERIES



TOLERANCES (inch)

$D_1 = +0.000/-0.003$

$D_2 = h_6$

TECH INFO 209

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	inch		SHANK DIAMETER $D_2$	EDP NO. UNCOATED
		OVERALL LENGTH $L_1$			
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

NON-FERROUS

PLASTICS/COMPOSITES

## 22M

METRIC SERIES

TECH INFO 209

CUTTING DIAMETER $D_1$	LENGTH OF CUT $L_2$	mm		SHANK DIAMETER $D_2$	EDP NO. UNCOATED
		OVERALL LENGTH $L_1$			
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

TOLERANCES (mm)




$D_1 = +0,00/-0,08$

$D_2 = h_6$





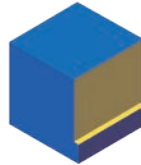
# Speed & Feed Recommendations

20, 31 Fractional	CUT		FEED (inch/rev)				
	TYPE	SFM	1/16	1/8	1/4	3/8	1/2
CFRP, AFRP (Carbon Fiber, Aramid Fiber)	Slot	400	0.0012	0.0024	0.0048	0.0090	0.0120
	Profile	500	0.0012	0.0024	0.0048	0.0090	0.0120
	Light	825	0.0028	0.0056	0.0111	0.0207	0.0276
GFRP (Fiberglass)	Slot	320	0.0012	0.0024	0.0048	0.0090	0.0120
	Profile	400	0.0012	0.0024	0.0048	0.0090	0.0120
	Light	660	0.0028	0.0056	0.0111	0.0207	0.0276
CARBON, GRAPHITE	Slot	480	0.0015	0.0030	0.0060	0.0114	0.0150
	Profile	600	0.0015	0.0030	0.0060	0.0114	0.0150
	Light	990	0.0035	0.0069	0.0138	0.0258	0.0345
PLASTIC	Slot	800	0.0015	0.0030	0.0060	0.0114	0.0150
	Profile	1000	0.0015	0.0030	0.0060	0.0114	0.0150
	Light	1650	0.0035	0.0069	0.0138	0.0258	0.0345
MACHINABLE CERAMIC, MACHINABLE GLASS	Slot	40	0.0006	0.0012	0.0024	0.0045	0.0060
	Profile	50	0.0006	0.0012	0.0024	0.0045	0.0060
	Light	85	0.0014	0.0027	0.0054	0.0102	0.0138

CUT TYPE			rpm = sfm x 3.82 / D <sub>1</sub> ipm = (inch/rev) x rpm
SLOT	PROFILE	LIGHT*	
31 Rw = D <sub>1</sub> Ad = D <sub>1</sub>	31 Rw = .5 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	20, 31 Rw = .05 x D <sub>1</sub> Ad = L <sub>2</sub>	<ul style="list-style-type: none"> <li>• maximum recommended depths shown</li> <li>• adjust speed and feed based upon resin type and/or fiber structure</li> <li>• reduce speed when overheating causes melting or damage to resin</li> <li>• reduce feed if delamination or fraying occurs</li> <li>* finish cuts typically require reduced feed and cutting depths</li> <li>• rates shown are for use without coolant; rates may be increased with coolant use</li> <li>• dust collection is vital when machining dry</li> <li>• diamond coating will increase tool life in graphite and composite materials</li> <li>• refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a>)</li> </ul>
			

# Speed & Feed Recommendations

20M, 31M Metric	CUT		SPEED					FEED (mm/rev)				
	TYPE	m/min	1.6	3	6	10	12					
CFRP, AFRP (Carbon Fiber, Aramid Fiber)	Slot	120	0.030	0.060	0.120	0.230	0.305					
	Profile	150	0.030	0.060	0.120	0.230	0.305					
	Light	250	0.070	0.140	0.280	0.525	0.700					
GFRP (Fiberglass)	Slot	100	0.030	0.060	0.120	0.230	0.305					
	Profile	120	0.030	0.060	0.120	0.230	0.305					
	Light	200	0.070	0.140	0.280	0.525	0.700					
CARBON, GRAPHITE	Slot	145	0.040	0.075	0.150	0.290	0.380					
	Profile	185	0.040	0.075	0.150	0.290	0.380					
	Light	300	0.090	0.175	0.350	0.655	0.875					
PLASTIC	Slot	245	0.040	0.075	0.150	0.290	0.380					
	Profile	305	0.040	0.075	0.150	0.290	0.380					
	Light	505	0.090	0.175	0.350	0.655	0.875					
MACHINABLE CERAMIC, MACHINABLE GLASS	Slot	10	0.015	0.030	0.060	0.115	0.150					
	Profile	15	0.015	0.030	0.060	0.115	0.150					
	Light	25	0.035	0.070	0.135	0.260	0.350					

CUT TYPE		
SLOT	PROFILE	LIGHT*
31M Rw = D <sub>1</sub> Ad = D <sub>1</sub>	31M Rw = .5 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	20M, 31M Rw = .05 x D <sub>1</sub> Ad = L <sub>2</sub>
		



$$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$$

$$\text{mm/min} = (\text{mm/rev}) \times \text{rpm}$$

- maximum recommended depths shown
- adjust speed and feed based upon resin type and/or fiber structure
- reduce speed when overheating causes melting or damage to resin
- reduce feed if delamination or fraying occurs
- \* finish cuts typically require reduced feed and cutting depths
- rates shown are for use without coolant; rates may be increased with coolant use
- dust collection is vital when machining dry
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# Speed & Feed Recommendations

25 Fractional	CUT		FEED (inch/flute)				
	TYPE	SPEED sfm	1/4	5/16	3/8	1/2	3/4
CFRP, AFRP (Carbon Fiber, Aramid Fiber)	Profile	500	0.0016	0.0025	0.0030	0.0040	0.0048
	Light	825	0.0037	0.0057	0.0069	0.0092	0.0110
GFRP (Fiberglass)	Profile	400	0.0016	0.0025	0.0030	0.0040	0.0048
	Light	660	0.0037	0.0057	0.0069	0.0092	0.0110
CARBON, GRAPHITE	Profile	600	0.0020	0.0031	0.0038	0.0050	0.0060
	Light	990	0.0046	0.0072	0.0086	0.0115	0.0138
PLASTIC	Profile	1000	0.0020	0.0031	0.0038	0.0050	0.0060
	Light	1650	0.0046	0.0072	0.0086	0.0115	0.0138
MACHINABLE CERAMIC, MACHINABLE GLASS	Profile	50	0.0008	0.0013	0.0015	0.0020	0.0024
	Light	85	0.0018	0.0029	0.0034	0.0046	0.0055

CUT TYPE		rpm = sfm x 3.82 / D <sub>1</sub> ipm = (inch/flute) x no. of flutes x rpm
PROFILE	LIGHT*	
Rw = .5 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Rw = .05 x D <sub>1</sub> Ad = L <sub>2</sub>	<ul style="list-style-type: none"> <li>• maximum recommended depths shown</li> <li>• adjust speed and feed based upon resin type and/or fiber structure</li> <li>• reduce speed when overheating causes melting or damage to resin</li> <li>• reduce feed if delamination or fraying occurs</li> <li>* finish cuts typically require reduced feed and cutting depths</li> <li>• rates shown are for use without coolant; rates may be increased with coolant use</li> <li>• dust collection is vital when machining dry</li> <li>• diamond coating will increase tool life in graphite and composite materials</li> <li>• refer to the SGS Tool Wizard for more complete technical information (available at <a href="http://www.sgstool.com">www.sgstool.com</a>)</li> </ul>
		

# Speed & Feed Recommendations

25M Metric	CUT		SPEED					FEED (mm/flute)				
	TYPE	m/min	6	8	10	12	16	6	8	10	12	16
CFRP, AFRP (Carbon Fiber, Aramid Fiber)	Profile	150	0.040	0.065	0.075	0.100	0.120					
	Light	250	0.095	0.145	0.175	0.235	0.280					
GFRP (Fiberglass)	Profile	120	0.040	0.065	0.075	0.100	0.120					
	Light	200	0.095	0.145	0.175	0.235	0.280					
CARBON, GRAPHITE	Profile	185	0.050	0.080	0.095	0.125	0.150					
	Light	300	0.115	0.185	0.220	0.290	0.350					
PLASTIC	Profile	305	0.050	0.080	0.095	0.125	0.150					
	Light	505	0.115	0.185	0.220	0.290	0.350					
MACHINABLE CERAMIC, MACHINABLE GLASS	Profile	15	0.020	0.035	0.040	0.050	0.060					
	Light	25	0.045	0.075	0.085	0.115	0.140					

CUT TYPE	
PROFILE	LIGHT*
Rw = .5 x D <sub>1</sub> Ad = 1.5 x D <sub>1</sub>	Rw = .05 x D <sub>1</sub> Ad = L <sub>2</sub>
	

$$\text{rpm} = (1000 \times \text{m/min}) / (3.14 \times D_1)$$

$$\text{mm/min} = (\text{mm/flute}) \times \text{no. of flutes} \times \text{rpm}$$


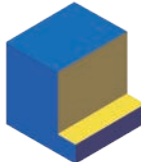
- maximum recommended depths shown
- adjust speed and feed based upon resin type and/or fiber structure
- reduce speed when overheating causes melting or damage to resin
- reduce feed if delamination or fraying occurs
- \* finish cuts typically require reduced feed and cutting depths
- rates shown are for use without coolant; rates may be increased with coolant use
- dust collection is vital when machining dry
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# Speed & Feed Recommendations

21, 22 Fractional	CUT	SPEED	FEED (inch/flute)				
	TYPE	sfm	1/8	1/4	3/8	1/2	3/4
HARDWOOD	Slot	1550	0.0008	0.0015	0.0025	0.0030	0.0045
	Profile						
SOFTWOOD	Slot	1950	0.0010	0.0020	0.0030	0.0035	0.0055
	Profile						
PLYWOOD	Slot	1950	0.0013	0.0025	0.0040	0.0050	0.0075
	Profile						
ALUMINUM	Slot	1150	0.0006	0.0015	0.0020	0.0025	0.0040
	Profile						
PLASTIC	Slot	1950	0.0008	0.0017	0.0025	0.0035	0.0050
	Profile						

21M, 22M Metric	CUT	SPEED	FEED (mm/flute)				
	TYPE	m/min	3	6	10	12	20
HARDWOOD	Slot	470	0.020	0.040	0.065	0.075	0.115
	Profile						
SOFTWOOD	Slot	600	0.025	0.050	0.075	0.090	0.140
	Profile						
PLYWOOD	Slot	600	0.030	0.065	0.100	0.125	0.190
	Profile						
ALUMINUM	Slot	350	0.015	0.040	0.050	0.065	0.100
	Profile						
PLASTIC	Slot	600	0.020	0.040	0.065	0.090	0.125
	Profile						

CUT TYPE		$rpm = sfm \times 3.82 / D_1$ $rpm = (1000 \times m/min) / (3.14 \times D_1)$ $ipm = (inch/flute) \times 2 \times rpm$ $mm/min = (mm/flute) \times 2 \times rpm$
SLOT	PROFILE	
$Rw = D_1$ $Ad = D_1$	$Rw = .5 \times D_1$ $Ad = 1.5 \times D_1$	<ul style="list-style-type: none"> <li>maximum recommended depths shown</li> </ul>
		

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30885	106	31154	106	31244	74	31348	100	31443	78	31523	94	31601	74	31754	89
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32674	32	32760	46	32830	44	33124	80	34307	51	34653	55	34728	48	34813	44
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32676	32	32762	46	32832	46	33126	81	34309	51	34655	55	34730	48	34816	44
32677	32	32763	46	32833	46	33127	75	34501	42	34656	55	34731	48	34817	44
32678	32	32764	46	32834	46	33128	81	34502	42	34657	55	34732	48	34818	44
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32680	32	32766	44	32836	46	33130	81	34504	42	34661	52	34734	48	35275	103
32681	32	32767	46	32837	46	33131	76	34505	42	34662	52	34735	48	35277	103
32682	32	32768	46	32838	46	33132	81	34506	42	34663	52	34736	48	35278	103
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32752	46	32822	46	33114	81	33344	96	34643	54	34720	48	34804	44	35505	88
32753	46	32823	46	33115	76	34300	51	34644	54	34721	48	34805	44	35506	88
32754	46	32824	46	33116	81	34301	51	34645	54	34722	48	34806	44	35507	88
32755	46	32825	44	33117	76	34302	51	34646	54	34723	48	34807	44	35508	88
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38294	102	38360	102	39025	75	39109	114	39174	81	39260	110	39365	91	39549	91
38295	102	38361	102	39026	80	39109	75	39175	76	39260	111	39366	97	39550	97
38296	102	38362	102	39027	75	39110	80	39176	81	39301	90	39367	91	39551	91
38297	102	38363	102	39028	80	39111	75	39177	75	39302	96	39368	97	39552	97
38298	102	38364	102	39029	75	39112	80	39178	80	39303	90	39369	91	39553	91
38299	102	38365	102	39030	80	39113	75	39189	114	39304	96	39370	97	39554	97
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38301	102	38367	102	39032	80	39115	75	39190	81	39306	96	39372	97	39556	97
38302	102	38368	102	39033	75	39116	80	39208	110	39307	90	39373	91	39557	91
38303	102	38369	102	39034	80	39117	75	39208	111	39308	96	39374	97	39558	97
38304	102	38370	102	39035	75	39118	80	39209	110	39309	90	39375	91	39559	91
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38308	102	38374	102	39039	75	39122	80	39211	110	39313	90	39389	114	39563	91
38309	102	38375	102	39040	80	39123	75	39211	111	39314	96	39389	91	39564	97
38310	102	38376	102	39041	75	39124	80	39212	110	39315	90	39390	114	39565	91
38311	102	38377	102	39042	81	39125	75	39212	111	39316	96	39390	97	39566	97
38312	102	38378	102	39043	75	39126	80	39213	110	39317	90	39501	90	39567	91
38313	102	38379	102	39044	81	39127	75	39213	111	39318	96	39502	96	39568	97
38314	102	38380	102	39045	75	39128	80	39214	110	39319	90	39503	90	39569	91
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38316	102	38382	102	39047	75	39130	80	39215	110	39321	90	39505	90	39571	91
38317	102	38383	102	39048	81	39131	75	39215	111	39322	96	39506	96	39572	97
38318	102	38384	102	39049	75	39132	80	39216	110	39323	90	39507	90	39573	91
38319	102	38385	102	39050	81	39133	75	39216	111	39324	96	39508	96	39574	97
38320	102	38386	102	39051	76	39134	80	39217	110	39325	90	39509	90	39575	91
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38322	102	38388	102	39053	76	39136	80	39218	110	39327	90	39511	90	39577	90
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38339	102	39004	80	39070	81	39153	76	39226	111	39344	97	39528	96	39612	83
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38356	102	39021	75	39105	75	39170	81	39250	110	39361	91	39545	91	39629	78
38357	102	39022	80	39106	80	39171	76	39250	111	39362	97	39546	97	39630	83

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39634	83	39727	104	40126	82	40374	98	41438	84	41717	89	43306	98	43919	93
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39637	78	39733	104	40133	77	40381	92	41445	79	41729	89	43315	92	43922	93
39638	83	39735	104	40134	82	40382	98	41446	84	41733	89	43316	98	43923	93
39639	78	39737	104	40137	77	40385	92	41449	79	41737	89	43325	92	43924	93
39640	83	39739	104	40138	82	40386	98	41450	84	41741	89	43326	98	43925	93
39641	114	39741	104	40141	77	40505	105	41453	79	41745	89	43335	92	43926	93
39642	114	39743	104	40142	82	40506	107	41454	84	41749	89	43336	98	43927	93
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39653	94	39751	104	40150	82	40514	107	41462	84	41765	89	43356	98	43931	93
39654	100	39753	104	40153	77	40517	105	41465	79	42606	33	43365	92	43932	93
39655	94	39755	104	40154	82	40518	107	41466	84	42607	33	43366	98	43933	93
39656	100	39757	104	40157	77	40521	105	41505	95	42608	33	43375	92	43934	93
39657	94	39759	104	40158	82	40522	107	41506	101	42609	33	43376	98	43935	93
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39673	94	40004	87	40305	92	40553	105	41537	95	42624	33	43525	105	43951	93
39674	100	40005	87	40306	98	40554	107	41538	101	42625	33	43526	107	43952	93
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39682	100	40017	87	40322	98	40570	107	41554	101	43106	82	43566	107	43960	108
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39691	94	40032	87	40342	98	41406	84	41617	74	43146	82	43903	99	44301	51
39692	100	40035	87	40345	92	41409	79	41621	74	43155	77	43904	99	44302	51
39692	114	40037	87	40346	98	41410	84	41625	74	43156	82	43905	99	44303	51
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39707	104	40106	82	40354	98	41418	84	41641	74	43176	82	43909	99	44307	51
39709	104	40109	77	40357	92	41421	79	41645	74	43185	77	43910	93	44308	51
39711	104	40110	82	40358	98	41422	84	41649	74	43186	82	43911	93	44309	51
39713	104	40113	77	40361	92	41425	79	41653	74	43195	77	43912	93	44505	43
39715	104	40114	82	40362	98	41426	84	41657	74	43196	82	43913	93	44506	43
39717	104	40117	77	40365	92	41429	79	41661	74	43301	92	43914	93	44509	43
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44517	43	44603	53	44803	45	46112	109	46473	26	46856	18	48517	77	48584	82
44518	43	44604	53	44804	45	46113	109	46474	26	46857	18	48518	77	48586	82
44521	43	44605	53	44805	45	46114	109	46475	26	46858	18	48519	77	48587	82
44522	43	44606	53	44806	45	46116	109	46476	26	46859	18	48520	77	48588	82
44525	43	44607	53	44807	45	46117	109	46477	26	46860	18	48522	77	48589	82
44526	43	44608	53	44808	45	46118	109	46478	26	46861	18	48523	77	48590	82
44529	43	44609	54	45277	103	46120	109	46479	26	46862	18	48524	77	48591	82
44530	43	44610	54	45279	103	46121	109	46480	26	46863	18	48525	77	48592	82
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44534	43	44612	54	45283	103	46128	109	46494	18	46865	18	48527	77	48594	82
44537	43	44613	54	45285	103	46129	109	46495	18	46866	18	48528	77	48595	82
44538	43	44614	54	45287	103	46130	109	46497	18	46880	18	48529	77	48596	82
44541	43	44615	55	45289	103	46131	109	46498	18	46881	18	48530	77	48597	82
44542	43	44616	55	45291	103	46132	109	46506	22	46882	18	48531	77	48598	82
44545	43	44617	55	45293	103	46133	109	46507	22	46884	18	48532	77	48599	82
44546	43	44618	55	45295	103	46140	40	46508	22	46886	18	48533	77	48600	82
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44566	54	44769	45	45491	88	46358	22	46620	36	46911	18	48550	77	48617	82
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44596	52	44796	45	46026	108	46466	26	46841	19	48510	77	48577	82	48644	92
44597	52	44797	45	46106	109	46467	26	46849	18	48511	77	48578	82	48645	92
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48652	92	48719	98	48786	105	48852	107	48928	79	49014	95	49100	101	49186	74
48653	92	48720	98	48787	105	48853	107	48929	79	49015	95	49101	101	49187	74
48654	92	48721	98	48788	105	48854	107	48930	79	49016	95	49102	101	49188	74
48655	92	48722	98	48789	105	48855	107	48931	79	49017	95	49103	101	49189	74
48656	92	48723	98	48790	105	48856	107	48932	79	49018	95	49104	101	49190	74
48657	92	48724	98	48791	105	48857	107	48933	79	49019	95	49105	101	49191	74
48658	92	48725	98	48792	105	48858	107	48934	79	49020	95	49106	101	49192	74
48659	92	48726	98	48793	105	48859	107	48935	79	49021	95	49107	101	49193	74
48660	92	48727	98	48794	105	48860	107	48936	79	49022	95	49108	101	49262	89
48661	92	48728	98	48795	105	48861	107	48937	79	49023	95	49109	101	49263	89
48662	92	48729	98	48796	105	48862	107	48938	79	49024	95	49115	101	49264	89
48663	92	48730	98	48797	105	48863	107	48939	79	49025	95	49116	101	49265	89
48664	92	48731	98	48798	105	48864	107	48940	79	49031	95	49117	101	49266	89
48665	92	48732	98	48799	105	48865	107	48941	79	49032	95	49118	101	49267	89
48666	92	48733	98	48800	105	48866	107	48947	84	49033	95	49119	101	49268	89
48667	92	48734	98	48801	105	48867	107	48948	84	49034	95	49120	101	49269	89
48668	92	48735	98	48802	105	48868	107	48949	84	49035	95	49121	101	49270	89
48669	92	48736	98	48803	105	48869	107	48950	84	49036	95	49122	101	49271	89
48670	92	48737	98	48804	105	48870	107	48951	84	49037	95	49123	101	49272	89
48671	92	48738	98	48805	105	48871	107	48952	84	49038	95	49124	101	49273	89
48672	92	48739	98	48806	105	48872	107	48953	84	49039	95	49125	101	49274	89
48673	92	48740	98	48807	105	48873	107	48954	84	49040	95	49126	101	49275	89
48674	92	48741	98	48808	105	48874	107	48955	84	49041	95	49127	101	49276	89
48675	92	48742	98	48809	105	48875	107	48956	84	49042	95	49128	101	49277	89
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48677	92	48744	98	48811	105	48877	107	48958	84	49044	95	49130	101	49284	89
48678	92	48745	98	48812	105	48878	107	48959	84	49045	95	49136	74	49285	89
48679	92	48746	98	48813	105	48879	107	48960	84	49046	95	49137	74	49286	89
48680	92	48747	98	48814	105	48880	107	48961	84	49052	95	49138	74	49287	89
48681	92	48748	98	48815	105	48881	107	48962	84	49053	95	49139	74	49288	89
48682	92	48749	98	48816	105	48882	107	48968	84	49054	95	49140	74	49289	89
48683	92	48750	98	48817	105	48883	107	48969	84	49055	95	49141	74	49290	89
48684	92	48751	98	48818	105	48884	79	48970	84	49056	95	49142	74	49291	89
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48686	92	48753	98	48820	107	48886	79	48972	84	49058	95	49144	74	49293	89
48687	92	48754	98	48821	107	48887	79	48973	84	49059	95	49145	74	49294	89
48688	92	48755	98	48822	107	48888	79	48974	84	49060	95	49146	74	49295	89
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48690	92	48757	105	48824	107	48890	79	48976	84	49062	95	49148	74	49297	89
48691	92	48758	105	48825	107	48891	79	48977	84	49063	95	49149	74	49298	89
48692	98	48759	105	48826	107	48892	79	48978	84	49064	95	49150	74	49304	89
48693	98	48760	105	48827	107	48893	79	48979	84	49065	95	49151	74	49305	89
48694	98	48761	105	48828	107	48894	79	48980	84	49066	95	49157	74	49306	89
48695	98	48762	105	48829	107	48895	79	48981	84	49067	95	49158	74	49307	89
48696	98	48763	105	48830	107	48896	79	48982	84	49073	101	49159	74	49308	89
48697	98	48764	105	48831	107	48897	79	48983	84	49074	101	49160	74	49309	89
48698	98	48765	105	48832	107	48898	79	48989	84	49075	101	49161	74	49310	89
48699	98	48766	105	48833	107	48899	79	48990	84	49076	101	49162	74	49311	89
48700	98	48767	105	48834	107	48905	79	48991	84	49077	101	49163	74	49312	89
48701	98	48768	105	48835	107	48906	79	48992	84	49078	101	49164	74	49313	89
48702	98	48769	105	48836	107	48907	79	48993	84	49079	101	49165	74	49314	89
48703	98	48770	105	48837	107	48908	79	48994	84	49080	101	49166	74	49315	89
48704	98	48771	105	48838	107	48909	79	48995	84	49081	101	49167	74	49316	89
48705	98	48772	105	48839	107	48910	79	48996	84	49082	101	49168	74	49317	89
48706	98	48773	105	48840	107	48911	79	48997	84	49083	101	49169	74	49318	89
48707	98	48774	105	48842	107	48912	79	48998	84	49084	101	49170	74	49319	89
48708	98	48775	105	48843	107	48913	79	48999	84	49085	101	49171	74	49388	77
48709	98	48776	105	48844	107	48914	79	49000	84	49086	101	49172	74	49389	77
48710	98	48778	105	48845	107	48915	79	49001	84	49087	101	49178	74	49390	77
48711	98	48779	105	48846	107	48916	79	49002	84	49088	101	49179	74	49391	77
48712	98	48780	105	48847	107	48917	79	49003	84	49094	101	49180	74	49392	77
48714	98	48781	105	48848	107	48918	79	49004	84	49095	101	49181	74	49393	77
48715	98	48782	105	48849	107	48919	79	49010	95	49096	101	49182	74	49394	77
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63749	134	63920	140	63986	143	67013	183	68318	160	68649	167	68723	168	69018	175
63750	134	63921	140	63987	143	67015	183	68319	160	68650	167	68728	168	69019	176
63751	134	63922	140	63988	143	67017	183	68320	160	68651	167	68733	169	69020	176
63752	134	63923	141	63989	143	67019	183	68321	160	68652	167	68738	169	69021	176
63753	134	63924	141	63990	143	67021	183	68322	160	68653	167	68743	169	69022	176
63754	135	63925	141	63991	143	67023	183	68323	160	68654	167	68748	169	69023	176
63755	135	63926	141	63992	143	67035	183	68324	161	68655	167	68753	169	69024	176
63756	135	63927	141	63993	143	67037	183	68325	161	68656	167	68758	169	69025	176
63757	135	63928,0	141	63994	143	67039	183	68326	161	68657	167	68763	169	69026	176
63758	135	63929	141	63995	143	67041	183	68327	161	68658	167	68768	169	69027	176
63759	135	63930	141	63996	143	67043	183	68328	161	68659	167	68773	169	69028	176
63760	135	63931	141	63997	143	67045	183	68329	161	68660	167	68778	169	69029	176
63761	135	63932	141	63998	141	67047	183	68330	161	68661	167	68780	169	69030	176
63762	135	63933	141	63999	141	67049	183	68331	161	68662	167	68965	173	69031	176
63763	135	63934	141	64000	143	67051	183	68332	161	68663	167	68966	173	69032	176
63764	135	63935	141	64001	143	67053	183	68333	161	68664	167	68967	173	69033	176
63765	135	63936	141	66001	170	68268	158	68334	161	68665	167	68968	173	69034	176
63766	135	63937	141	66002	170	68269	158	68335	161	68666	167	68969	173	69035	176
63767	135	63938	141	66003	170	68270	158	68336	161	68667	167	68970	173	69036	176
63768	135	63939	141	66004	170	68271	158	68337	161	68668	167	68971	173	69037	176
63769	135	63940	141	66005	170	68272	159	68338	161	68669	167	68972	173	69038	176
63770	135	63941	141	66006	170	68273	159	68339	161	68670	167	68973	173	69039	176
63771	136	63942	141	66007	170	68274	159	68340	162	68671	167	68974	173	69040	176
63772	136	63943	141	66008	170	68275	159	68341	162	68672	167	68975	173	69041	177
63773	136	63944	141	66009	170	68276	160	68342	162	68673	167	68976	173	69042	177
63774	136	63945	141	66010	170	68277	160	68343	162	68674	167	68977	173	69043	177
63775	136	63946	141	66011	171	68278	160	68344	162	68675	167	68978	173	69044	177
63776	136	63947	141	66012	171	68279	161	68345	162	68676	167	68979	174	69045	177
63777	136	63948	141	66013	171	68280	161	68346	162	68677	167	68980	174	69046	177
63778	136	63949	141	66014	171	68281	161	68347	162	68678	167	68981	174	69047	177
63779	136	63950	141	66015	171	68282	161	68348	162	68679	167	68982	174	69048	177
63780	136	63951	142	66016	171	68283	162	68349	162	68680	167	68983	174	69049	177
63781	136	63952	142	66017	171	68284	162	68350	162	68681	168	68984	174	69050	177
63782	136	63953	142	66018	171	68285	162	68351	162	68682	168	68985	174	69051	177
63783	136	63954	142	66019	171	68286	162	68352	162	68683	168	68986	174	69052	177
63784	136	63955	142	66020	171	68287	163	68353	162	68684	168	68987	174	69053	177
63785	136	63956	142	66021	171	68288	163	68354	162	68685	168	68988	174	69054	177
63786	136	63957	142	66022	172	68289	163	68355	162	68686	168	68989	174	69055	177
63787	136	63958	142	66023	172	68290	163	68356	162	68687	168	68990	174	69056	177
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63790	137	63961	142	66026	172	68293	163	68359	163	68690	168	68993	174	70005	192
63791	137	63962	142	66027	172	68294	158	68360	163	68691	168	68994	174	70006	192
63792	137	63963	142	66028	172	68295	158	68361	163	68692	168	68995	175	70007	192
63793	137	63964	142	66029	172	68296	158	68362	163	68693	168	68996	175	70008	192
63794	137	63965	142	66030	172	68297	158	68363	163	68694	168	68997	175	70009	192
63900	140	63966	142	66031	172	68298	159	68364	163	68695	168	68998	175	70010	192
63901	140	63967	142	66032	172	68299	159	68365	163	68696	168	68999	175	70011	192
63902	140	63968	142	66033	172	68300	159	68366	163	68697	168	69000	175	70012	192
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72956.....	201	73029.....	200	74107.....	184	74219.....	184	81021.....	191	82989.....	201	90045.....	203	91121.....	204
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# SGS 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* = (tool diameter / 2) - $\sqrt{(\text{tool diameter}^2 - \text{pitch}^2) / 4}$	cuspl height* = (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
#1	5,79	0.2280	R	8,61	0.3390	–	13,00	0.5118	–	0,10	0.0039	–	1,60	0.0630	9/64	3,57	0.1406
–	5,80	0.2283	–	8,70	0.3425	33/64	13,10	0.5156	–	0,20	0.0079	#52	1,61	0.0635	–	3,60	0.1417
–	5,90	0.2323	11/32	8,73	0.3438	17/32	13,49	0.5312	–	0,25	0.0098	–	1,65	0.0650	#27	3,66	0.1440
A	5,94	0.2340	–	8,75	0.3445	–	13,50	0.5315	–	0,30	0.0118	#51	1,70	0.0669	–	3,70	0.1457
15/64	5,95	0.2344	–	8,80	0.3465	35/64	13,89	0.5469	#80	0,34	0.0135	–	1,75	0.0689	#26	3,73	0.1470
–	6,00	0.2362	S	8,84	0.3480	–	14,00	0.5512	–	0,35	0.0138	#50	1,78	0.0700	–	3,75	0.1476
B	6,05	0.2380	–	8,90	0.3504	9/16	14,29	0.5625	#79	0,37	0.0145	–	1,80	0.0709	#25	3,80	0.1495
–	6,10	0.2402	–	9,00	0.3543	–	14,50	0.5709	1/64	0,40	0.0156	#49	1,85	0.0728	–	3,80	0.1496
C	6,15	0.2420	T	9,09	0.3580	37/64	14,68	0.5781	#78	0,41	0.0160	–	1,90	0.0748	#24	3,86	0.1520
–	6,20	0.2441	–	9,10	0.3583	–	15,00	0.5906	–	0,45	0.0177	#48	1,93	0.0760	–	3,90	0.1535
D	6,25	0.2461	23/64	9,13	0.3594	19/32	15,08	0.5938	#77	0,46	0.0180	–	1,95	0.0768	#23	3,91	0.1540
–	6,30	0.2480	–	9,20	0.3622	39/64	15,48	0.6094	–	0,50	0.0197	5/64	1,98	0.0781	5/32	3,97	0.1562
E	6,35	0.2500	–	9,25	0.3642	–	15,50	0.6102	#76	0,51	0.0200	#47	1,99	0.0785	#22	3,99	0.1570
1/4	6,35	0.2500	–	9,30	0.3661	5/8	15,88	0.6250	#75	0,53	0.0210	–	2,00	0.0787	–	4,00	0.1575
–	6,40	0.2520	U	9,35	0.3680	–	16,00	0.6299	–	0,55	0.0217	–	2,05	0.0807	#21	4,04	0.1590
–	6,50	0.2559	–	9,40	0.3701	41/64	16,27	0.6406	#74	0,57	0.0225	#46	2,06	0.0810	#20	4,09	0.1610
F	6,53	0.2570	–	9,50	0.3740	–	16,50	0.6496	–	0,60	0.0236	#45	2,08	0.0820	–	4,10	0.1614
–	6,60	0.2598	3/8	9,53	0.3750	21/32	16,67	0.6562	#73	0,61	0.0240	–	2,10	0.0827	–	4,20	0.1654
G	6,63	0.2610	V	9,56	0.3770	–	17,00	0.6693	#72	0,64	0.0250	–	2,15	0.0846	#19	4,22	0.1660
–	6,70	0.2638	–	9,60	0.3780	43/64	17,07	0.6719	–	0,65	0.0256	#44	2,18	0.0860	–	4,25	0.1673
17/64	6,75	0.2656	–	9,70	0.3819	11/16	17,46	0.6875	#71	0,66	0.0260	–	2,20	0.0866	–	4,30	0.1693
H	6,76	0.2660	–	9,75	0.3839	–	17,50	0.6890	–	0,70	0.0276	–	2,25	0.0886	#18	4,31	0.1695
–	6,80	0.2677	W	9,80	0.3858	45/64	17,86	0.7031	#70	0,71	0.0280	#43	2,26	0.0890	11/64	4,37	0.1719
–	6,90	0.2717	–	9,90	0.3898	–	18,00	0.7087	#69	0,74	0.0292	–	2,30	0.0906	#17	4,39	0.1730
I	6,91	0.2720	25/64	9,92	0.3906	23/32	18,26	0.7188	–	0,75	0.0295	–	2,35	0.0925	–	4,40	0.1732
–	7,00	0.2756	–	10,00	0.3937	–	18,50	0.7283	#68	0,79	0.0310	#42	2,37	0.0935	#16	4,50	0.1770
J	7,04	0.2770	X	10,08	0.3970	47/64	18,65	0.7344	1/32	0,79	0.0313	3/32	2,38	0.0938	–	4,50	0.1772
–	7,10	0.2795	–	10,10	0.3976	–	19,00	0.7480	–	0,80	0.0315	–	2,40	0.0945	#15	4,57	0.1800
K	7,14	0.2810	–	10,20	0.4016	3/4	19,05	0.7500	#67	0,81	0.0320	#41	2,44	0.0960	–	4,60	0.1811
9/32	7,14	0.2812	Y	10,26	0.4040	49/64	19,45	0.7656	#66	0,84	0.0330	–	2,45	0.0965	#14	4,62	0.1820
–	7,20	0.2835	–	10,30	0.4055	–	19,50	0.7677	–	0,85	0.0335	#40	2,50	0.0984	#13	4,70	0.1850
–	7,25	0.2854	13/32	10,32	0.4062	25/32	19,84	0.7812	#65	0,89	0.0350	#39	2,53	0.0995	–	4,75	0.1870
–	7,30	0.2874	–	10,40	0.4094	–	20,00	0.7874	–	0,90	0.0354	#38	2,58	0.1015	3/16	4,76	0.1875
L	7,37	0.2900	Z	10,49	0.4130	51/64	20,24	0.7969	#64	0,91	0.0360	–	2,60	0.1024	#12	4,80	0.1890
–	7,40	0.2913	–	10,50	0.4134	–	20,50	0.8071	#63	0,94	0.0370	#37	2,64	0.1040	#11	4,85	0.1910
M	7,49	0.2950	–	10,60	0.4173	13/16	20,64	0.8125	–	0,95	0.0374	–	2,70	0.1063	–	4,90	0.1929
–	7,50	0.2953	–	10,70	0.4213	–	21,00	0.8268	#62	0,97	0.0380	#36	2,71	0.1065	#10	4,91	0.1935
19/64	7,54	0.2969	27/64	10,72	0.4219	53/64	21,03	0.8281	#61	0,99	0.0390	–	2,75	0.1083	#9	4,98	0.1960
–	7,60	0.2992	–	10,80	0.4252	27/32	21,43	0.8438	–	1,00	0.0394	7/64	2,78	0.1094	–	5,00	0.1969
N	7,67	0.3020	–	10,90	0.4291	–	21,50	0.8465	#60	1,02	0.0400	#35	2,79	0.1100	#8	5,05	0.1990
–	7,70	0.3031	–	11,00	0.4331	55/64	21,84	0.8594	#59	1,04	0.0410	–	2,80	0.1102	–	5,10	0.2008
–	7,75	0.3051	–	11,10	0.4370	–	22,00	0.8661	–	1,05	0.0413	#34	2,82	0.1110	#7	5,11	0.2010
–	7,80	0.3071	7/16	11,11	0.4375	7/8	22,23	0.8750	#58	1,07	0.0420	#33	2,87	0.1130	13/64	5,16	0.2031
–	7,90	0.3110	–	11,20	0.4409	–	22,50	0.8858	#57	1,09	0.0430	–	2,90	0.1142	#6	5,18	0.2040
5/16	7,94	0.3125	–	11,30	0.4449	57/64	22,62	0.8906	–	1,10	0.0433	#32	2,95	0.1160	–	5,20	0.2047
–	8,00	0.3150	–	11,40	0.4488	–	23,00	0.9055	–	1,15	0.0453	–	3,00	0.1181	#5	5,22	0.2055
O	8,03	0.3160	–	11,50	0.4528	29/32	23,02	0.9062	#56	1,18	0.0465	#31	3,05	0.1200	–	5,25	0.2067
–	8,10	0.3189	29/64	11,51	0.4531	59/64	23,42	0.9219	3/64	1,19	0.0469	–	3,10	0.1220	–	5,3	0.2087
–	8,20	0.3228	–	11,60	0.4567	–	23,50	0.9252	–	1,20	0.0472	1/8	3,18	0.1250	#4	5,31	0.2090
P	8,20	0.3230	–	11,70	0.4606	15/16	23,81	0.9375	–	1,25	0.0492	–	3,20	0.1260	–	5,40	0.2126
–	8,25	0.3248	–	11,80	0.4646	–	24,00	0.9449	–	1,30	0.0512	–	3,25	0.1280	#3	5,41	0.2130
–	8,30	0.3268	–	11,90	0.4685	61/64	24,21	0.9531	#55	1,32	0.0520	#30	3,26	0.1285	–	5,50	0.2165
21/64	8,33	0.3281	15/32	11,91	0.4688	–	24,50	0.9646	–	1,35	0.0531	–	3,30	0.1299	7/32	5,56	0.2188
–	8,40	0.3307	–	12,00	0.4724	31/32	24,61	0.9688	#54	1,40	0.0550	–	3,40	0.1339	–	5,60	0.2205
Q	8,43	0.3320	31/64	12,30	0.4844	–	25,00	0.9843	#53	1,51	0.0595	#29	3,45	0.1360	#2	5,61	0.2210
–	8,50	0.3346	–	12,50	0.4921	63/64	25,00	0.9844	–	1,55	0.0610	–	3,50	0.1378	–	5,70	0.2244
–	8,60	0.3386	1/2	12,70	0.5000	1	25,40	1.0000	1/16	1,59	0.0625	#28	3,57	0.1405	–	5,75	0.2264

# 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

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